



RADIO TEST REPORT

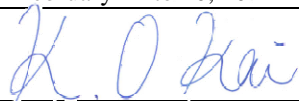
Test Report No. : 32FE0253-HO-A

Applicant : SAMSUNG ELECTRONICS CO., LTD.
Type of Equipment : GPRS850/1900, EDGE850/1900, WCDMA2,
WCDMA5 Tablet with 802.11bgn, BT3.0+EDR
Model No. : GT-P5100
FCC ID : A3LGTP5100
Test regulation : FCC Part 15 Subpart C: 2012
Test Result : Complied


1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Date of test: February 14 to 20, 2012

Representative test engineer:


Katsunori Okai
Engineer of WiSE Japan,
UL Verification Service

Approved by:


Takahiro Hatakeda
Leader of WiSE Japan,
UL Verification Service



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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SECTION 1: Customer information

Company Name : SAMSUNG ELECTRONICS CO., LTD.
Address : 416, MAETAN 3-DONG, YEONGTONG-GU SUWON-CITY,
GYEONGGI-DO 443-742, SOUTH KOREA

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

2.1 Identification of E.U.T.

Type of Equipment : GPRS850/1900, EDGE850/1900, WCDMA2, WCDMA5 Tablet with
802.11bgn, BT3.0+EDR
Model No. : GT-P5100
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC5.0V
Receipt Date of Sample : February 6, 2012
Modification of EUT : No Modification by the test lab

2.2 Product Description

Radio Specification

Bluetooth

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	FHSS
Bandwidth & Channel spacing	1MHz & 1MHz
Antenna Type	PIFA
Antenna Gain	-0.31 dBi (MAX)

WLAN (IEEE802.11b/g/n-20)

Equipment Type	Transceiver
Frequency of Operation	2412-2462MHz
Type of Modulation	DSSS, OFDM
Bandwidth & Channel spacing	20MHz & 5MHz
Antenna Type	PIFA
Antenna Gain	-0.31 dBi (MAX)

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GSM

Equipment Type	Transceiver
Frequency of Operation	[Up Link] GSM850: 824 – 849MHz PCS: 1850 – 1910MHz [Down Link] GSM850: 869 – 894MHz PCS: 1930 – 1990MHz
Type of Modulation	GMSK , 8PSK
Antenna Type	PIFA
Antenna Gain	GSM850: 824-849MHz: -4.63dBi (MAX) 869-894MHz: -2.35dBi (MAX) PCS: 1850-1910MHz: -5.1dBi (MAX) 1930-1990MHz: -5.55dBi (MAX)

W-CDMA

Equipment Type	Transceiver
Frequency of Operation	[Up Link] Band V: 824 – 849MHz Band II: 1850 – 1910MHz [Down Link] Band V: 869 – 894MHz Band II: 1930 – 1990MHz
Type of Modulation	QPSK
Antenna Type	PIFA
Antenna Gain	Band V: 824-849MHz: -4.63dBi (MAX) 869-894MHz: -2.35dBi (MAX) Band II: 1850-1910MHz: -5.1dBi (MAX) 1930-1900MHz: -5.55dBi (MAX)

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2012, final revised on February 1, 2012

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928MHz,
2400-2483.5MHz, and 5725-5850MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.4:2003 7. AC powerline Conducted Emission measurements ----- IC: RSS-Gen 7.2.4	FCC: Section 15.207 ----- IC: RSS-Gen 7.2.4	QP 15.4dB, 0.49308MHz, L AV 17.6dB, 7.70523MHz, L	Complied	-
6dB Bandwidth	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.6.2	FCC: Section 15.247(a)(2) ----- IC: RSS-210 A8.2(a)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.8	FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4)		Complied	Conducted
Power Density	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: -	FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.9	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.3	1.3dB 2483.500MHz, AV, Hori.	Complied	Conducted/ Radiated

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

* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 4.6.1	IC: RSS-Gen 4.6.1	N/A	-	Conducted

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

3.4 Uncertainty

EMI

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

Test room (semi-anechoic chamber)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.6dB
No.3	3.6dB
No.4	3.6dB

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.2dB	5.0dB	5.1dB	4.7dB	5.7dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	4.8dB	5.6dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	4.8dB	5.6dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	4.8dB	5.6dB	5.1dB	4.2dB

*3m/1m/0.5m = Measurement distance

Power meter (+dB)	
Below 1GHz	Above 1GHz
1.0dB	1.0dB

Antenna terminal conducted emission and Power density (+dB)			Antenna terminal conducted emission (+dB)		Channel power (+dB)
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.0dB	1.1dB	2.7dB	3.2dB	3.3dB	1.5dB

Conducted Emission test

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

Radiated emission test(3m).

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

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3.5 Test Location

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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

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.

Mode	Remarks*
IEEE 802.11b (11b)	11Mbps, PN9
IEEE 802.11g (11g)	6Mbps, PN9
IEEE 802.11n SISO 20MHz BW (11n-20)	MCS 0, PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	

Power of the EUT was set by the software as follows:

H/W version: Rev 1.0
S/W version: P5100.001

[Power Setting]

11b: 15dBm
11g: 12dBm
11n-20: 10dBm

*The above setting of the software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.

*Details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Conducted Emission	11g Tx*1)	2462MHz
6dB Bandwidth	11b Tx	2412MHz
99% Occupied Bandwidth	11g Tx	2437MHz
Maximum Peak Output Power	11n-20 Tx	2462MHz
Spurious Band Edge (Conducted Emission Band Edge compliance)		
Power Density	11b Tx	2412MHz
Spurious Emission (Conducted)	11g Tx *2)	2437MHz
Spurious Emission (Radiated)		2462MHz
*1) The mode was tested as a representative, because it had the highest power at antenna terminal test and the noise levels at the mode/tested frequencies were equivalent to those of other modes/tested frequencies.		
*2) Since 11g/ 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest peak output power.		

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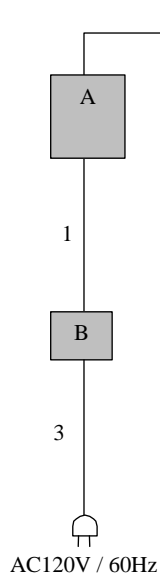
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4.2 Configuration and peripherals



* Cabling and setup(s) 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	GPRS850/1900, EDGE850/1900, WCDMA2, WCDMA5 Tablet with 802.11bgn, BT3.0+EDR	GT-P5100	R32C200S12B *1) R32C200S11T *2)	SAMSUNG	EUT
B	AC Adapter	ETA-P11X	-	SAMSUNG	EUT
C	Ear phone	-	-	SAMSUNG	-

*1) Used for Conducted Emission and Radiated Emission tests

*2) Used for Antenna Terminal conducted test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	1.0	Shielded	Shielded	-
2	Ear phone Cable	1.2	Unshielded	Unshielded	-
3	AC Cable	0.9	Unshielded	Unshielded	-

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.5m by 1.0m, raised 0.8m above the conducting ground plane.

The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and 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 a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Detector	: QP and AV
Measurement range	: 0.15-30MHz
Test data	: APPENDIX
Test result	: Pass

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SECTION 6: Radiated Spurious Emission

Test Procedure

It was measured based on "2. Radiated emission test" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".

EUT was placed on a urethane platform of nominal size, 1.5m by 1.0m, raised 0.8m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

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

Test Antennas are used as below;

Frequency	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100kHz bandwidth outside the restricted 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.

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5(IC) and outside the restricted band of FCC15.205 / Table 3 of RSS-Gen 7.2.2 (IC).

Frequency	Below 1GHz	Above 1GHz		20dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz *1)	RBW: 100kHz VBW: 300kHz (S/A)
Test Distance	3m	3m (below 10GHz), 1m*2) (above 10GHz)		3m (below 10GHz), 1m*2) (above 10GHz)

*1) As both cycle and Off duration were short enough, 10Hz video bandwidth was used. (See Appendix)

*2) Distance Factor: $20 \times \log(3.0m/1.0m) = 9.5dB$

- 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.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 30M-25GHz
Test data : APPENDIX
Test result : Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	20MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak	-	Power Meter (Sensor: 50MHz BW)
Peak Power Density	20MHz	30kHz	100kHz	667 sec	Peak	Max Hold	Spectrum Analyzer *2) *3)
Conducted Spurious Emission *4)	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				
	30MHz to 25GHz (Less or equal to 5GHz)	100kHz	300kHz				

*1) The measurement was performed with Max Hold since the duty cycle was not 100%.
*2) PSD Option 1 of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".
*3) The test was not performed at RBW:3kHz however the measurement is to be performed with RBW:3kHz in the regulation, because the measurement value with RBW:3kHz is less than the value of RBW:30kHz and the test data met the limit with RBW:30kHz.
*4) 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=9.1kHz).

The test results and limit are rounded off to two decimals place, so some differences might be observed.

