



# RADIO TEST REPORT

**Test Report No.: 10158552S-B**

**Applicant** : PIONEER CORPORATION  
**Type of Equipment** : Car Audio with Bluetooth  
**Model No.** : NXF-9738  
**FCC ID** : AJDK081  
**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:** January 16 to 20, 2014

**Representative test engineer:** M. Hosaka  
Makoto Hosaka  
Engineer of WiSE Japan,  
UL Verification Service

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



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13-EM-F0429



**Contents**

	<b>Page</b>
<b>SECTION 1: Customer information.....</b>	<b>4</b>
<b>SECTION 2: Equipment under test (E.U.T.) .....</b>	<b>4</b>
<b>SECTION 3: Test specification, procedures &amp; results.....</b>	<b>6</b>
<b>SECTION 4: Operation of E.U.T. during testing.....</b>	<b>8</b>
<b>SECTION 5: 6dB bandwidth &amp; Occupied bandwidth (99%) .....</b>	<b>11</b>
<b>SECTION 6: Maximum peak conducted output power.....</b>	<b>11</b>
<b>SECTION 7: Out of band emissions (Antenna port conducted) .....</b>	<b>11</b>
<b>SECTION 8: Peak power density.....</b>	<b>11</b>
<b>SECTION 9: Radiated emission .....</b>	<b>12</b>
<b>Contents of APPENDIXES.....</b>	<b>14</b>
<b>APPENDIX 1: Data of Radio tests.....</b>	<b>15</b>
<b>APPENDIX 2: Test instruments .....</b>	<b>40</b>
<b>APPENDIX 3: Photographs of test setup .....</b>	<b>41</b>

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## **SECTION 1: Customer information**

Company Name : PIONEER CORPORATION  
Brand name : Pioneer  
Address : 25-1 Aza-Nishi-machi, Yamada, Kawagoe-shi, Saitama, 350-8555, JAPAN  
Telephone Number : +81-49-228-6415  
Facsimile Number : +81-49-228-6493  
Contact Person : Tomoyuki Tanaka

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

### **2.1 Identification of E.U.T.**

Type of Equipment : Car Audio with Bluetooth  
Model No. : NXF-9738  
Serial No. : Refer to 4.2 of this report.  
Rating : DC 13.2V  
Country of Mass-production : Japan  
Condition of EUT : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No modification by the test lab.  
Receipt Date of Sample : January 10, 2014

### **2.2 Product description**

Model: NXF-9738 (referred to as the EUT in this report) is a Car Audio with Bluetooth.

Radio specification:

Bluetooth:

Equipment type : Transceiver  
Frequency of operation : 2402-2480MHz  
Bandwidth & channel spacing : 79MHz & 1MHz  
Type of modulation : GFSK,  $\pi/4$ DQPSK, 8DPSK  
Antenna type : Ceramic patch antenna  
Antenna gain with cable loss : +2dBi (max)  
Antenna connector type : MHF series micro coaxial connector receptacle vertical  
Operation temperature range : -20 to +65 deg.C.

Refer to the test report: 10158552S-A for Bluetooth part.

Wireless LAN:

Equipment type : Transceiver  
Frequency of operation : 2412-2462MHz  
Bandwidth & channel spacing : 20MHz & 5MHz  
Type of modulation : BPSK, QPSK, CCK, 16QAM, 64QAM  
Antenna type : Ceramic patch antenna  
Antenna gain with cable loss : +2dBi (max)  
Antenna connector type : MHF series micro coaxial connector receptacle vertical  
Operation temperature range : -20 to +65 deg.C.

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FCC 15.31 (e)

The equipment provides the wireless transmitter with stable power supply (DC3.3V). Therefore, the equipment 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.

Clock Frequency:

48MHz, 24MHz, 32.768kHz, 4MHz, 24.576MHz

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test specification**

Test specification : FCC Part 15 Subpart C: 2013,  
final revised on September 30, 2013 and effective October 30, 2013  
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.209 Radiated emission limits, general requirements  
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz,  
and 5725-5850MHz

### **3.2 Procedures & Results**

Item	Test Procedure *1)	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.10:2009	FCC 15.207	-	N/A *2)	-	-
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	1.4dB Freq.: 777.199MHz Polarization: Vertical Detection: Quasi-Peak Mode: Tx 2437MHz, IEEE 802.11n (20HT)	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".

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

### **3.3 Addition to standard**

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied bandwidth (99%)	ANSI C63.4:2009 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 <sup>*1</sup> /SR <sup>*2</sup> (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
<b>Radiated emission (Measurement distance: 3m)</b>	9kHz-30MHz	3.7 dB	3.7 dB	3.6 dB
	30MHz-300MHz	4.8 dB	5.0 dB	4.8 dB
	300MHz-1GHz	5.0 dB	5.0 dB	4.8 dB
	1GHz-15GHz	4.9 dB	4.9 dB	4.9 dB
<b>Radiated emission (Measurement distance: 1m)</b>	15GHz-18GHz	5.7 dB	5.6 dB	5.6 dB
	18GHz-40GHz	5.2 dB	4.3 dB	4.3 dB

\*1: SAC=Semi-Anechoic Chamber

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

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

#### Antenna port conducted test

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

Spurious emission (Conducted) measurement (below 1GHz) uncertainty for this test was: (±) 1.6dB

Spurious emission (Conducted) measurement (1G-3GHz) uncertainty for this test was: (±) 1.4dB

Spurious emission (Conducted) measurement (3G-18GHz) uncertainty for this test was: (±) 2.8dB

Spurious emission (Conducted) measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.5dB

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 semi-anechoic chamber	-	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
<input type="checkbox"/> No.1 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.2 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.3 shielded room	-	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
<input type="checkbox"/> No.4 shielded room	-	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
<input type="checkbox"/> No.5 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input type="checkbox"/> No.6 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input checked="" type="checkbox"/> No.1 measurement room	-	-	2.55 x 4.1 x 2.5	-	-

### 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**

<b>Test item</b>	<b>Mode</b>	<b>Tested frequency</b>	<b>Power setting *1)</b>	<b>Worst data rate *2)</b>
Spurious emission Radiated (below 1GHz) *3) Conducted (below 30MHz)	Transmitting IEEE 802.11n (20HT)	2437MHz	Fixed	MCS0, PN9
Other items	Transmitting IEEE 802.11b	2412MHz, 2437MHz, 2462MHz	Fixed	1Mbps, PN9
	Transmitting IEEE 802.11g	2412MHz, 2437MHz, 2462MHz	Fixed	6Mbps, PN9
	Transmitting IEEE 802.11n (20HT)	2412MHz, 2437MHz, 2462MHz	Fixed	MCS0, PN9
*1) Software used for the test: NAVI soft, ver. VD121000 *2) The worst condition was determined based on the test result of Maximum Peak Conducted Output Power. *3) Test operating mode was determined as follows according to "Section 1 of 6 802.11 a/b/g/n testing- Managing Complex Regulatory Approvals - "of TCB Council Workshop October 2009.				

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

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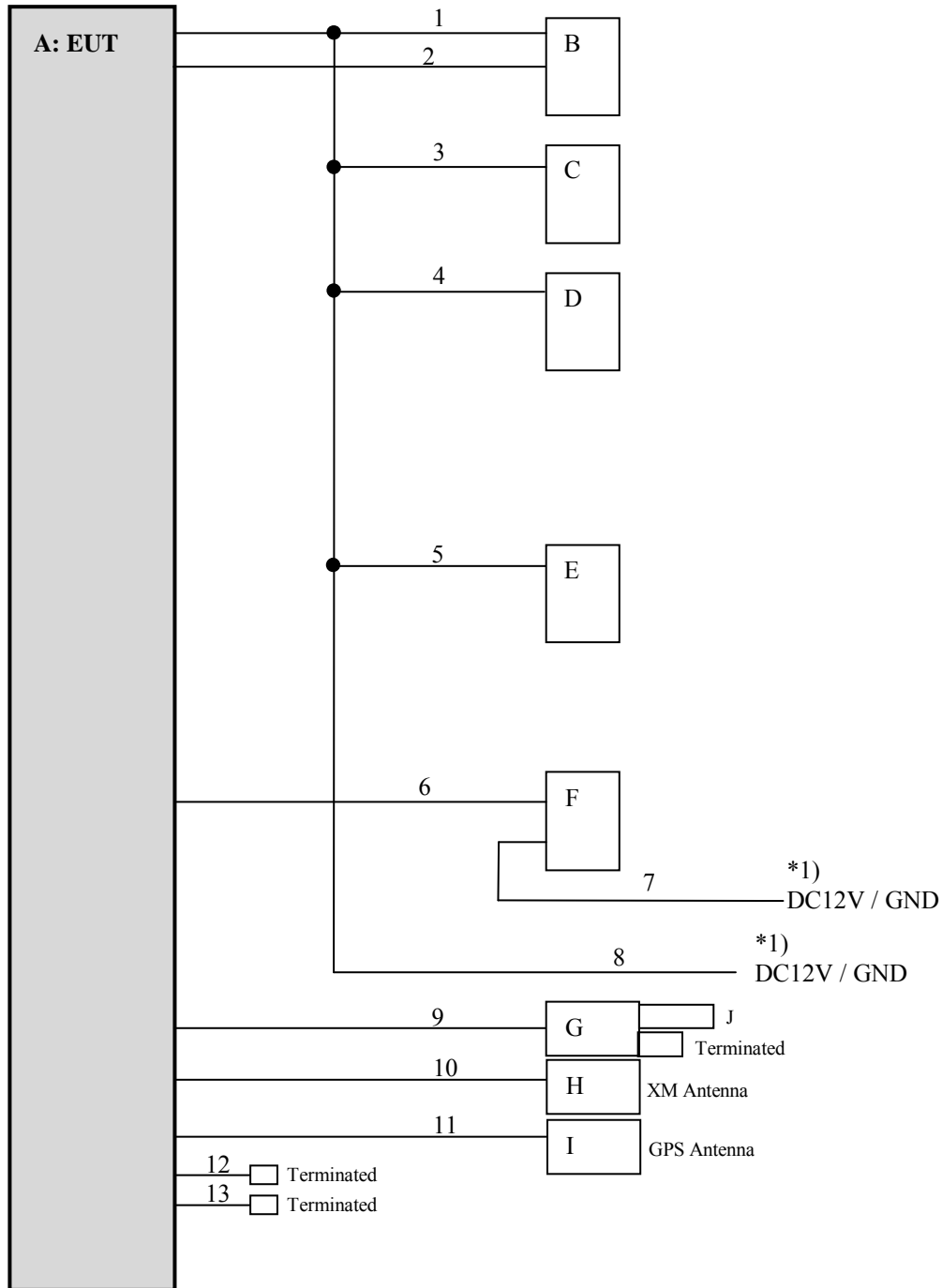
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## 4.2 Configuration and peripherals



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

\*1) DC power supply (Model No.: PAN35-10A) was used for DC 12V input.

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### Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Car Audio with Bluetooth	NXF-9738	*1)	Pioneer	EUT
B	Display	86110-30330	462200-3296	DENSO	-
C	Remote Control Device	84780-30080	-	Tokai Rika Co., Ltd.	-
D	Steering Switch	-	-	-	-
E	Rear Camera	86790-48130	2XC00154	-	-
F	Amplifier	GM-4038ZT	TPJA000142WL	Pioneer	-
G	USB connector	86190-48036	3104482	-	-
H	XM Antenna	86860-30330	-	AISIN	-
I	GPS Antenna	86860-22090	-	DENSO	-
J	USB Memory	JF V33/2GB	-	Transcend	-

\*1) Antenna terminal conducted tests: MKPKTP0022EW, Radiated emission tests: MKPKTP0016EW

### List of cables used

No.	Name	Length (m)	Shield- Cable	Shield- Connector	Remarks
1	Signal cable for Display	2.0	Unshielded	Unshielded	-
2	Image output cable	2.0	Unshielded	Unshielded	-
3	Signal cable for Remote control	2.0	Unshielded	Unshielded	-
4	Signal cable for Steering Switch	2.0	Unshielded	Unshielded	-
5	Signal cable for Rear Camera	2.0	Unshielded	Unshielded	-
6	Signal cable for Amplifier	2.0	Shielded	Shielded	-
7	DC power cable	4.0	Unshielded	Unshielded	-
8	DC power cable	4.0	Unshielded	Unshielded	-
9	USB cable	3.0	Shielded	Shielded	-
10	Antenna cable for XM	2.4	Shielded	Shielded	-
11	Antenna cable for GPS	1.6	Shielded	Shielded	-
12	Antenna cable for Radio	0.15	Shielded	Shielded	-
13	Antenna cable for Radio	0.15	Shielded	Shielded	-

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

### **Test procedure**

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

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

## **SECTION 6: 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 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.  
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: 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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## **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, 1.0m by 2.0m, raised 0.8m (30MHz-15GHz) or 1.0m (15-25GHz) 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.

### **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) (Refer to Figure 1). Measurements were performed with quasi-peak, peak and average detector. The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detection.

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

\*1) Average Power Measurement was measured based on 12.2.5 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

The axis of EUT was fixed at angle of 6.9 deg. based on the product specification.

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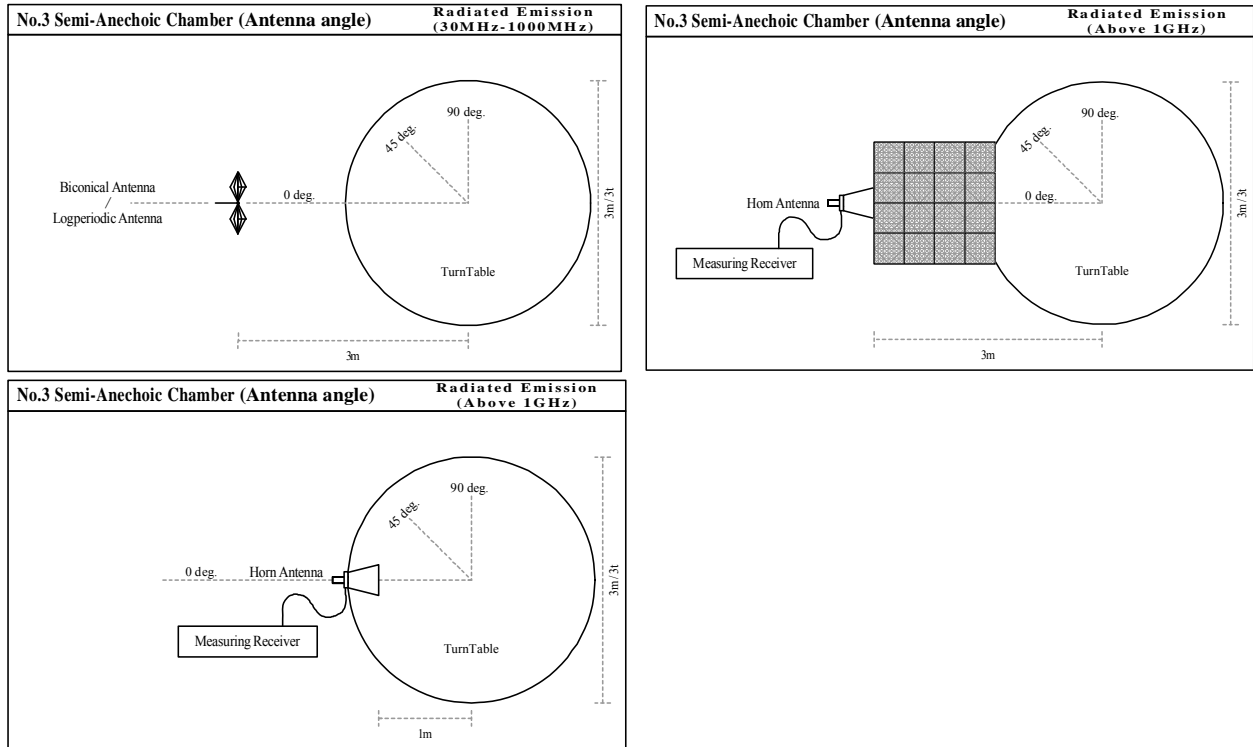
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**Figure 1. Antenna angle**



## 9.5 Band edge

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

## 9.6 Results

Summary of the test results : Pass  
\* No noise was detected above the 3<sup>rd</sup> order harmonics.

Refer to APPENDIX 1.

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## **Contents of APPENDIXES**

### **APPENDIX 1: Data of Radio tests**

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

### **APPENDIX 2: Test instruments**

Test instruments

### **APPENDIX 3: Photographs of test setup**

Radiated emission

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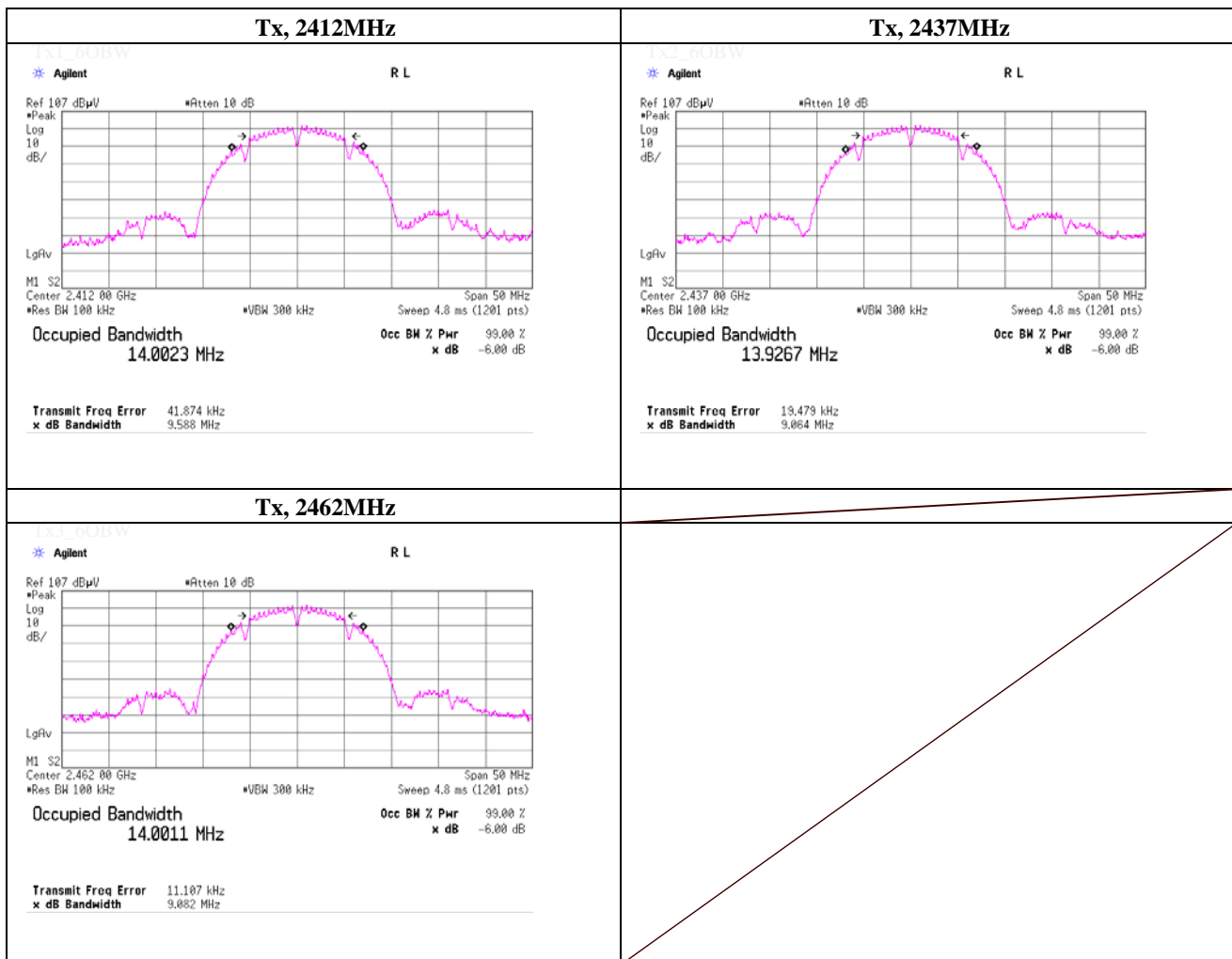
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## APPENDIX 1: Data of Radio tests

### -6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 16, 2014	
Temperature / Humidity	23 deg.C , 44 %RH	
Engineer	Shinichi Takano	
Mode	Tx, IEEE802.11b, PN9, worst data mode 1Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	9.588	> 0.500
2437.0000	9.064	> 0.500
2462.0000	9.082	> 0.500



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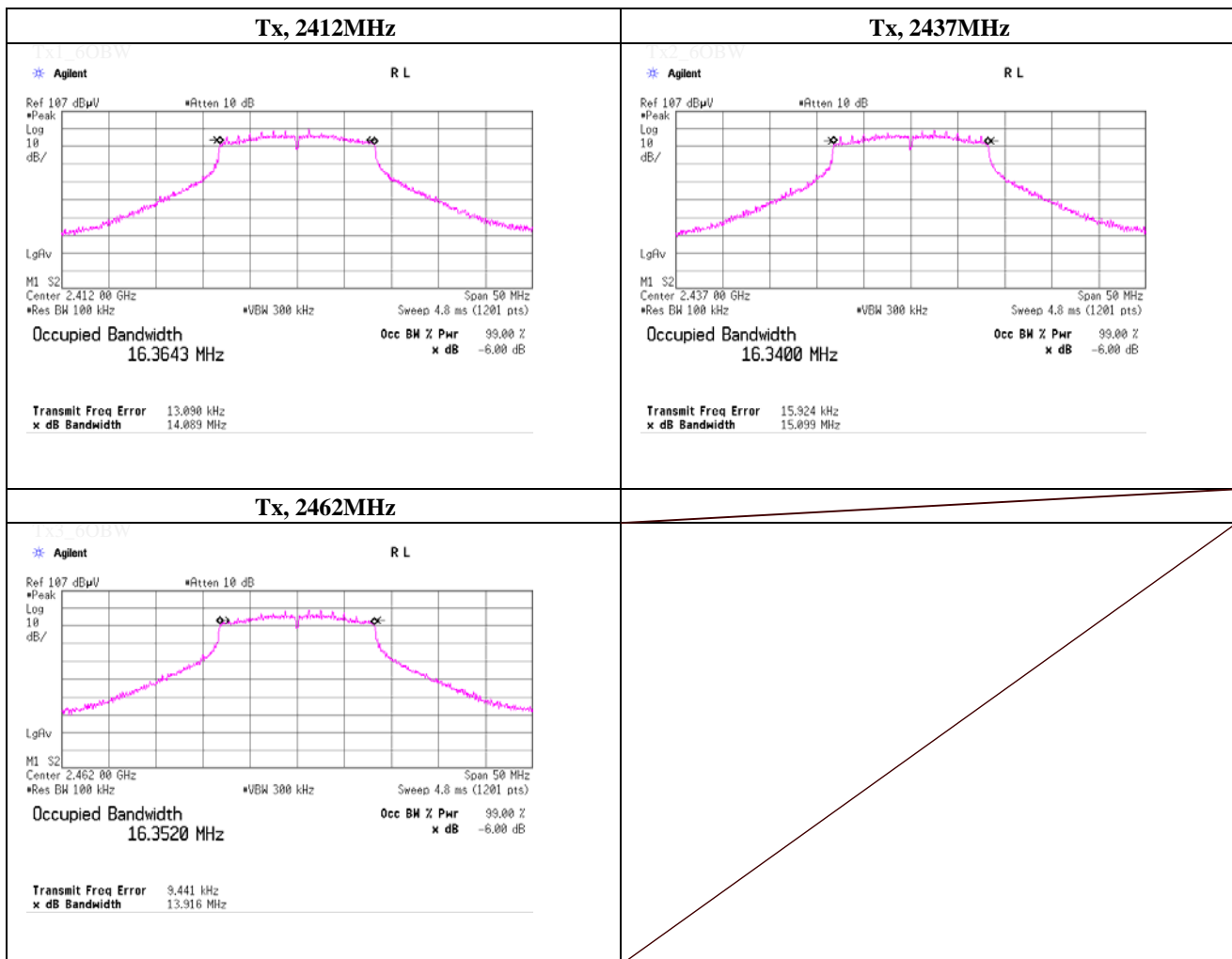
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### -6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 16, 2014	
Temperature / Humidity	23 deg.C , 44 %RH	
Engineer	Shinichi Takano	
Mode	Tx, IEEE802.11g, PN9, worst data mode 6Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	14.089	> 0.500
2437.0000	15.099	> 0.500
2462.0000	13.916	> 0.500