Test data : **APPENDIX**
Test result : **Pass**

APPENDIX 1: Data of EMI test

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

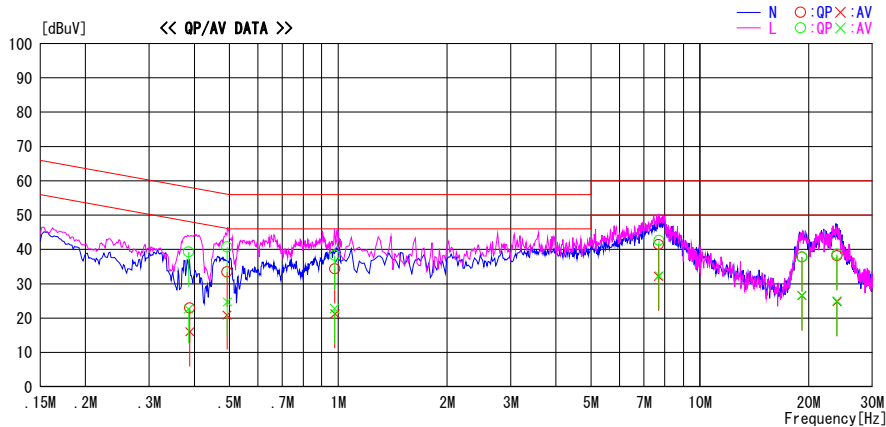
UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2012/02/17

Report No. : 32FE0253-H0

Temp./Humi. : 23 deg. C / 32% RH
Engineer : Takumi Shimada

Mode / Remarks : WLAN Tx 11g 6Mbps 2462MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.38822	9.6	2.7	13.3	22.9	16.0	58.1	48.1	35.2	32.1	N	
0.49223	20.1	7.6	13.3	33.4	20.9	56.1	46.1	22.7	25.2	N	
0.97925	21.1	8.0	13.3	34.4	21.3	56.0	46.0	21.6	24.7	N	
7.67757	27.4	18.2	14.0	41.4	32.2	60.0	50.0	18.6	17.8	N	
19.14547	23.0	11.7	14.8	37.8	26.5	60.0	50.0	22.2	23.5	N	
23.97197	23.2	9.8	15.0	38.2	24.8	60.0	50.0	21.8	25.2	N	
0.38557	26.0	9.4	13.3	39.3	22.7	58.2	48.2	18.9	25.5	L	
0.49308	27.4	11.4	13.3	40.7	24.7	56.1	46.1	15.4	21.4	L	
0.97854	25.0	9.5	13.3	38.3	22.8	56.0	46.0	17.7	23.2	L	
7.70523	28.6	18.4	14.0	42.6	32.4	60.0	50.0	17.4	17.6	L	
19.15134	23.0	11.8	14.8	37.8	26.6	60.0	50.0	22.2	23.4	L	
23.97201	23.6	10.1	15.0	38.6	25.1	60.0	50.0	21.4	24.9	L	

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT [dBuV] = READING [dBuV] + C. F [dB] (LISN LOSS + CABLE LOSS)
Except for the above table : adequate margin data below the limits.

6dB Bandwidth

Test place Head Office EMC Lab. No.11 Measurement Room
Report No. 32FE0253-HO
Date 02/20/2012
Temperature / Humidity 22 deg.C / 32% RH
Engineer Katsunori Okai
Mode Tx

11b

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	7.609	>500
2437	7.721	>500
2462	7.995	>500

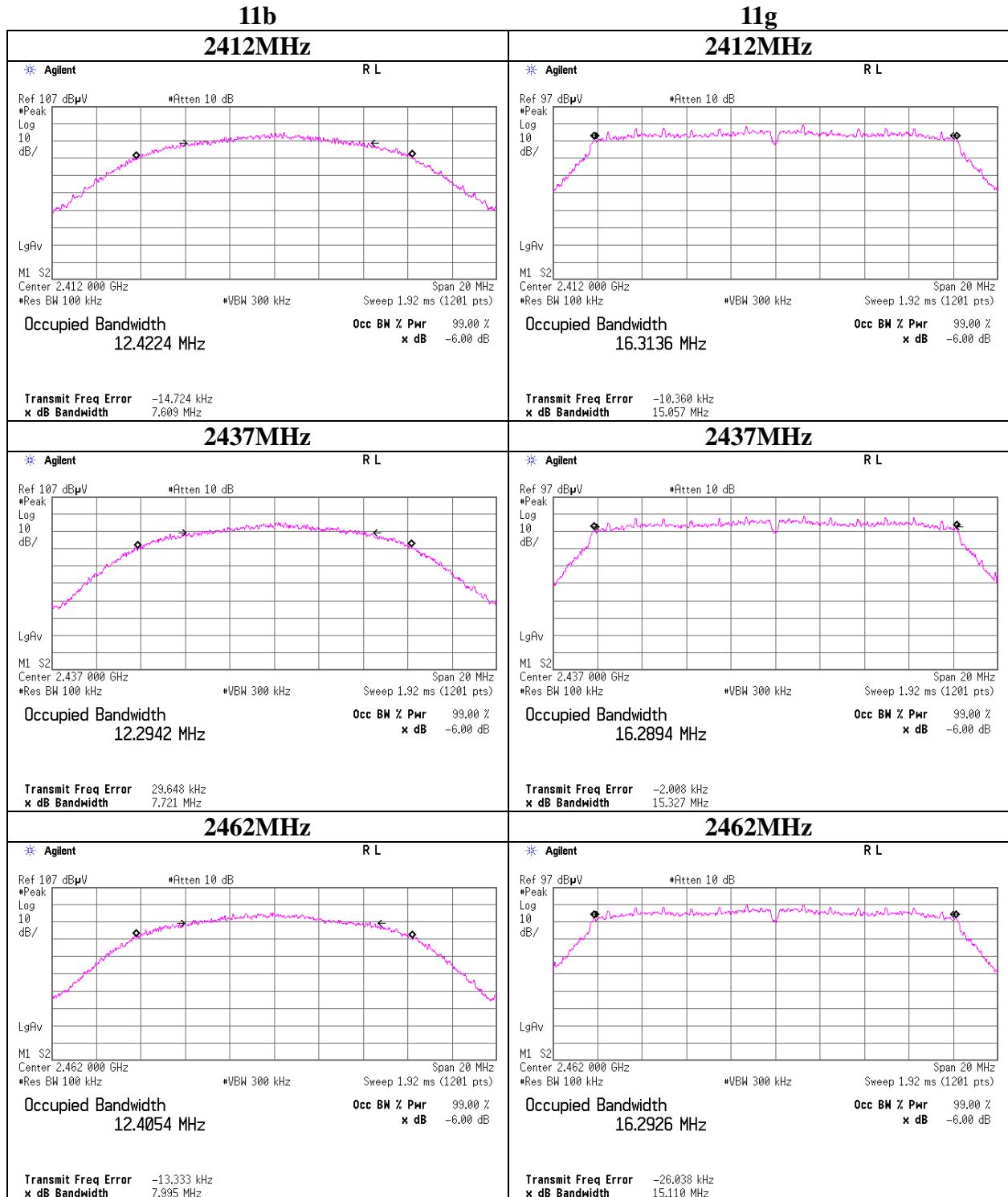
11g

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	15.057	>500
2437	15.327	>500
2462	15.110	>500

11n-20

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	15.126	>500
2437	16.084	>500
2462	15.119	>500