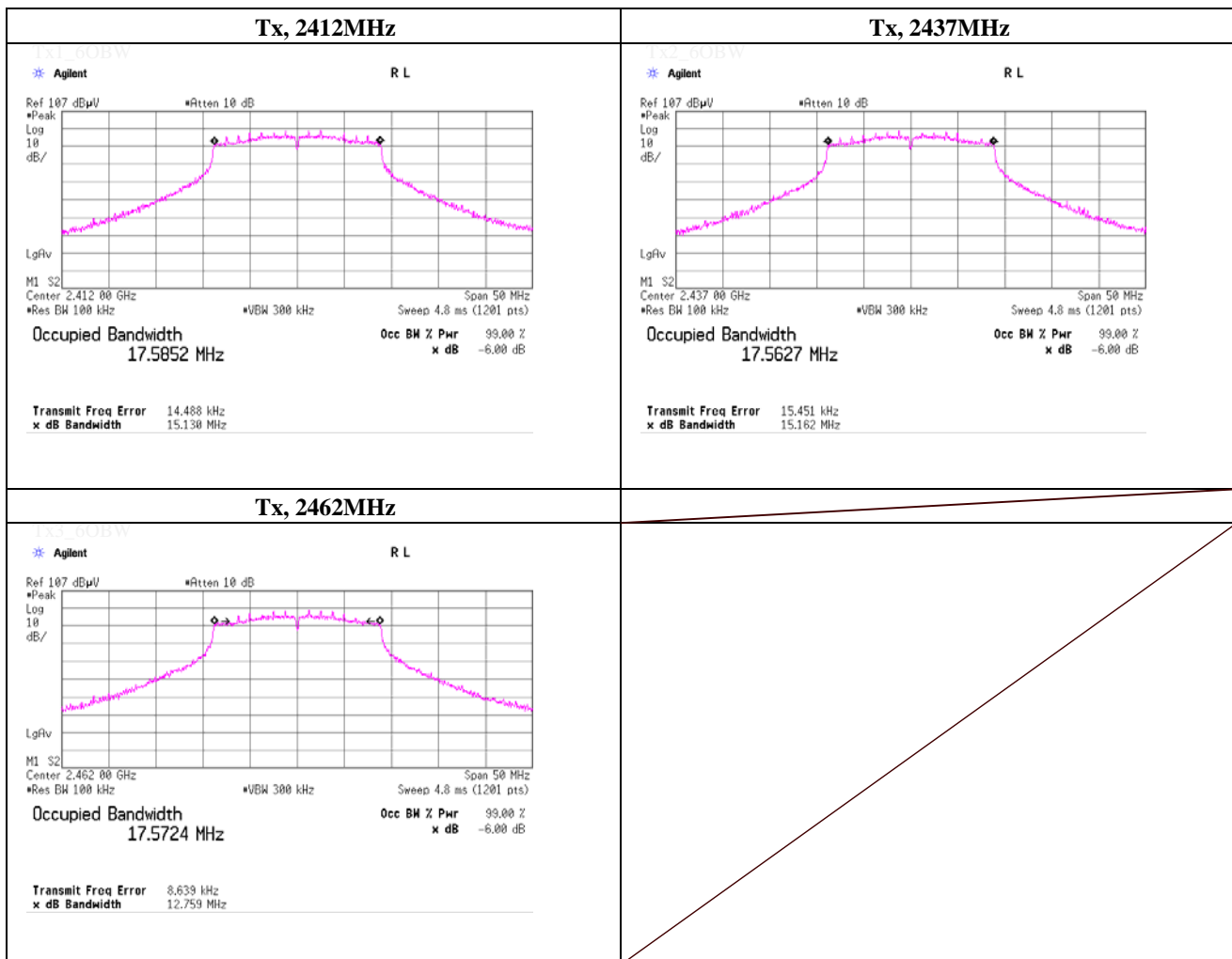




### -6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 16, 2014	
Temperature / Humidity	23 deg.C , 44 %RH	
Engineer	Shinichi Takano	
Mode	Tx, IEEE802.11n(20HT), PN9, worst data mode 0(MCS)	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	15.130	> 0.500
2437.0000	15.162	> 0.500
2462.0000	12.759	> 0.500









## Radiated Emission

Test place            No.3 Semi Anechoic Chamber  
Date                    January 17, 2014                    January 18, 2014                    January 19, 2014  
Temperature / Humidity    24 deg.C, 28 %RH                    23 deg.C, 30 %RH                    23 deg.C, 29 %RH  
Engineer                Shinichi Takano                    Wataru Kojima                    Yasumasa Owaki  
Mode                    Tx,                    2412 MHz  
                              Tx, IEEE802.11b, 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.	1776.453	PK	49.8	26.2	14.0	38.6	51.4	73.9	22.5	100	69	
Hori.	2390.000	PK	45.5	26.8	14.7	38.2	48.8	73.9	25.1	100	330	
Hori.	2813.987	PK	43.0	27.7	7.3	38.1	39.9	73.9	34.0	100	330	
Hori.	4824.000	PK	44.3	31.1	7.9	37.1	46.2	73.9	27.7	100	220	
Hori.	7236.000	PK	45.5	37.1	9.1	39.4	52.3	73.9	21.6	100	0	
Hori.	1776.453	AV	41.2	26.2	14.0	38.6	42.8	53.9	11.1	100	69	
Hori.	2390.000	AV	34.8	26.8	14.7	38.2	38.1	53.9	15.8	100	330	
Hori.	2813.987	AV	34.6	27.7	7.3	38.1	31.5	53.9	22.4	100	330	
Hori.	4824.000	AV	36.2	31.1	7.9	37.1	38.1	53.9	15.8	100	220	
Hori.	7236.000	AV	36.0	37.1	9.1	39.4	42.8	53.9	11.1	100	0	
Vert.	1776.466	PK	51.2	26.2	14.0	38.6	52.8	73.9	21.1	100	215	
Vert.	2390.000	PK	44.9	26.8	14.7	38.2	48.2	73.9	25.7	100	359	
Vert.	2814.035	PK	44.5	27.7	7.3	38.1	41.4	73.9	32.5	100	359	
Vert.	4824.000	PK	44.4	31.1	7.9	37.1	46.3	73.9	27.6	100	172	
Vert.	7236.000	PK	45.0	37.1	9.1	39.4	51.8	73.9	22.1	100	0	
Vert.	1776.466	AV	42.7	26.2	14.0	38.6	44.3	53.9	9.6	100	215	
Vert.	2390.000	AV	35.3	26.8	14.7	38.2	38.6	53.9	15.3	100	359	
Vert.	2814.035	AV	35.1	27.7	7.3	38.1	32.0	53.9	21.9	100	359	
Vert.	4824.000	AV	36.2	31.1	7.9	37.1	38.1	53.9	15.8	100	172	
Vert.	7236.000	AV	35.9	37.1	9.1	39.4	42.7	53.9	11.2	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	91.6	26.8	14.7	38.2	94.9	-	-	
Hori.	2396.974	PK	43.1	26.8	14.7	38.2	46.4	74.9	28.5	
Hori.	2400.000	PK	39.1	26.8	14.7	38.2	42.4	74.9	32.5	
Vert.	2412.000	PK	92.2	26.8	14.7	38.2	95.5	-	-	
Vert.	2397.008	PK	43.5	26.8	14.7	38.2	46.8	75.5	28.7	
Vert.	2400.000	PK	39.6	26.8	14.7	38.2	42.9	75.5	32.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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## Radiated Emission

Test place            No.3 Semi Anechoic Chamber  
Date                    January 17, 2014                    January 18, 2014                    January 19, 2014  
Temperature / Humidity    24 deg.C, 28 %RH                    23 deg.C, 30 %RH                    23 deg.C, 29 %RH  
Engineer                Shinichi Takano                    Wataru Kojima                    Yasumasa Owaki  
Mode                    Tx,                    2437 MHz  
                              Tx, IEEE802.11b, 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.	1776.460	PK	50.1	26.2	14.0	38.6	51.7	73.9	22.2	100	64	
Hori.	2843.148	PK	44.1	27.8	7.1	38.1	40.9	73.9	33.0	100	346	
Hori.	4874.000	PK	44.9	31.3	7.9	37.1	47.0	73.9	26.9	100	220	
Hori.	7311.000	PK	45.6	37.2	9.1	39.4	52.5	73.9	21.4	100	0	
Hori.	1776.460	AV	41.3	26.2	14.0	38.6	42.9	53.9	11.0	100	64	
Hori.	2843.148	AV	34.9	27.8	7.1	38.1	31.7	53.9	22.2	100	346	
Hori.	4874.000	AV	36.6	31.3	7.9	37.1	38.7	53.9	15.2	100	220	
Hori.	7311.000	AV	35.7	37.2	9.1	39.4	42.6	53.9	11.3	100	0	
Vert.	1776.392	PK	51.0	26.2	14.0	38.6	52.6	73.9	21.3	100	212	
Vert.	2843.190	PK	45.5	27.8	7.1	38.1	42.3	73.9	31.6	100	359	
Vert.	4874.000	PK	44.3	31.3	7.9	37.1	46.4	73.9	27.5	100	178	
Vert.	7311.000	PK	44.6	37.2	9.1	39.4	51.5	73.9	22.4	100	0	
Vert.	1776.392	AV	42.6	26.2	14.0	38.6	44.2	53.9	<b>9.7</b>	100	212	
Vert.	2843.190	AV	35.1	27.8	7.1	38.1	31.9	53.9	22.0	100	359	
Vert.	4874.000	AV	36.1	31.3	7.9	37.1	38.2	53.9	15.7	100	178	
Vert.	7311.000	AV	35.8	37.2	9.1	39.4	42.7	53.9	11.2	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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## Radiated Emission

Test place            No.3 Semi Anechoic Chamber  
 Date                    January 17, 2014                    January 18, 2014                    January 19, 2014  
 Temperature / Humidity 24 deg.C, 28 %RH                    23 deg.C, 30 %RH                    23 deg.C, 29 %RH  
 Engineer                Shinichi Takano                    Wataru Kojima                    Yasumasa Owaki  
 Mode                    Tx,                    2462 MHz  
                               Tx, IEEE802.11b, 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.	1776.458	PK	50.7	26.2	14.0	38.6	52.3	73.9	21.6	100	65	
Hori.	2483.500	PK	44.7	26.9	14.8	38.1	48.3	73.9	25.6	216	344	
Hori.	2488.000	PK	45.0	26.9	14.8	38.1	48.6	73.9	25.3	216	345	
Hori.	2873.000	PK	42.5	27.9	7.1	38.1	39.4	73.9	34.5	100	0	
Hori.	4924.000	PK	44.8	31.6	7.8	37.0	47.2	73.9	26.7	100	274	
Hori.	7386.000	PK	45.6	37.3	9.3	39.4	52.8	73.9	21.1	100	0	
Hori.	1776.458	AV	40.9	26.2	14.0	38.6	42.5	53.9	11.4	100	65	
Hori.	2483.500	AV	36.1	26.9	14.8	38.1	39.7	53.9	14.2	216	344	
Hori.	2488.000	AV	35.7	26.9	14.8	38.1	39.3	53.9	14.6	216	345	
Hori.	2873.000	AV	33.7	27.9	7.1	38.1	30.6	53.9	23.3	100	0	
Hori.	4924.000	AV	37.2	31.6	7.8	37.0	39.6	53.9	14.3	100	274	
Hori.	7386.000	AV	35.6	37.3	9.3	39.4	42.8	53.9	11.1	100	0	
Vert.	1776.408	PK	50.9	26.2	14.0	38.6	52.5	73.9	21.4	100	210	
Vert.	2483.500	PK	44.5	26.9	14.8	38.1	48.1	73.9	25.8	100	23	
Vert.	2488.000	PK	45.3	26.9	14.8	38.1	48.9	73.9	25.0	100	23	
Vert.	2872.295	PK	43.6	27.9	7.1	38.1	40.5	73.9	33.4	100	341	
Vert.	4924.000	PK	45.8	31.6	7.8	37.0	48.2	73.9	25.7	100	178	
Vert.	7386.000	PK	45.1	37.3	9.3	39.4	52.3	73.9	21.6	100	0	
Vert.	1776.408	AV	42.0	26.2	14.0	38.6	43.6	53.9	<b>10.3</b>	100	210	
Vert.	2483.500	AV	35.5	26.9	14.8	38.1	39.1	53.9	14.8	100	23	
Vert.	2488.000	AV	35.5	26.9	14.8	38.1	39.1	53.9	14.8	100	23	
Vert.	2872.295	AV	34.5	27.9	7.1	38.1	31.4	53.9	22.5	100	341	
Vert.	4924.000	AV	38.8	31.6	7.8	37.0	41.2	53.9	12.7	100	178	
Vert.	7386.000	AV	35.6	37.3	9.3	39.4	42.8	53.9	11.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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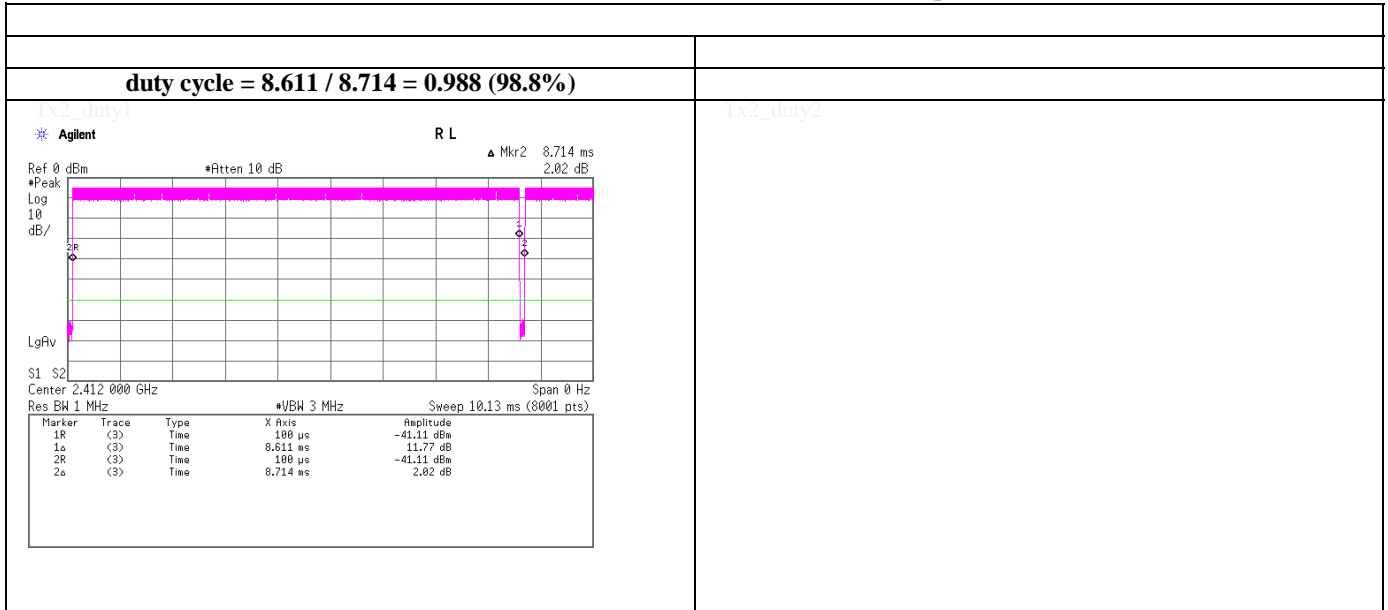
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## Burst rate confirmation

**Tx, IEEE802.11b, PN9, worst data mode 1Mbps**





## Radiated Emission

Test place            No.3 Semi Anechoic Chamber  
 Date                    January 17, 2014                    January 18, 2014                    January 19, 2014  
 Temperature / Humidity    24 deg.C, 28 %RH                    23 deg.C, 30 %RH                    23 deg.C, 29 %RH  
 Engineer                Shinichi Takano                    Wataru Kojima                    Yasumasa Owaki  
 Mode                    Tx,                    2412 MHz  
                               Tx, IEEE802.11g, 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.	1776.461	PK	49.0	26.2	14.0	38.6	50.6	73.9	23.3	100	65	
Hori.	2390.000	PK	46.2	26.8	14.7	38.2	49.5	73.9	24.4	100	329	
Hori.	2814.009	PK	44.7	27.7	7.3	38.1	41.6	73.9	32.3	100	347	
Hori.	4824.000	PK	41.5	31.1	7.9	37.1	43.4	73.9	30.5	100	0	
Hori.	7236.000	PK	45.3	37.1	9.1	39.4	52.1	73.9	21.8	100	0	
Hori.	1776.461	AV	40.8	26.2	14.0	38.6	42.4	53.9	11.5	100	65	*2
Hori.	2390.000	AV	36.4	26.8	14.7	38.2	39.7	53.9	14.2	100	329	*1
Hori.	2814.009	AV	34.5	27.7	7.3	38.1	31.4	53.9	22.5	100	347	*2
Vert.	1776.465	PK	51.5	26.2	14.0	38.6	53.1	73.9	20.8	100	214	
Vert.	2390.000	PK	46.1	26.8	14.7	38.2	49.4	73.9	24.5	100	359	
Vert.	2814.054	PK	44.7	27.7	7.3	38.1	41.6	73.9	32.3	100	359	
Vert.	4824.000	PK	45.1	31.1	7.9	37.1	47.0	73.9	26.9	100	0	
Vert.	7236.000	PK	45.6	37.1	9.1	39.4	52.4	73.9	21.5	100	0	
Vert.	1776.465	AV	42.7	26.2	14.0	38.6	44.3	53.9	<b>9.6</b>	100	214	*2
Vert.	2390.000	AV	36.4	26.8	14.7	38.2	39.7	53.9	14.2	100	359	*1
Vert.	2814.054	AV	35.4	27.7	7.3	38.1	32.3	53.9	21.6	100	359	*2

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

\*1) Out of band emission (Leakage Power)

\*2) Continuous wave (no pulse emission)

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4824.000	AV	33.5	31.1	7.9	37.1	0.6	36.0	53.9	17.9	
Hori.	7236.000	AV	36.0	37.1	9.1	39.4	0.6	43.4	53.9	<b>10.5</b>	
Vert.	4824.000	AV	33.5	31.1	7.9	37.1	0.6	36.0	53.9	17.9	
Vert.	7236.000	AV	35.8	37.1	9.1	39.4	0.6	43.2	53.9	10.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	89.3	26.8	14.7	38.2	92.6	-	-	
Hori.	2400.000	PK	56.0	26.8	14.7	38.2	59.3	72.6	13.3	
Vert.	2412.000	PK	89.8	26.8	14.7	38.2	93.1	-	-	
Vert.	2400.000	PK	56.2	26.8	14.7	38.2	59.5	73.1	13.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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## Radiated Emission

Test place            No.3 Semi Anechoic Chamber  
Date                    January 17, 2014                    January 18, 2014                    January 19, 2014  
Temperature / Humidity    24 deg.C, 28 %RH                    23 deg.C, 30 %RH                    23 deg.C, 29 %RH  
Engineer                Shinichi Takano                    Wataru Kojima                    Yasumasa Owaki  
Mode                    Tx,                    2437 MHz  
                              Tx, IEEE802.11g, 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.	1776.472	PK	50.5	26.2	14.0	38.6	52.1	73.9	21.8	100	66	
Hori.	2843.145	PK	43.5	27.8	7.1	38.1	40.3	73.9	33.6	100	346	
Hori.	4874.000	PK	42.9	31.3	7.9	37.1	45.0	73.9	28.9	100	0	
Hori.	7311.000	PK	44.7	37.2	9.1	39.4	51.6	73.9	22.3	100	0	
Hori.	1776.472	AV	41.5	26.2	14.0	38.6	43.1	53.9	10.8	100	66	*2
Hori.	2843.145	AV	34.6	27.8	7.1	38.1	31.4	53.9	22.5	100	346	*2
Vert.	1776.419	PK	50.2	26.2	14.0	38.6	51.8	73.9	22.1	100	217	
Vert.	2843.161	PK	44.5	27.8	7.1	38.1	41.3	73.9	32.6	100	341	
Vert.	4874.000	PK	41.0	31.3	7.9	37.1	43.1	73.9	30.8	100	0	
Vert.	7311.000	PK	44.4	37.2	9.1	39.4	51.3	73.9	22.6	100	0	
Vert.	1776.419	AV	42.4	26.2	14.0	38.6	44.0	53.9	<b>9.9</b>	100	217	*2
Vert.	2843.161	AV	35.5	27.8	7.1	38.1	32.3	53.9	21.6	100	341	*2

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

\*1) Out of band emission (Leakage Power)

\*2) Continuous wave (no pulse emission)

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	33.4	31.3	7.9	37.1	0.6	36.1	53.9	17.8	
Hori.	7311.000	AV	35.8	37.2	9.1	39.4	0.6	43.3	53.9	<b>10.6</b>	
Vert.	4874.000	AV	33.3	31.3	7.9	37.1	0.6	36.0	53.9	17.9	
Vert.	7311.000	AV	35.6	37.2	9.1	39.4	0.6	43.1	53.9	10.8	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor