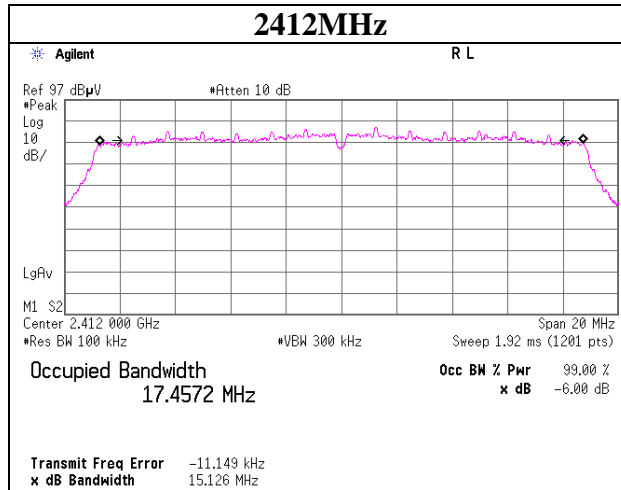
6dB Bandwidth



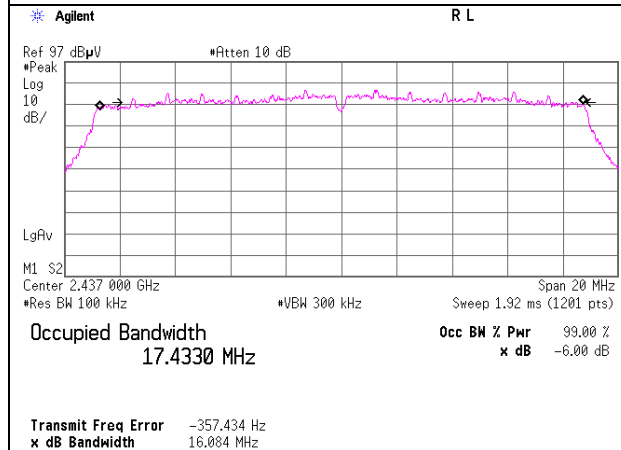
6dB Bandwidth

11n-20

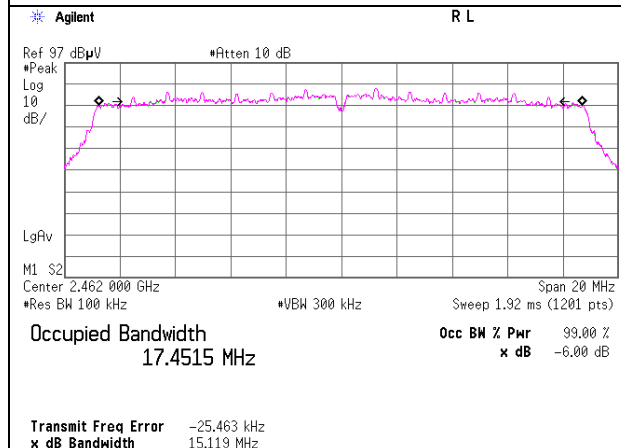
2412MHz



2437MHz



2462MHz



Maximum Peak Output Power

Test place	Head Office EMC Lab. No.11 Measurement Room
Report No.	32FE0253-HO
Date	02/14/2012
Temperature/ Humidity	21 deg. C / 31% RH
Engineer	Yutaka Yoshida
Mode	11g Tx

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	13.25	2.37	9.99	25.61	363.92	30.00	1000	4.39
2437	13.26	2.37	9.99	25.62	364.75	30.00	1000	4.38
2462	13.45	2.37	9.99	25.81	381.07	30.00	1000	4.19

Sample Calculation:

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

11g

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
6	13.32	*
9	13.30	
12	12.25	
18	13.00	
24	12.96	
36	13.11	
48	13.31	
54	13.06	

*: Worst Rate

All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Test place	Head Office EMC Lab. No.11 Measurement Room
Report No.	32FE0253-HO
Date	02/14/2012
Temperature/ Humidity	21 deg. C / 31% RH
Engineer	Yutaka Yoshida
Mode	11n-20 Tx

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	11.17	2.37	9.99	23.53	225.42	30.00	1000	6.47
2437	11.20	2.37	9.99	23.56	226.99	30.00	1000	6.44
2462	11.18	2.37	9.99	23.54	225.94	30.00	1000	6.46

Sample Calculation:

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

11n-20

2437MHz

Rate	Reading [dBm]	Remark
MCS0	11.20	*
MCS1	11.18	
MCS2	11.01	
MCS3	10.95	
MCS4	11.08	
MCS5	10.81	
MCS6	11.01	
MCS7	11.08	

*: Worst Rate

All comparison were carried out on same frequency and measurement factors.

Maximum Average Output Power (Reference data for SAR testing)

IEEE802.11b 1Mbps

Ch	Frequency [MHz]	P/M Reading	Cable Loss [dB]	Atten. [dB]	Result	
		AVG			[dBm] AVG	[mW] AVG
1	2412	5.67	2.37	9.99	18.03	63.53
6	2437	5.69	2.37	9.99	18.05	63.83
11	2462	5.60	2.37	9.99	17.96	62.52

IEEE802.11g 6Mbps

Ch	Frequency [MHz]	P/M Reading	Cable Loss [dB]	Atten. [dB]	Result	
		AVG			[dBm] AVG	[mW] AVG
1	2412	2.68	2.37	9.99	15.04	31.92
6	2437	2.65	2.37	9.99	15.01	31.70
11	2462	2.54	2.37	9.99	14.90	30.90

IEEE802.11n-20 MCS0

Ch	Frequency [MHz]	P/M Reading	Cable Loss [dB]	Atten. [dB]	Result	
		AVG			[dBm] AVG	[mW] AVG
1	2412	0.35	2.37	9.99	12.71	18.66
6	2437	0.27	2.37	9.99	12.63	18.32
11	2462	0.22	2.37	9.99	12.58	18.11

Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 and 4 Semi Anechoic Chamber
Report No. 32FE0253-HO
Date 02/15/2012 02/16/2012
Temperature/ Humidity 22 deg. C /39% RH 23 deg. C / 32% RH
Engineer Hiroshi Kukita Takumi Shimada
(1-10GHz) (10-26.5GHz)
Mode 11g Tx 2412MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	69.8	28.1	2.2	34.8	65.3	73.9	8.6	See 20dBc Data Sheet
Hori	2400.000	PK	78.9	28.1	2.2	34.8	74.4	-	-	
Hori	4824.000	PK	43.1	31.2	3.8	34.0	44.1	73.9	29.8	
Hori	7236.000	PK	42.8	35.6	4.5	34.2	48.7	73.9	25.2	
Hori	9648.000	PK	44.4	38.3	5.3	34.7	53.3	73.9	20.6	
Hori	24120.000	PK	45.3	38.7	-0.9	31.6	51.5	73.9	22.4	
Hori	2390.000	AV	52.0	28.1	2.2	34.8	47.5	53.9	6.4	See 20dBc Data Sheet
Hori	2400.000	AV	61.0	28.1	2.2	34.8	56.5	-	-	
Hori	4824.000	AV	31.7	31.2	3.8	34.0	32.7	53.9	21.2	
Hori	7236.000	AV	30.8	35.6	4.5	34.2	36.7	53.9	17.2	
Hori	9648.000	AV	32.1	38.3	5.3	34.7	41.0	53.9	12.9	
Hori	24120.000	AV	32.5	38.7	-0.9	31.6	38.7	53.9	15.2	
Vert	2390.000	PK	65.2	28.1	2.2	34.8	60.7	73.9	13.2	See 20dBc Data Sheet
Vert	2400.000	PK	71.0	28.1	2.2	34.8	66.5	-	-	
Vert	4824.000	PK	42.2	31.2	3.8	34.0	43.2	73.9	30.7	
Vert	7236.000	PK	42.4	35.6	4.5	34.2	48.3	73.9	25.6	
Vert	9648.000	PK	43.9	38.3	5.3	34.7	52.8	73.9	21.1	
Vert	24120.000	PK	44.7	38.7	-0.9	31.6	50.9	73.9	23.0	
Vert	2390.000	AV	45.8	28.1	2.2	34.8	41.3	53.9	12.6	See 20dBc Data Sheet
Vert	2400.000	AV	54.5	28.1	2.2	34.8	50.0	-	-	
Vert	4824.000	AV	30.9	31.2	3.8	34.0	31.9	53.9	22.0	
Vert	7236.000	AV	30.8	35.6	4.5	34.2	36.7	53.9	17.2	
Vert	9648.000	AV	32.0	38.3	5.3	34.7	40.9	53.9	13.0	
Vert	24120.000	AV	32.5	38.7	-0.9	31.6	38.7	53.9	15.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	102.8	28.2	2.2	34.8	98.4	-	-	Carrier
Hori	2400.000	PK	66.2	28.1	2.2	34.8	61.7	78.4	16.7	
Vert	2412.000	PK	95.5	28.2	2.2	34.8	91.1	-	-	Carrier
Vert	2400.000	PK	57.0	28.1	2.2	34.8	52.5	71.1	18.6	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 and 4 Semi Anechoic Chamber
Report No. 32FE0253-HO
Date 02/15/2012 02/16/2012
Temperature/ Humidity 22 deg. C /39% RH 23 deg. C / 32% RH
Engineer Hiroshi Kukita Takumi Shimada
(1-10GHz) (30-1000MHz,10-26.5GHz)
Mode 11g Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	30.000	QP	29.4	18.9	7.2	32.1	23.4	40.0	16.6	
Hori	37.226	QP	28.7	15.8	7.3	32.2	19.6	40.0	20.4	
Hori	78.006	QP	40.0	6.5	7.9	32.1	22.3	40.0	17.7	
Hori	89.550	QP	26.7	8.2	8.0	32.2	10.7	43.5	32.8	
Hori	104.004	QP	34.8	10.8	8.2	32.2	21.6	43.5	21.9	
Hori	360.680	QP	29.2	17.0	10.3	32.1	24.4	46.0	21.6	
Hori	2483.500	PK	75.0	28.5	2.3	34.8	71.0	73.9	2.9	
Hori	4924.000	PK	43.9	31.5	3.3	34.0	44.7	73.9	29.2	
Hori	7386.000	PK	43.0	35.8	4.6	34.3	49.1	73.9	24.8	
Hori	9848.000	PK	43.6	38.5	4.7	34.7	52.1	73.9	21.8	
Hori	24620.000	PK	45.5	38.6	-0.9	31.6	51.6	73.9	22.3	
Hori	2483.500	AV	56.6	28.5	2.3	34.8	52.6	53.9	1.3	
Hori	4924.000	AV	32.5	31.5	3.9	34.0	33.9	53.9	20.0	
Hori	7386.000	AV	31.0	35.8	4.1	34.3	36.6	53.9	17.3	
Hori	9848.000	AV	31.9	38.5	5.4	34.7	41.1	53.9	12.8	
Hori	24620.000	AV	33.2	38.6	-0.9	31.6	39.3	53.9	14.6	
Vert	30.000	QP	40.5	18.9	7.2	32.1	34.5	40.0	5.5	
Vert	37.260	QP	37.4	15.8	7.3	32.2	28.3	40.0	11.7	
Vert	78.013	QP	37.3	6.5	7.9	32.1	19.6	40.0	20.4	
Vert	89.772	QP	32.4	8.3	8.0	32.2	16.5	43.5	27.0	
Vert	104.010	QP	28.9	10.8	8.2	32.2	15.7	43.5	27.8	
Vert	535.985	QP	25.6	19.6	11.4	32.1	24.5	46.0	21.5	
Vert	2483.500	PK	70.1	28.5	2.3	34.8	66.1	73.9	7.8	
Vert	4924.000	PK	42.3	31.5	3.9	34.0	43.7	73.9	30.2	
Vert	7386.000	PK	42.1	35.8	4.6	34.3	48.2	73.9	25.7	
Vert	9848.000	PK	43.4	38.5	5.4	34.7	52.6	73.9	21.3	
Vert	24620.000	PK	45.6	38.6	-0.9	31.6	51.7	73.9	22.2	
Vert	2483.500	AV	52.0	28.5	2.3	34.8	48.0	53.9	5.9	
Vert	4924.000	AV	31.0	31.5	3.9	34.0	32.4	53.9	21.5	
Vert	7386.000	AV	31.0	35.8	4.6	34.3	37.1	53.9	16.8	
Vert	9848.000	AV	32.0	38.5	5.4	34.7	41.2	53.9	12.7	
Vert	24620.000	AV	33.2	38.6	-0.9	31.6	39.3	53.9	14.6	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. 32FE0253-HO
Date 02/16/2012
Temperature/ Humidity 23 deg. C / 32% RH
Engineer Takumi Shimada
(1-10GHz)
Mode 11n-20 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	69.6	28.5	2.6	32.2	68.5	73.9	5.4	
Hori	2483.500	AV	48.6	28.5	2.6	32.2	47.5	53.9	6.4	
Vert	2483.500	PK	67.5	28.5	2.6	32.2	66.4	73.9	7.6	
Vert	2483.500	AV	45.9	28.5	2.6	32.2	44.8	53.9	9.1	