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

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## Radiated Emission

Test place            No.3 Semi Anechoic Chamber  
Date                    January 17, 2014                    January 18, 2014                    January 19, 2014  
Temperature / Humidity    24 deg.C, 28 %RH                    23 deg.C, 30 %RH                    23 deg.C, 29 %RH  
Engineer                Shinichi Takano                    Wataru Kojima                    Yasumasa Owaki  
Mode                    Tx,                    2462 MHz  
                              Tx, IEEE802.11g, 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.	1776.483	PK	50.2	26.2	14.0	38.6	51.8	73.9	22.1	100	61	
Hori.	2483.500	PK	52.3	26.9	14.8	38.1	55.9	73.9	18.0	263	342	
Hori.	2873.000	PK	42.9	27.9	7.1	38.1	39.8	73.9	34.1	100	0	
Hori.	4924.000	PK	42.9	31.6	7.8	37.0	45.3	73.9	28.6	100	0	
Hori.	7386.000	PK	44.5	37.3	9.3	39.4	51.7	73.9	22.2	100	0	
Hori.	1776.483	AV	40.4	26.2	14.0	38.6	42.0	53.9	11.9	100	61	*2
Hori.	2483.500	AV	40.5	26.9	14.8	38.1	44.1	53.9	<b>9.8</b>	263	342	*1
Hori.	2873.000	AV	33.8	27.9	7.1	38.1	30.7	53.9	23.2	100	0	*2
Vert.	1776.458	PK	50.8	26.2	14.0	38.6	52.4	73.9	21.5	100	211	
Vert.	2483.500	PK	47.8	26.9	14.8	38.1	51.4	73.9	22.5	100	24	
Vert.	2872.320	PK	43.7	27.9	7.1	38.1	40.6	73.9	33.3	100	339	
Vert.	4924.000	PK	42.1	31.6	7.8	37.0	44.5	73.9	29.4	100	0	
Vert.	7386.000	PK	46.4	37.3	9.3	39.4	53.6	73.9	20.3	100	0	
Vert.	1776.458	AV	41.5	26.2	14.0	38.6	43.1	53.9	10.8	100	211	*2
Vert.	2483.500	AV	38.2	26.9	14.8	38.1	41.8	53.9	12.1	100	24	*1
Vert.	2872.320	AV	34.9	27.9	7.1	38.1	31.8	53.9	22.1	100	339	*2

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

\*1) Out of band emission (Leakage Power)

\*2) Continuous wave (no pulse emission)

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4924.000	AV	33.6	31.6	7.8	37.0	0.6	36.6	53.9	17.3	
Hori.	7386.000	AV	35.6	37.3	9.3	39.4	0.6	43.4	53.9	10.5	
Vert.	4924.000	AV	33.7	31.6	7.8	37.0	0.6	36.7	53.9	17.2	
Vert.	7386.000	AV	35.8	37.3	9.3	39.4	0.6	43.6	53.9	<b>10.3</b>	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor

Distance factor : 15GHz -40GHz :  $20\log(3.0m/1.0m) = 9.5dB$ **UL Japan, Inc.****Shonan EMC Lab.**

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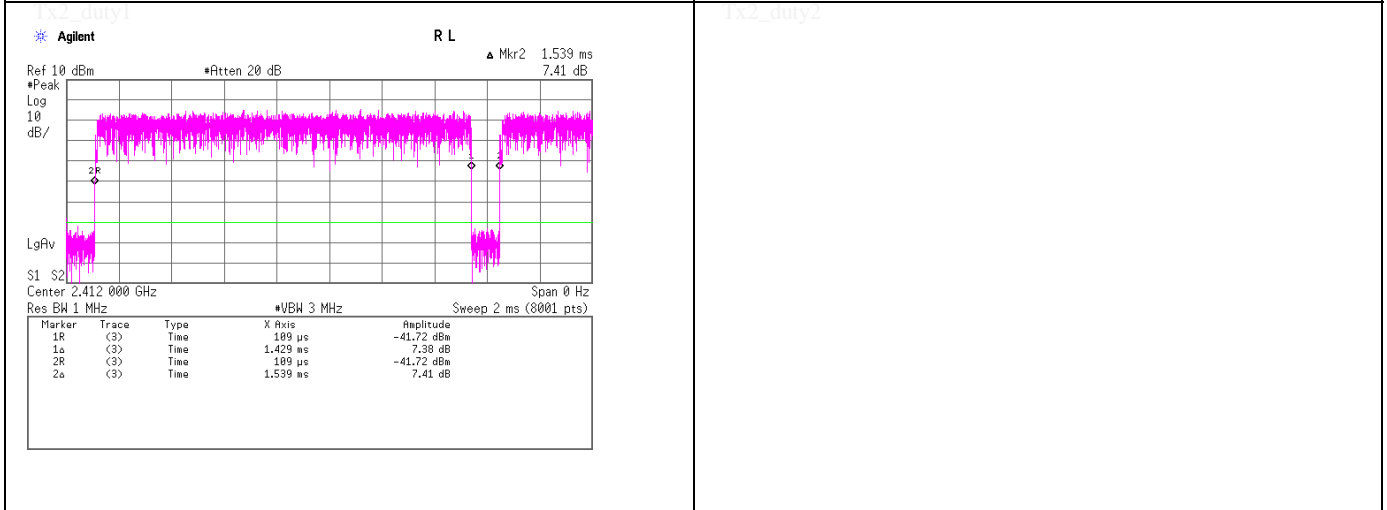
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## Duty Factor Calculation chart

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

### Duty Factor Calculation

**Duty Factor:  $20\log(1/\text{duty cycle}) = 0.6\text{dB}$**   
**duty cycle =  $1.429 / 1.539 = 0.929$  (92.9%)**



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## Radiated Emission

Test place            No.3 Semi Anechoic Chamber  
 Date                    January 17, 2014                    January 18, 2014                    January 19, 2014  
 Temperature / Humidity 24 deg.C, 28 %RH                    23 deg.C, 30 %RH                    23 deg.C, 29 %RH  
 Engineer                Shinichi Takano                    Wataru Kojima                    Yasumasa Owaki  
 Mode                    Tx,                    2412 MHz  
                               Tx, IEEE802.11n(20HT), 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.	1776.479	PK	49.2	26.2	14.0	38.6	50.8	73.9	23.1	100	68	
Hori.	2390.000	PK	47.0	26.8	14.7	38.2	50.3	73.9	23.6	100	329	
Hori.	2814.036	PK	43.7	27.7	7.3	38.1	40.6	73.9	33.3	100	347	
Hori.	4824.000	PK	42.8	31.1	7.9	37.1	44.7	73.9	29.2	100	0	
Hori.	7236.000	PK	46.3	37.1	9.1	39.4	53.1	73.9	20.8	100	0	
Hori.	1776.479	AV	40.9	26.2	14.0	38.6	42.5	53.9	11.4	100	68	*2
Hori.	2390.000	AV	37.2	26.8	14.7	38.2	40.5	53.9	13.4	100	329	*1
Hori.	2814.036	AV	34.9	27.7	7.3	38.1	31.8	53.9	22.1	100	347	*2
Vert.	1776.462	PK	51.5	26.2	14.0	38.6	53.1	73.9	20.8	100	212	
Vert.	2390.000	PK	50.3	26.8	14.7	38.2	53.6	73.9	20.3	100	359	
Vert.	2813.943	PK	44.3	27.7	7.3	38.1	41.2	73.9	32.7	100	340	
Vert.	4824.000	PK	43.5	31.1	7.9	37.1	45.4	73.9	28.5	100	0	
Vert.	7236.000	PK	45.4	37.1	9.1	39.4	52.2	73.9	21.7	100	0	
Vert.	1776.462	AV	42.9	26.2	14.0	38.6	44.5	53.9	<b>9.4</b>	100	212	*2
Vert.	2390.000	AV	37.4	26.8	14.7	38.2	40.7	53.9	13.2	100	359	*1
Vert.	2813.943	AV	36.6	27.7	7.3	38.1	33.5	53.9	20.4	100	340	*2

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

\*1) Out of band emission (Leakage Power)

\*2) Continuous wave (no pulse emission)

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4824.000	AV	33.6	31.1	7.9	37.1	0.7	36.2	53.9	17.7	
Hori.	7236.000	AV	36.0	37.1	9.1	39.4	0.7	43.5	53.9	<b>10.4</b>	
Vert.	4824.000	AV	33.7	31.1	7.9	37.1	0.7	36.3	53.9	17.6	
Vert.	7236.000	AV	36.0	37.1	9.1	39.4	0.7	43.5	53.9	<b>10.4</b>	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	89.1	26.8	14.7	38.2	92.4	-	-	
Hori.	2400.000	PK	56.3	26.8	14.7	38.2	59.6	72.4	12.8	
Vert.	2412.000	PK	90.0	26.8	14.7	38.2	93.3	-	-	
Vert.	2400.000	PK	57.6	26.8	14.7	38.2	60.9	73.3	12.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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## Radiated Emission

Test place	No.3 Semi Anechoic Chamber			
Date	January 17, 2014	January 18, 2014	January 19, 2014	January 20, 2014
Temperature / Humidity	24 deg.C, 28 %RH	23 deg.C, 30 %RH	23 deg.C, 29 %RH	21 deg.C, 32 %RH
Engineer	Shinichi Takano	Wataru Kojima	Yasumasa Owaki	Makoto Hosaka
Mode	Tx, 2437 MHz Tx, IEEE802.11n(20HT), 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.	481.125	QP	43.5	17.1	9.4	31.9	38.1	46.0	7.9	100	359	
Hori.	666.169	QP	41.6	19.3	10.1	31.9	39.1	46.0	6.9	100	36	
Hori.	777.199	QP	42.1	20.4	10.5	31.7	41.3	46.0	4.7	106	222	
Hori.	851.219	QP	42.8	21.1	10.7	31.3	43.3	46.0	2.7	110	146	
Hori.	925.236	QP	37.8	21.8	10.9	30.8	39.7	46.0	6.3	106	166	
Hori.	1776.472	PK	50.5	26.2	14.0	38.6	52.1	73.9	21.8	100	66	
Hori.	2843.145	PK	43.5	27.8	7.1	38.1	40.3	73.9	33.6	100	346	
Hori.	4874.000	PK	42.9	31.3	7.9	37.1	45.0	73.9	28.9	100	0	
Hori.	7311.000	PK	44.7	37.2	9.1	39.4	51.6	73.9	22.3	100	0	
Hori.	1776.472	AV	41.5	26.2	14.0	38.6	43.1	53.9	10.8	100	66	*2
Hori.	2843.145	AV	34.6	27.8	7.1	38.1	31.4	53.9	22.5	100	346	*2
Vert.	777.199	QP	45.4	20.4	10.5	31.7	44.6	46.0	<b>1.4</b>	100	356	
Vert.	851.219	QP	38.7	21.1	10.7	31.3	39.2	46.0	6.8	100	155	
Vert.	925.236	QP	37.5	21.8	10.9	30.8	39.4	46.0	6.6	100	57	
Vert.	1776.419	PK	50.2	26.2	14.0	38.6	51.8	73.9	22.1	100	217	
Vert.	2843.161	PK	44.5	27.8	7.1	38.1	41.3	73.9	32.6	100	341	
Vert.	4874.000	PK	41.0	31.3	7.9	37.1	43.1	73.9	30.8	100	0	
Vert.	7311.000	PK	44.4	37.2	9.1	39.4	51.3	73.9	22.6	100	0	
Vert.	1776.419	AV	42.4	26.2	14.0	38.6	44.0	53.9	9.9	100	217	*2
Vert.	2843.161	AV	35.5	27.8	7.1	38.1	32.3	53.9	21.6	100	341	*2

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

\*1) Out of band emission (Leakage Power)

\*2) Continuous wave (no pulse emission)

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	33.4	31.3	7.9	37.1	0.7	36.2	53.9	17.7	
Hori.	7311.000	AV	35.8	37.2	9.1	39.4	0.7	43.4	53.9	<b>10.5</b>	
Vert.	4874.000	AV	33.3	31.3	7.9	37.1	0.7	36.1	53.9	17.8	
Vert.	7311.000	AV	35.6	37.2	9.1	39.4	0.7	43.2	53.9	10.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor