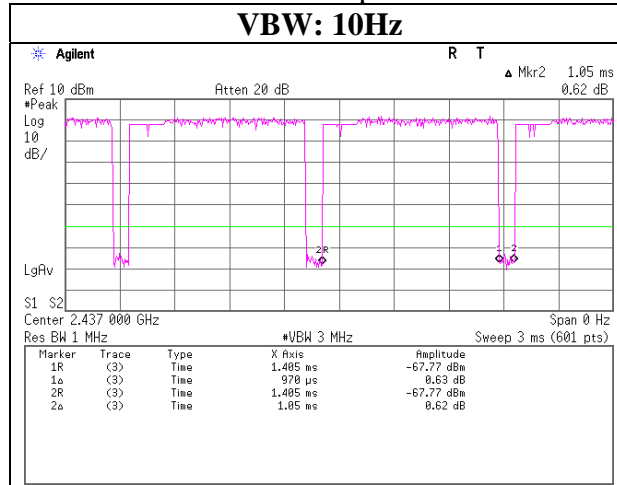
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

VBW (AV) Calculation

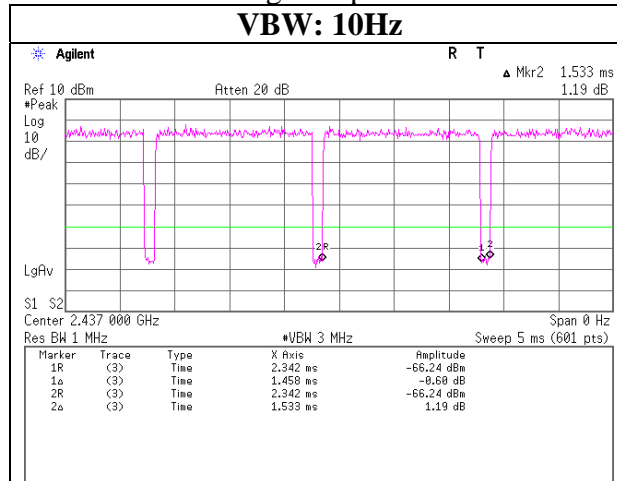
11b 11Mbps

VBW: 10Hz



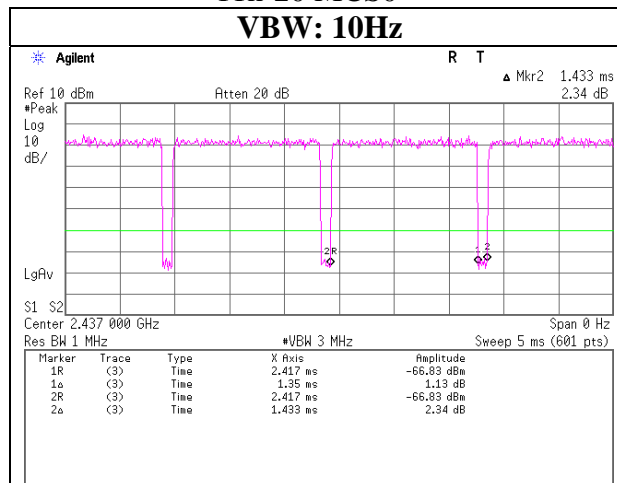