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

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## Radiated Emission

Test place            No.3 Semi Anechoic Chamber  
Date                    January 17, 2014                    January 18, 2014                    January 19, 2014  
Temperature / Humidity    24 deg.C, 28 %RH                    23 deg.C, 30 %RH                    23 deg.C, 29 %RH  
Engineer                Shinichi Takano                    Wataru Kojima                    Yasumasa Owaki  
Mode                    Tx,                    2462 MHz  
                              Tx, IEEE802.11n(20HT), 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.	1776.461	PK	50.1	26.2	14.0	38.6	51.7	73.9	22.2	100	67	
Hori.	2483.500	PK	55.5	26.9	14.8	38.1	59.1	73.9	14.8	260	342	
Hori.	2873.000	PK	42.7	27.9	7.1	38.1	39.6	73.9	34.3	100	0	
Hori.	4924.000	PK	43.4	31.6	7.8	37.0	45.8	73.9	28.1	100	0	
Hori.	7386.000	PK	45.0	37.3	9.3	39.4	52.2	73.9	21.7	100	0	
Hori.	1776.461	AV	40.4	26.2	14.0	38.6	42.0	53.9	11.9	100	67	*2
Hori.	2483.500	AV	42.2	26.9	14.8	38.1	45.8	53.9	<b>8.1</b>	260	342	*1
Hori.	2873.000	AV	34.0	27.9	7.1	38.1	30.9	53.9	23.0	100	0	*2
Vert.	1776.394	PK	50.9	26.2	14.0	38.6	52.5	73.9	21.4	100	212	
Vert.	2483.500	PK	52.1	26.9	14.8	38.1	55.7	73.9	18.2	115	41	
Vert.	2872.316	PK	43.5	27.9	7.1	38.1	40.4	73.9	33.5	100	339	
Vert.	4924.000	PK	42.7	31.6	7.8	37.0	45.1	73.9	28.8	100	0	
Vert.	7386.000	PK	45.0	37.3	9.3	39.4	52.2	73.9	21.7	100	0	
Vert.	1776.394	AV	41.8	26.2	14.0	38.6	43.4	53.9	10.5	100	212	*2
Vert.	2483.500	AV	40.8	26.9	14.8	38.1	44.4	53.9	9.5	115	41	*1
Vert.	2872.316	AV	34.8	27.9	7.1	38.1	31.7	53.9	22.2	100	339	*2

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

\*1) Out of band emission (Leakage Power)

\*2) Continuous wave (no pulse emission)

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4924.000	AV	33.6	31.6	7.8	37.0	0.7	36.7	53.9	17.2	
Hori.	7386.000	AV	35.7	37.3	9.3	39.4	0.7	43.6	53.9	<b>10.3</b>	
Vert.	4924.000	AV	33.0	31.6	7.8	37.0	0.7	36.1	53.9	17.8	
Vert.	7386.000	AV	35.5	37.3	9.3	39.4	0.7	43.4	53.9	10.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor

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

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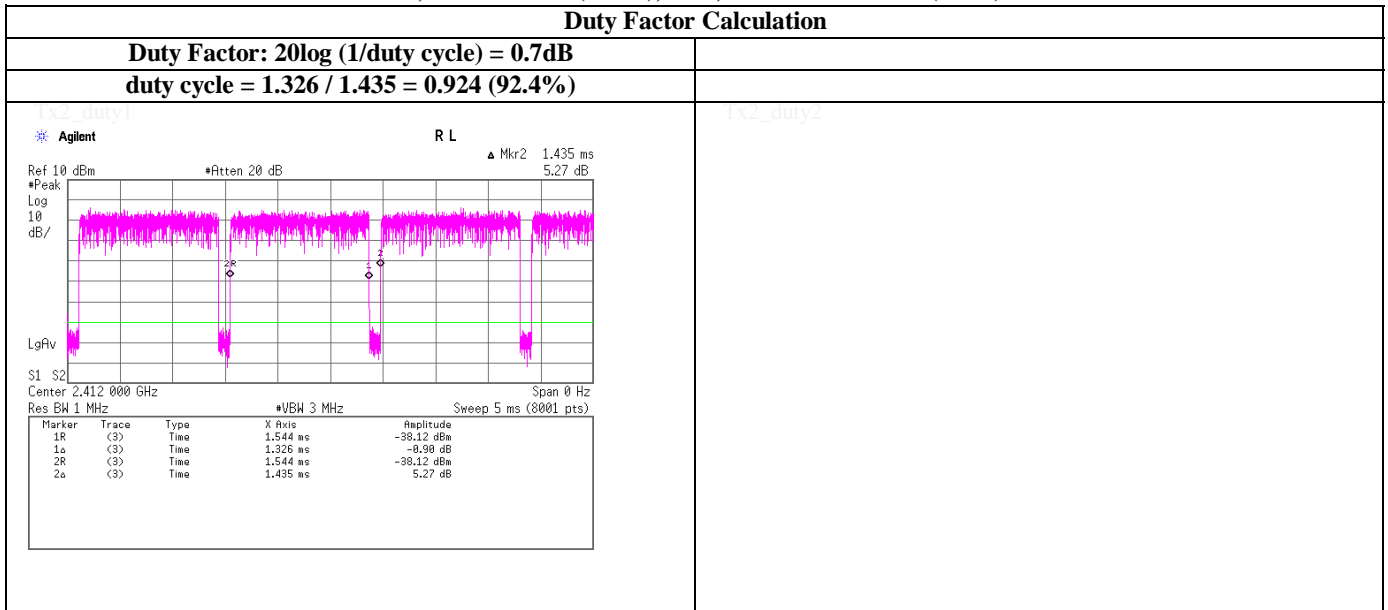
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## Duty Factor Calculation chart

**Tx, IEEE802.11n(20HT), PN9, worst data mode 0(MCS)**



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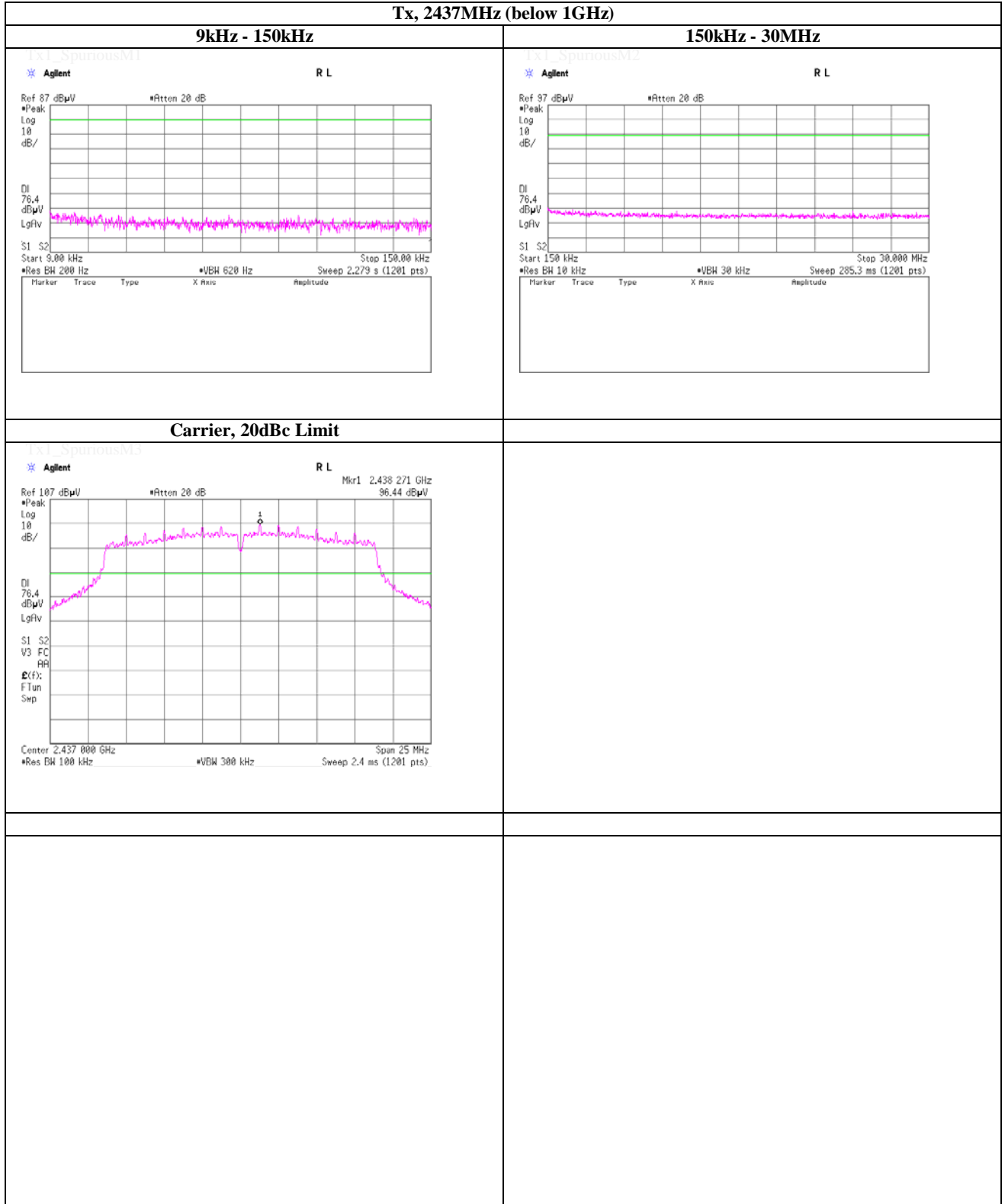
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**(Reference chart) Spurious emission (Conducted)**