11g 6Mbps

VBW: 10Hz



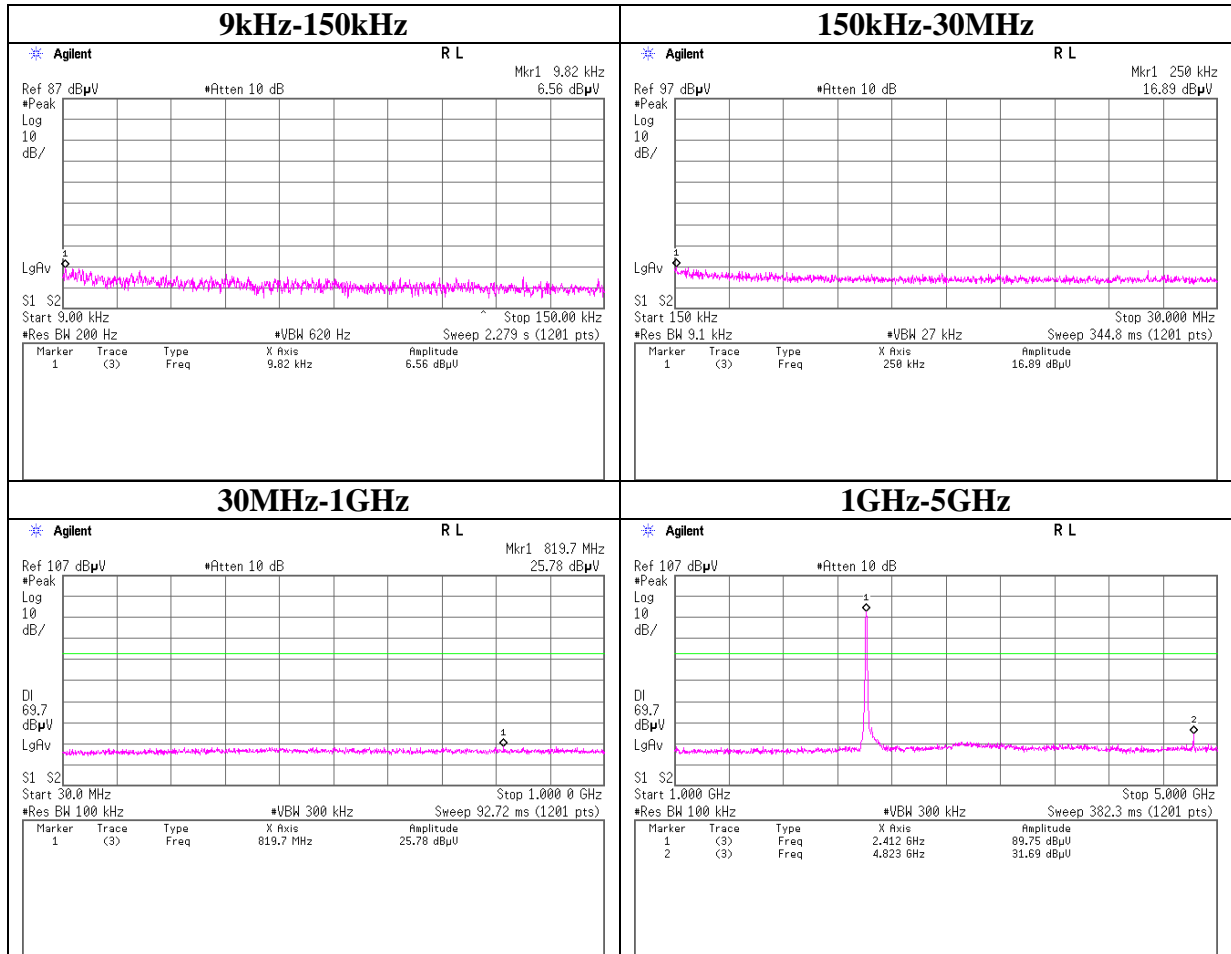
11n-20 MCS0

VBW: 10Hz



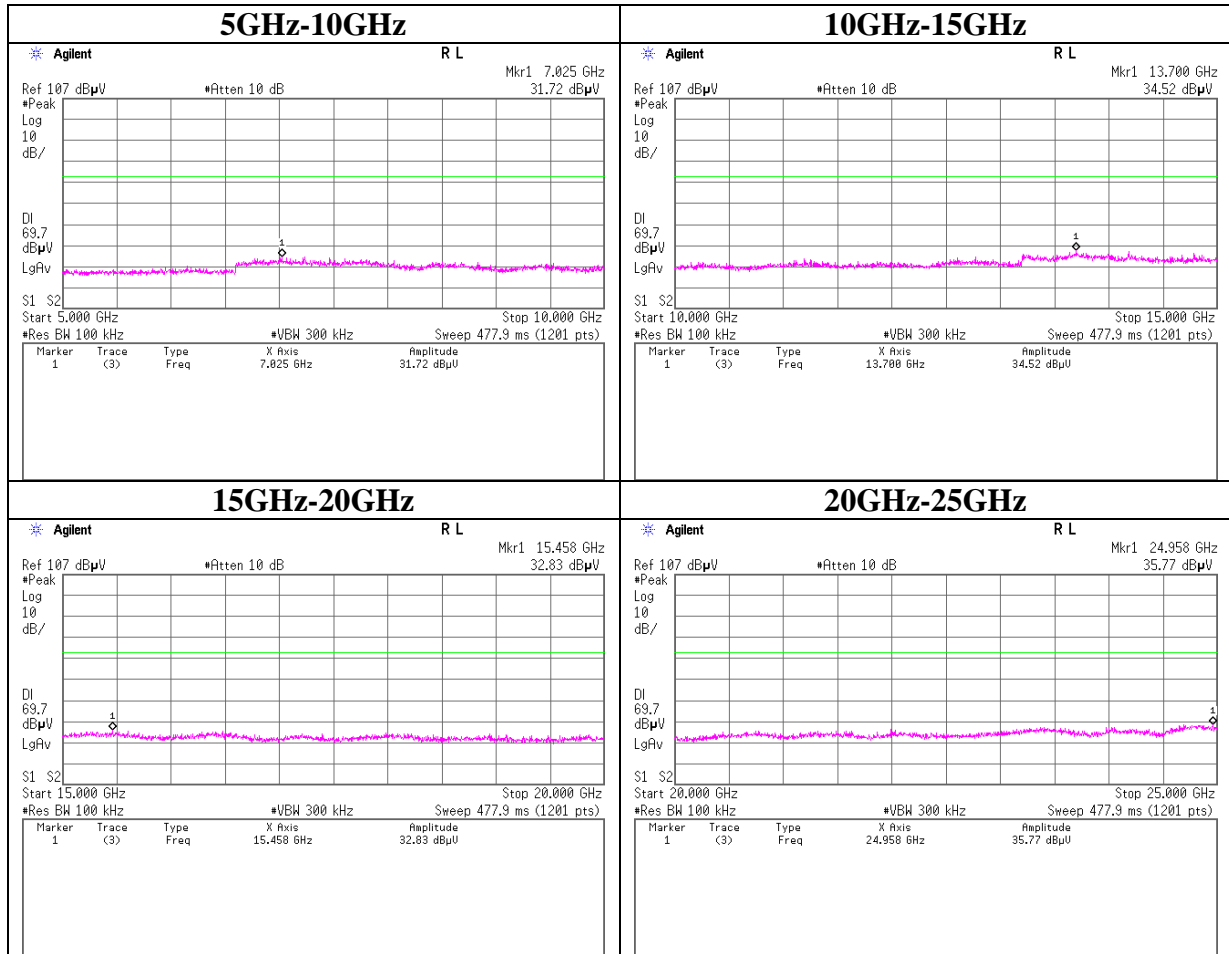
Conducted Spurious Emission

11b Tx 2412MHz



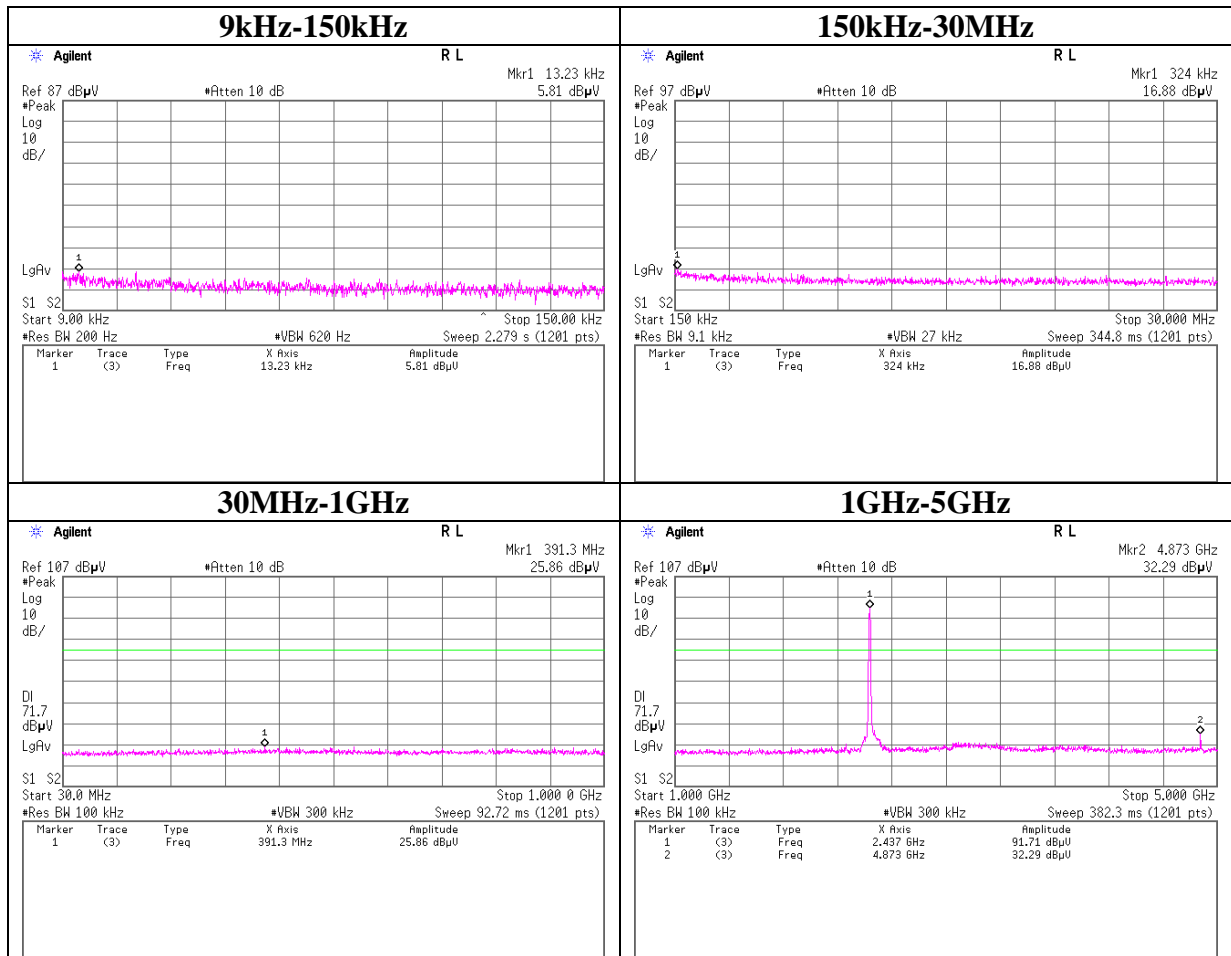