**Tx, IEEE802.11n(20HT), PN9, worst data mode 0(MCS)**

**Tx, 2437MHz (below 1GHz)**



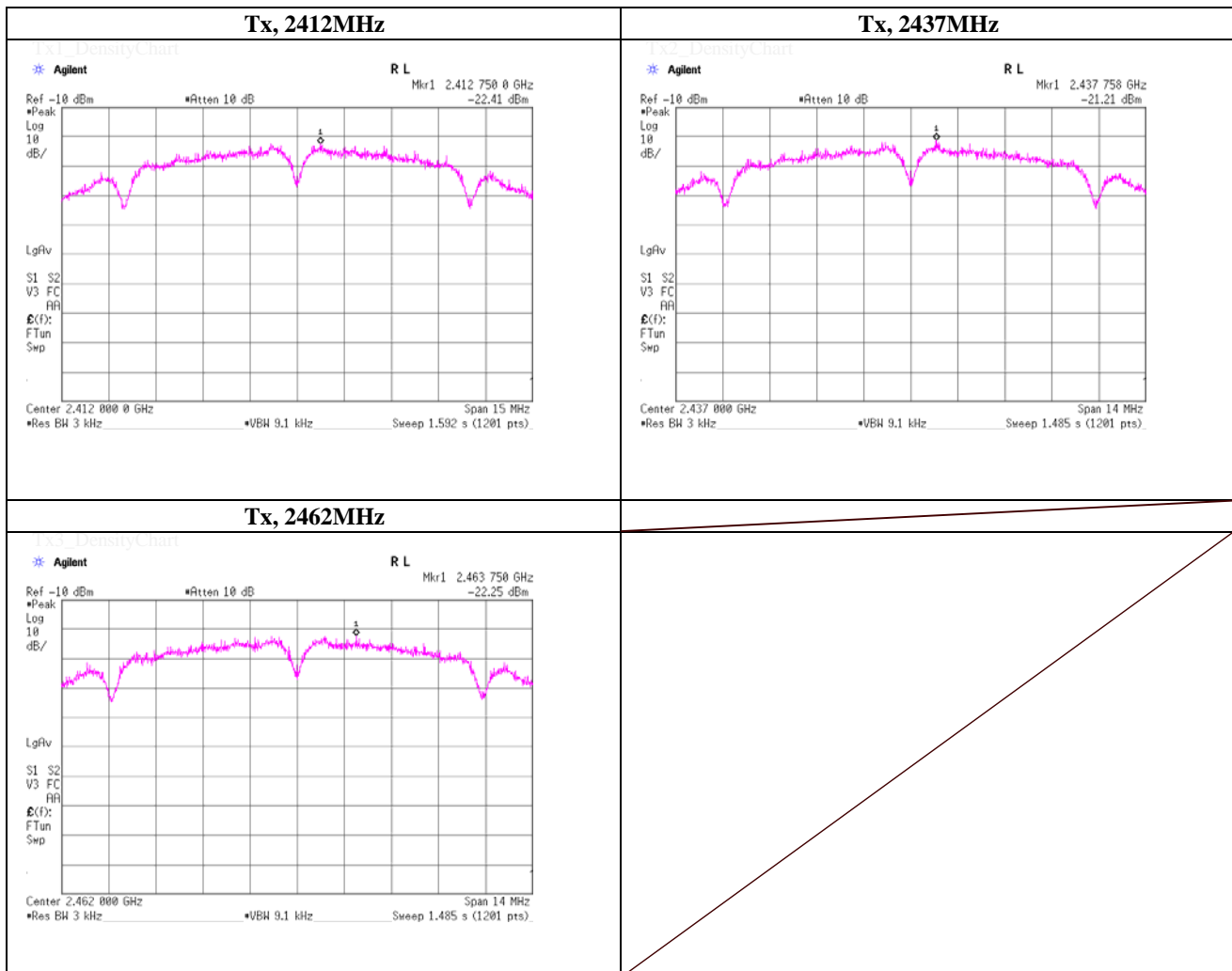
## Maximum Power Spectral Density

(PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 16, 2014	
Temperature / Humidity	23 deg.C , 44 %RH	
Engineer	Shinichi Takano	
Mode	Tx, IEEE802.11b, PN9, worst data mode 1Mbps	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2412.75	-22.41	2.00	9.98	-10.43	8.00	18.43
2437.0000	2437.76	-21.21	2.00	9.98	-9.23	8.00	17.23
2462.0000	2463.75	-22.25	2.01	9.98	-10.26	8.00	18.26

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



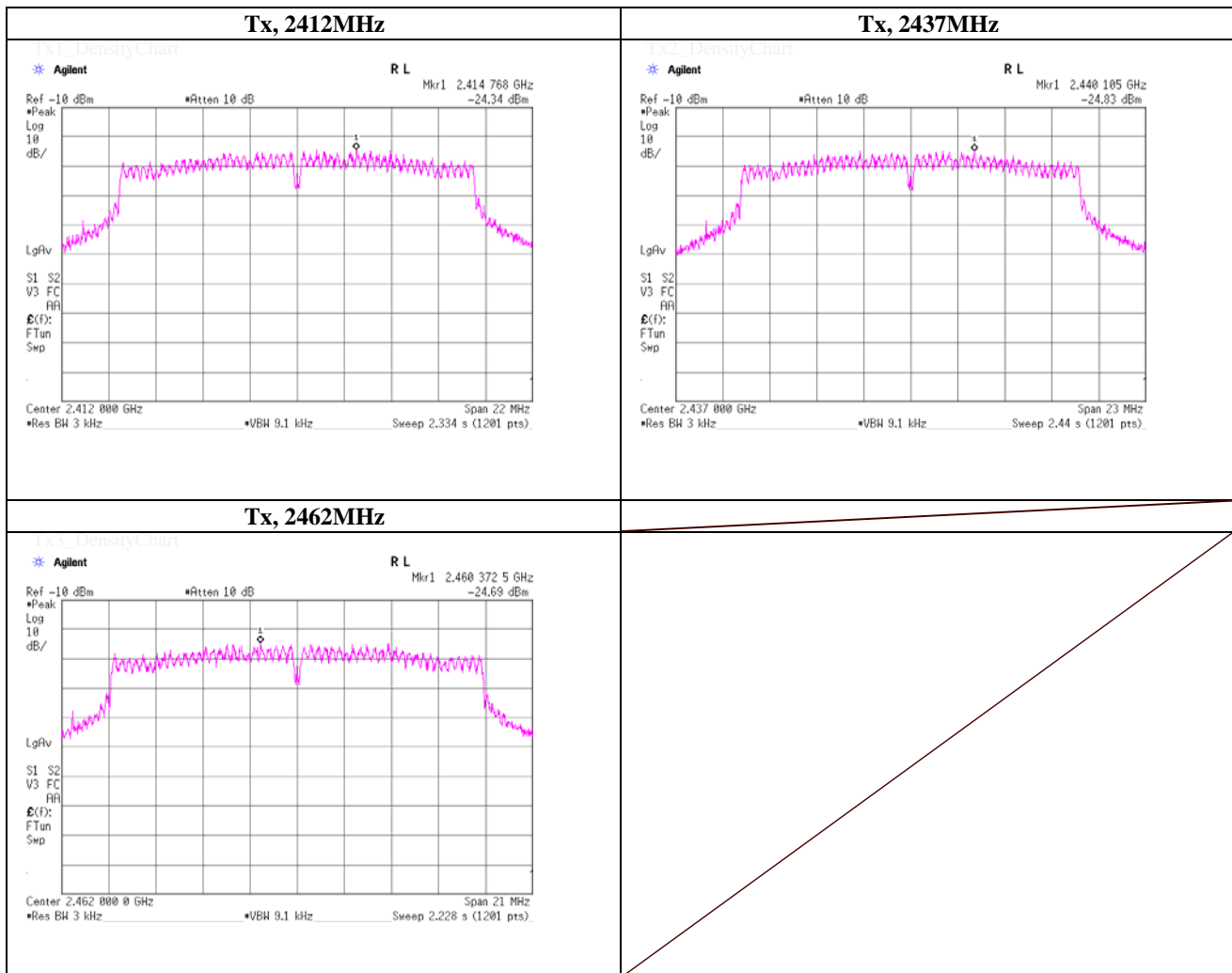
## Maximum Power Spectral Density

(PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 16, 2014	
Temperature / Humidity	23 deg.C , 44 %RH	
Engineer	Shinichi Takano	
Mode	Tx, IEEE802.11g, PN9, worst data mode 6Mbps	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2414.77	-24.34	2.00	9.98	-12.36	8.00	20.36
2437.0000	2440.11	-24.83	2.00	9.98	-12.85	8.00	20.85
2462.0000	2460.37	-24.69	2.01	9.98	-12.70	8.00	20.70

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



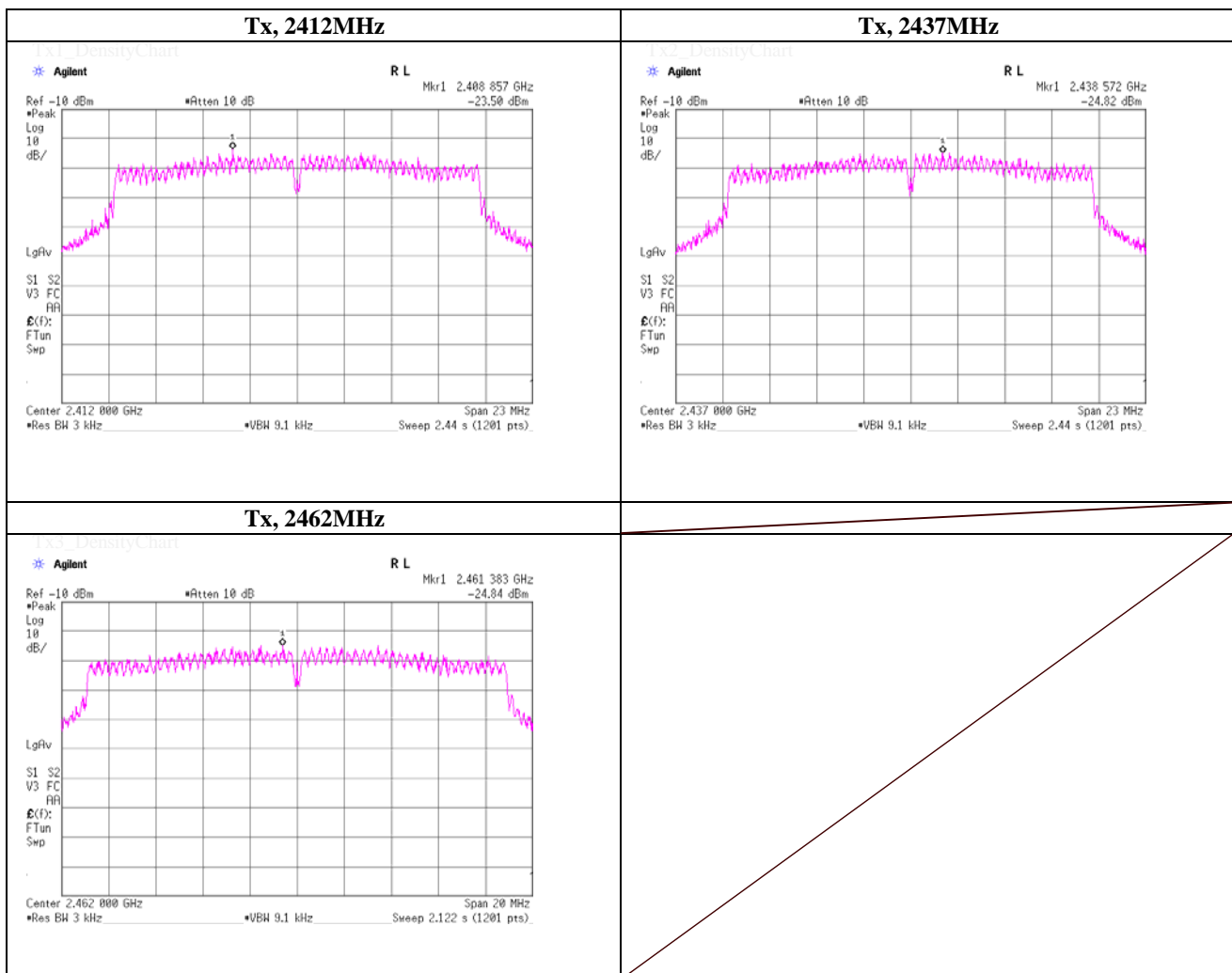
## Maximum Power Spectral Density

(PKPSD)

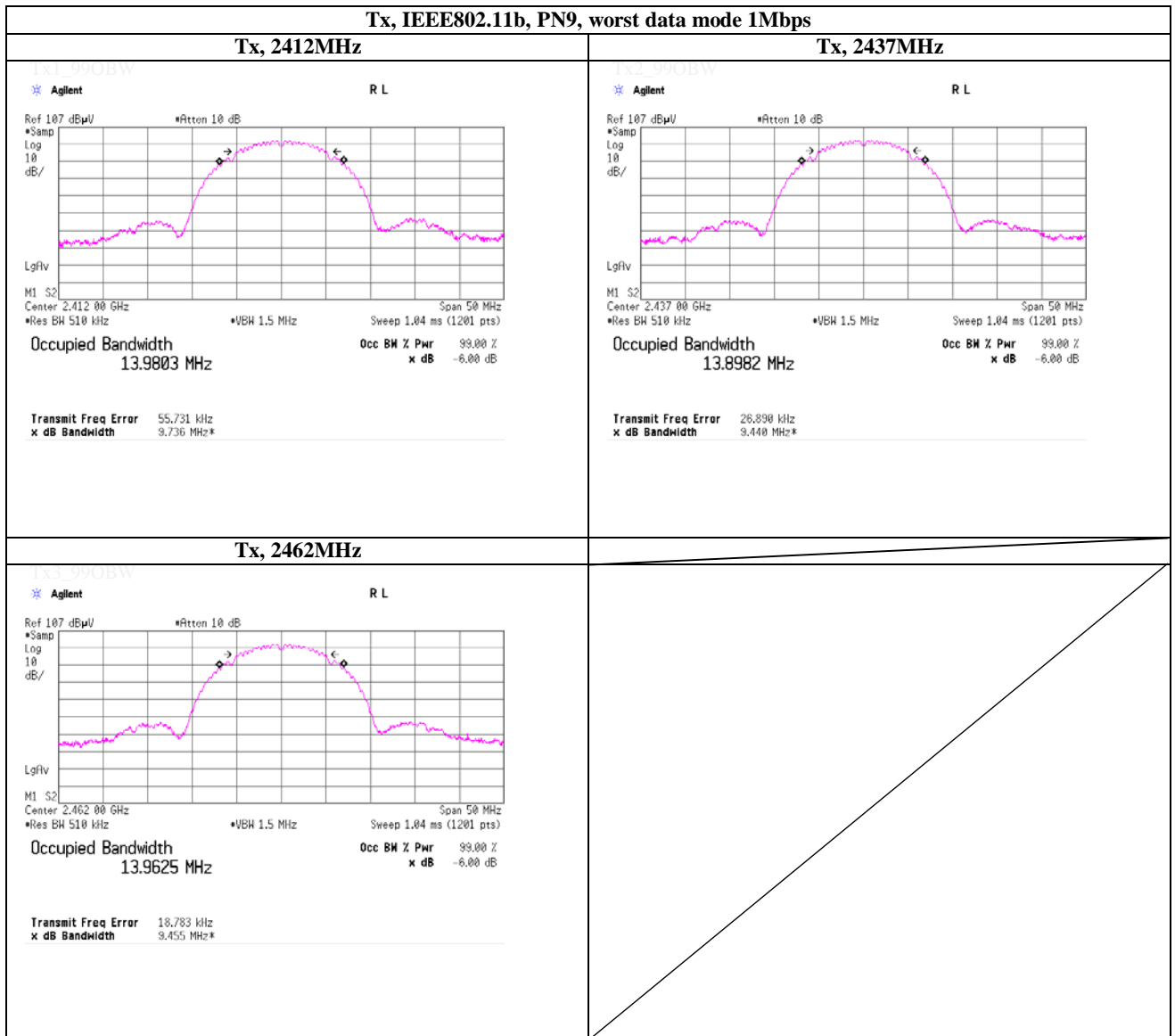
Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 16, 2014	
Temperature / Humidity	23 deg.C , 44 %RH	
Engineer	Shinichi Takano	
Mode	Tx, IEEE802.11n(20HT), PN9, worst data mode 0(MCS)	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2408.86	-23.50	2.00	9.98	-11.52	8.00	19.52
2437.0000	2438.57	-24.82	2.00	9.98	-12.84	8.00	20.84
2462.0000	2461.38	-24.84	2.01	9.98	-12.85	8.00	20.85

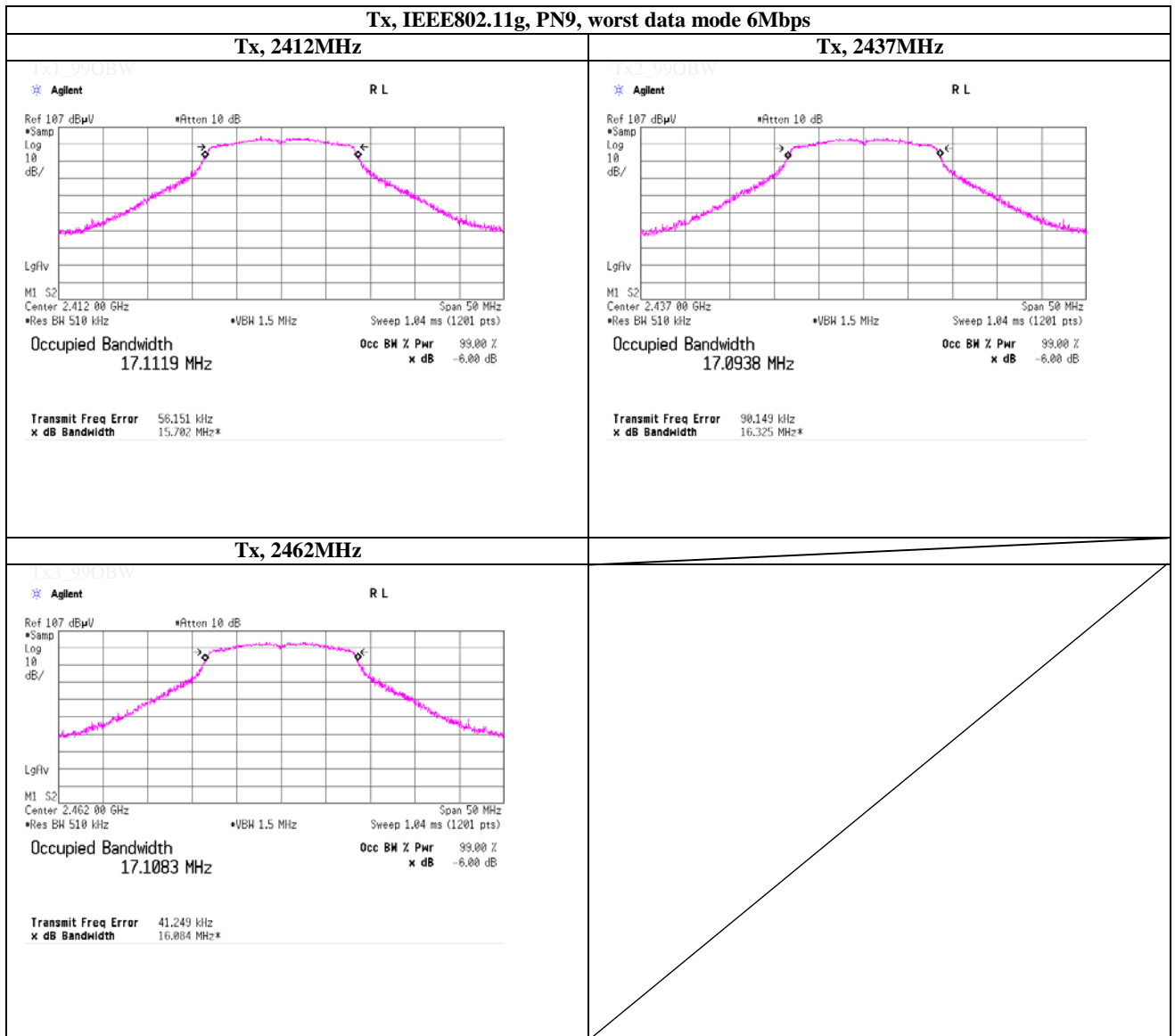
Sample Calculation:  
 Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss



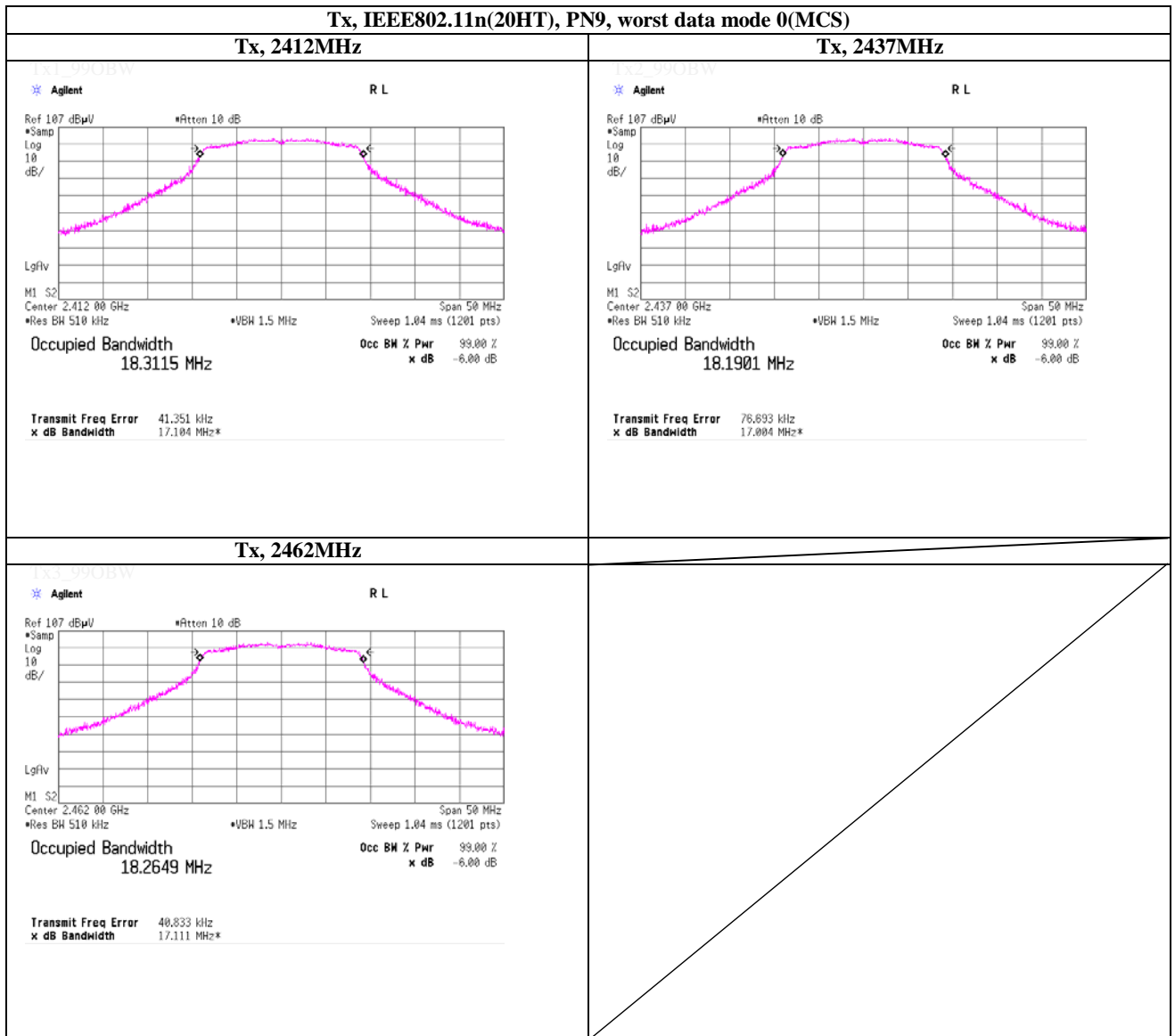
## 99% Occupied Bandwidth



## 99% Occupied Bandwidth



## 99% Occupied Bandwidth



## APPENDIX 2 Test Instruments

### EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2013/04/09 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2013/04/09 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2013/03/04 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2013/04/09 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2013/03/16 * 12
SOS-13	Humidity Indicator	Custom	GTH-202	Q.C.17	AT	2013/04/25 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2013/07/09 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2013/11/22 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2013/04/11 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2013/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2013/08/19 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2013/02/27 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2013/03/28 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	RE	-
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2013/11/22 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2013/11/22 * 12
SHA-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-03	Pre Amplifier	SONOMA	310N	290213	RE	2013/02/12 * 12
SAT6-06	Attenuator	JFW	50HF-006N	-	RE	2013/02/12 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2013/10/26 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2013/04/03 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A0901	RE	2013/10/26 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2013/02/27 * 12

The expiration date of the calibration is the end of the expired month .

As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

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

Test Item :

RE: Radiated emission,

AT: Antenna terminal conducted test