Conducted Spurious Emission

11b Tx 2412MHz



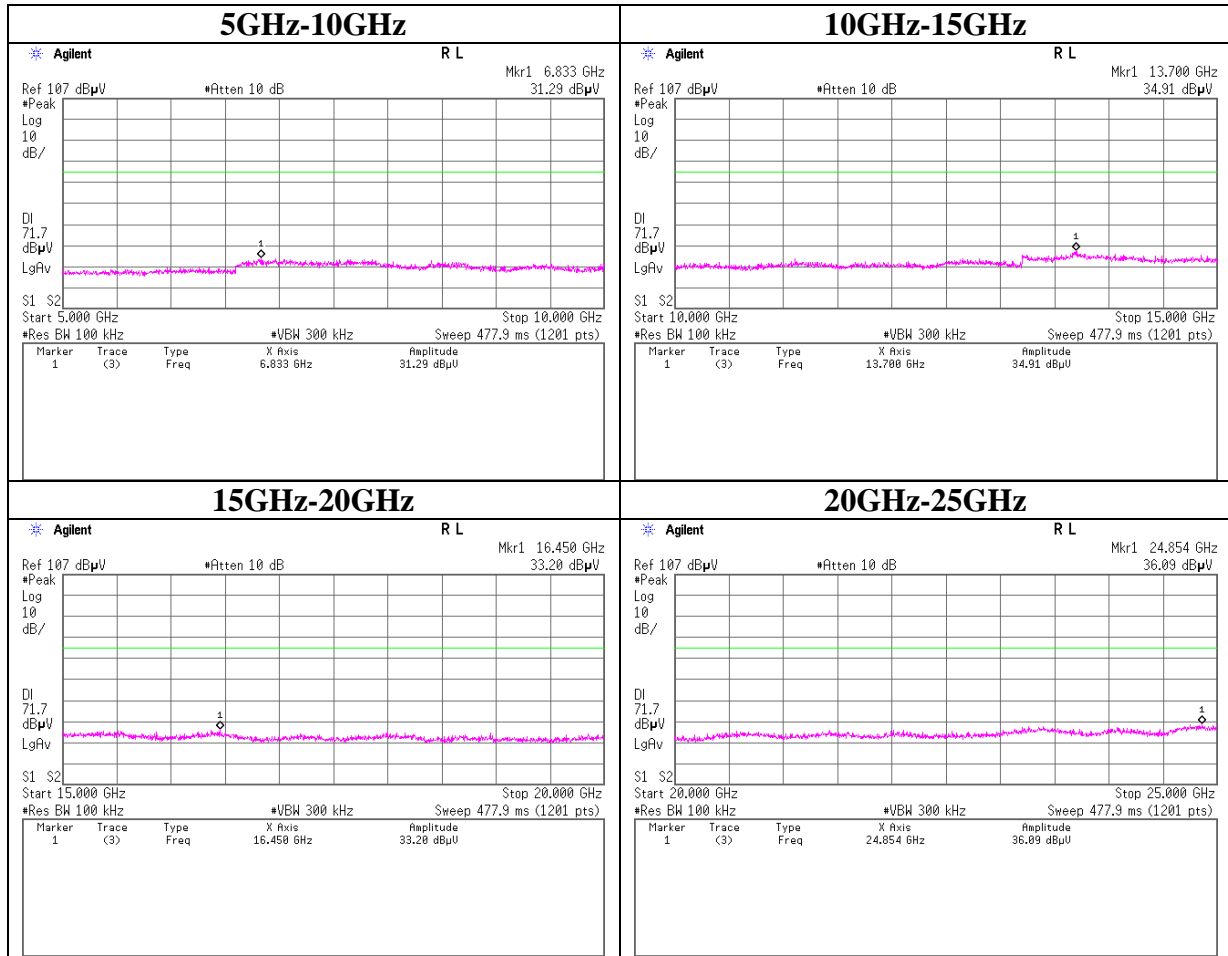
Conducted Spurious Emission

11b Tx 2437MHz



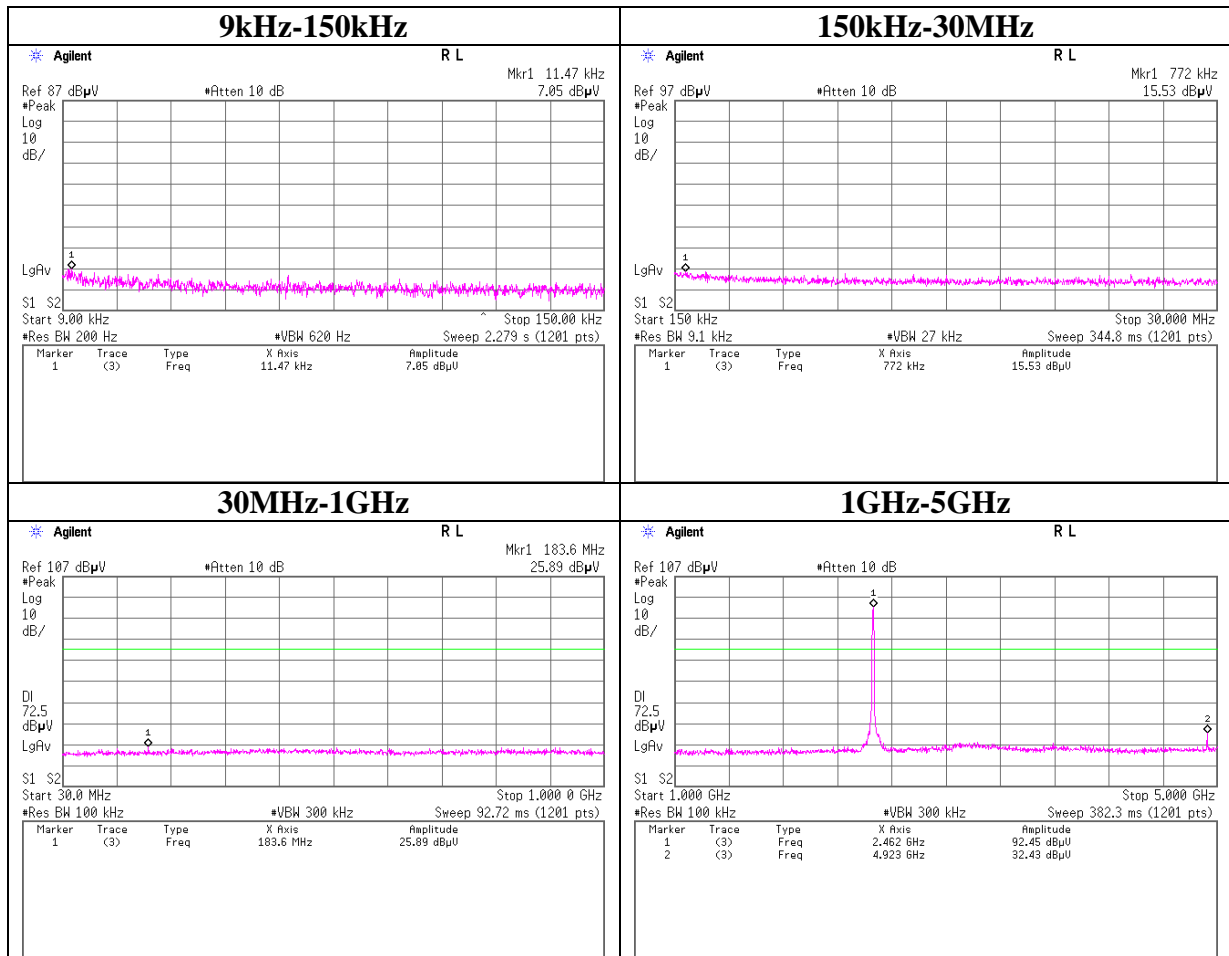
Conducted Spurious Emission

11b Tx 2437MHz



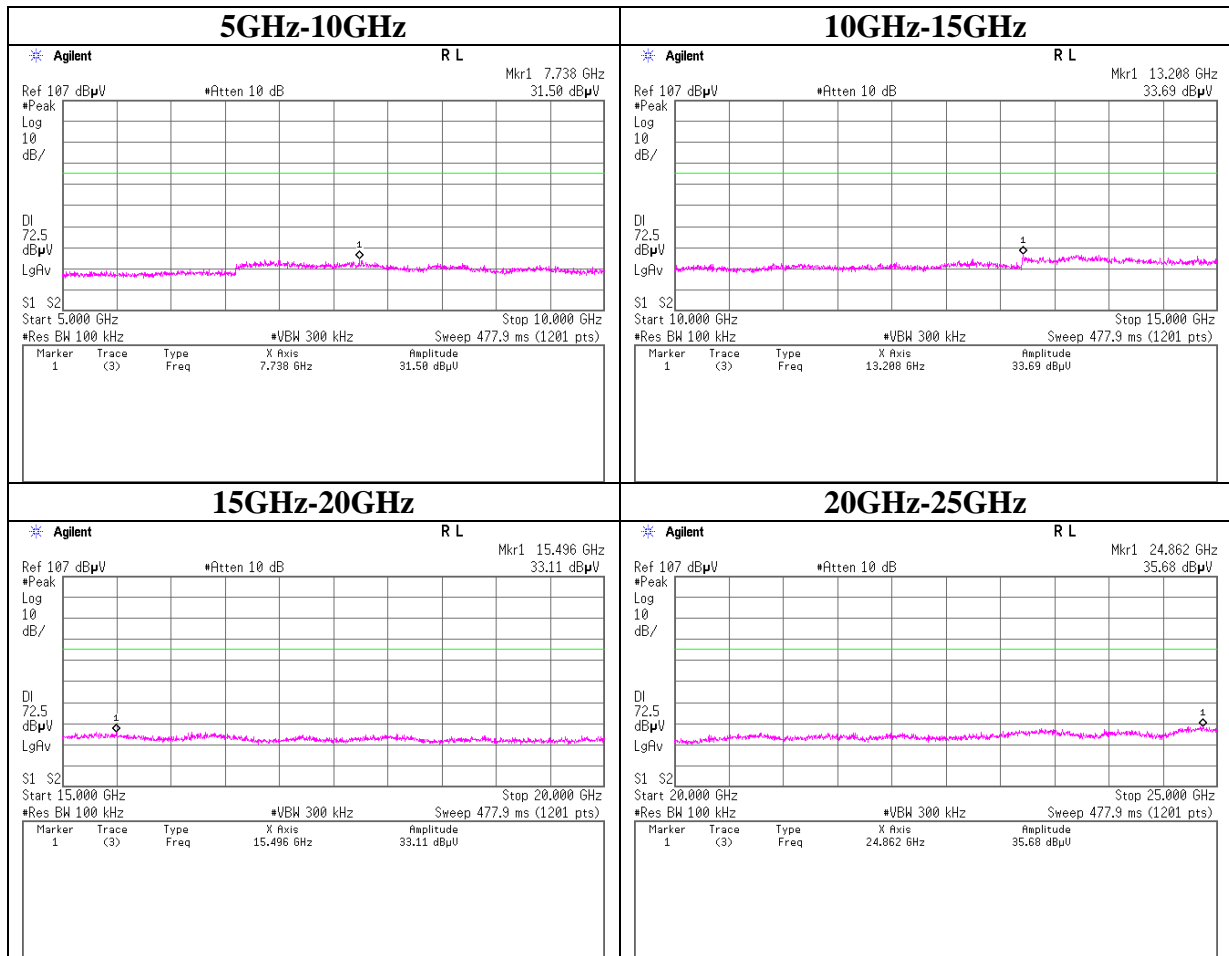
Conducted Spurious Emission

11b Tx 2462MHz



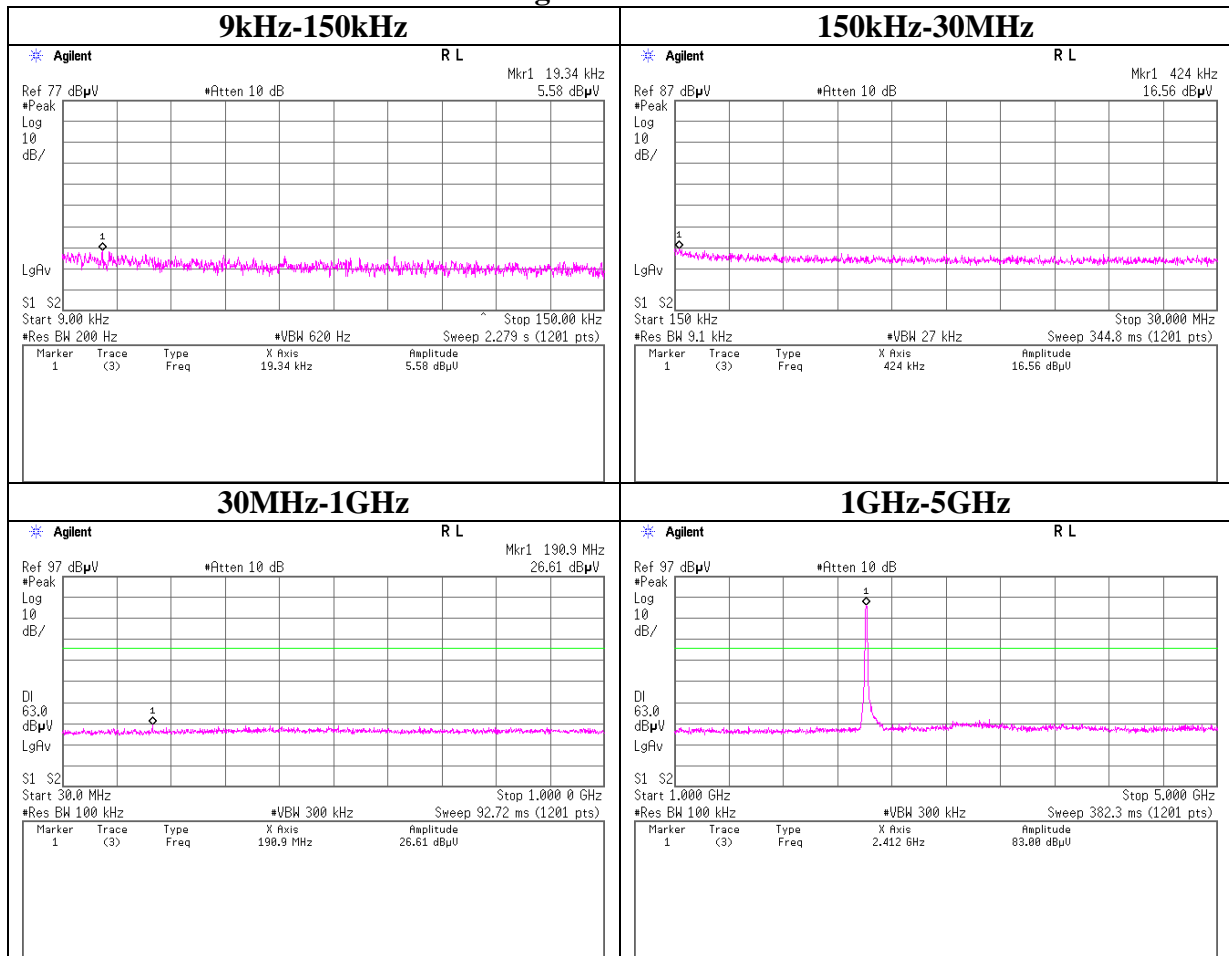
Conducted Spurious Emission

11b Tx 2462MHz



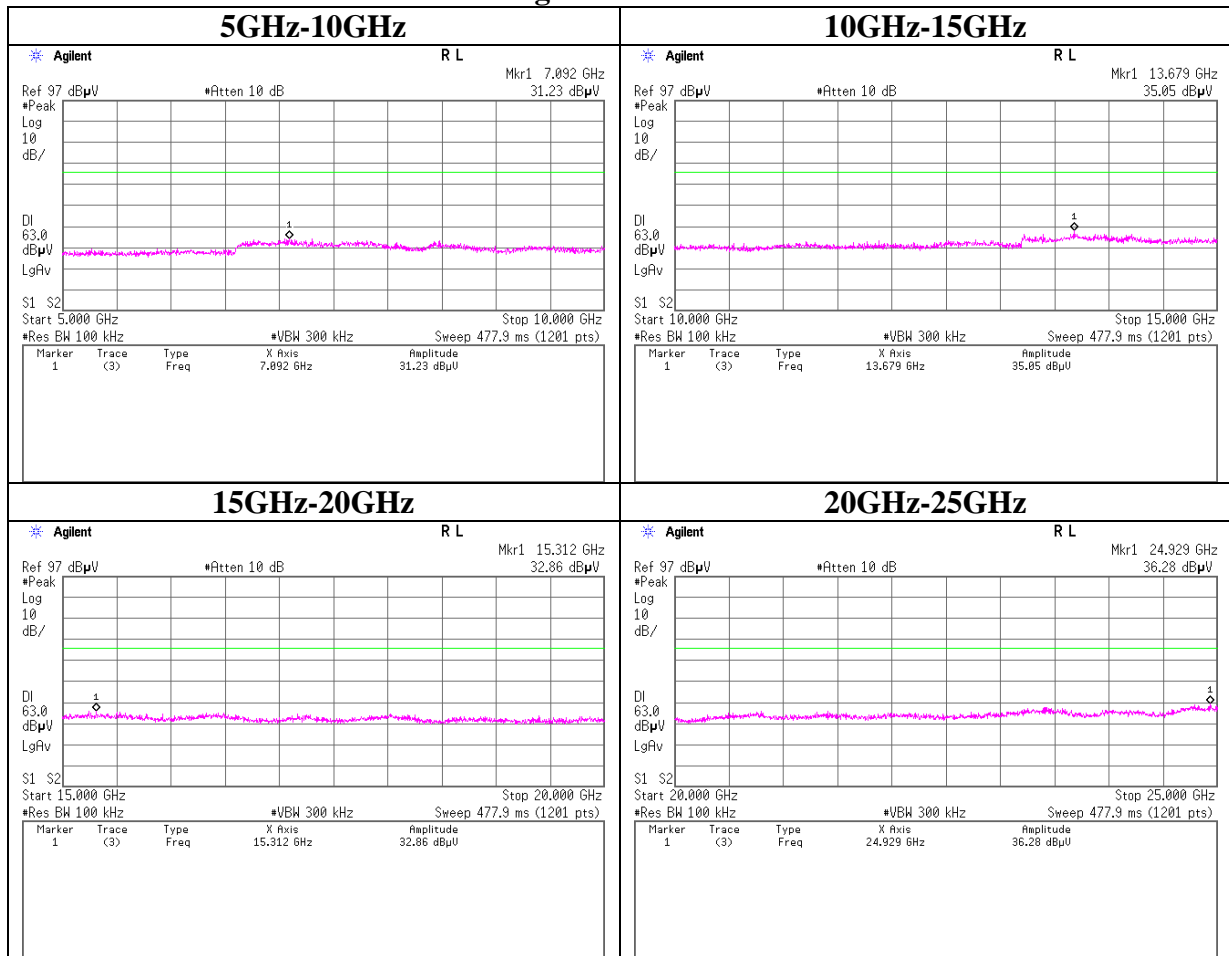
Conducted Spurious Emission

11g Tx 2412MHz



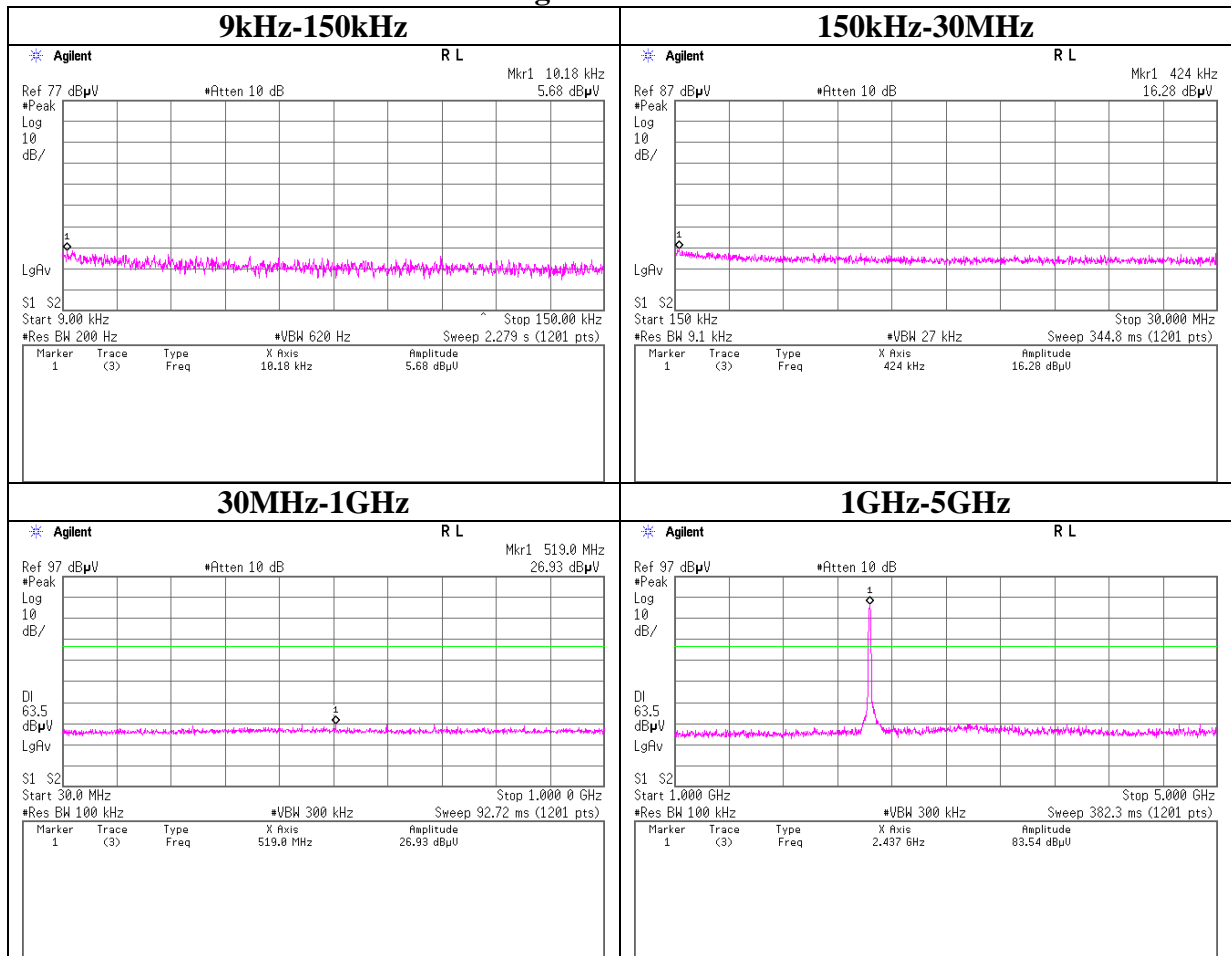
Conducted Spurious Emission

11g Tx 2412MHz



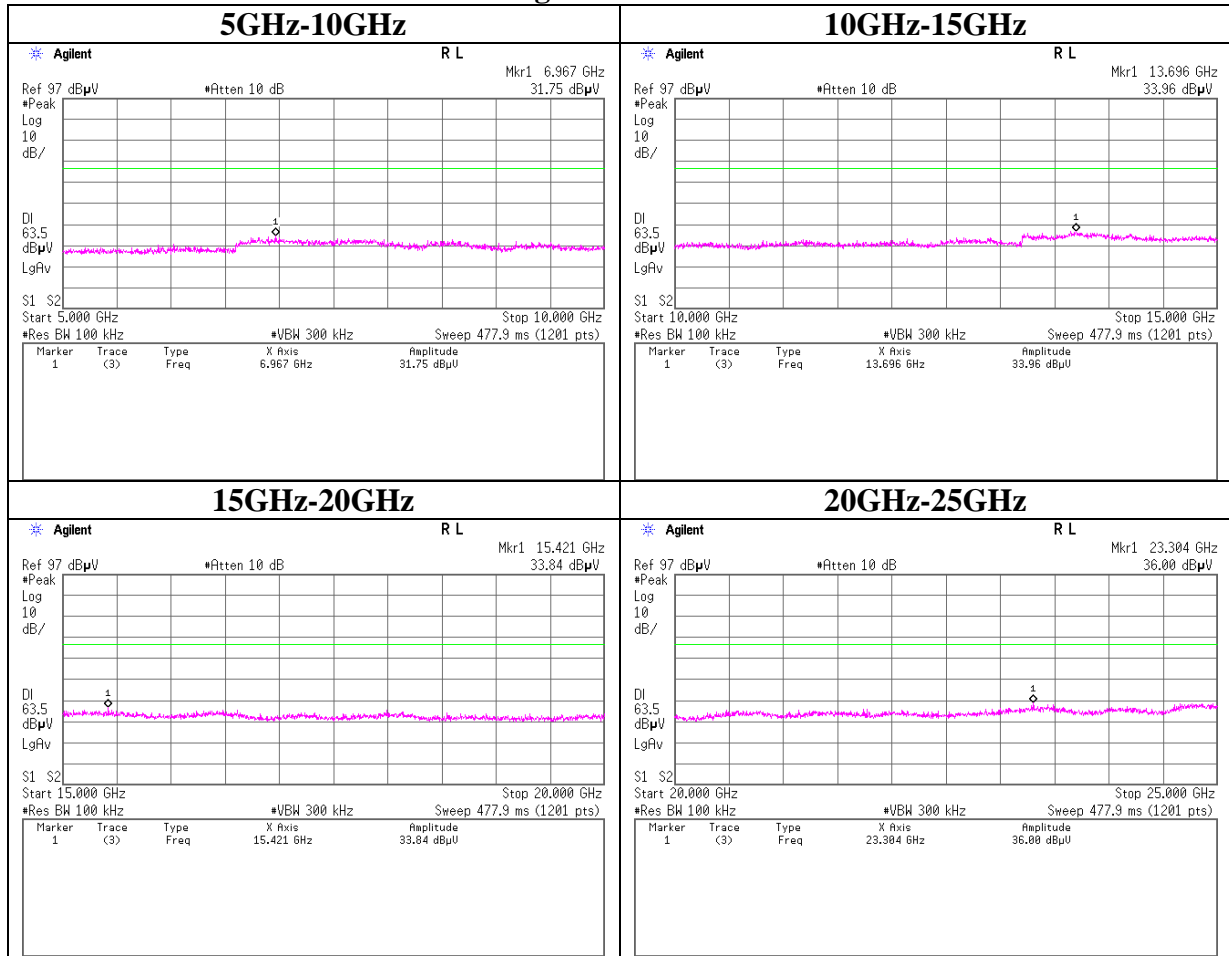
Conducted Spurious Emission

11g Tx 2437MHz



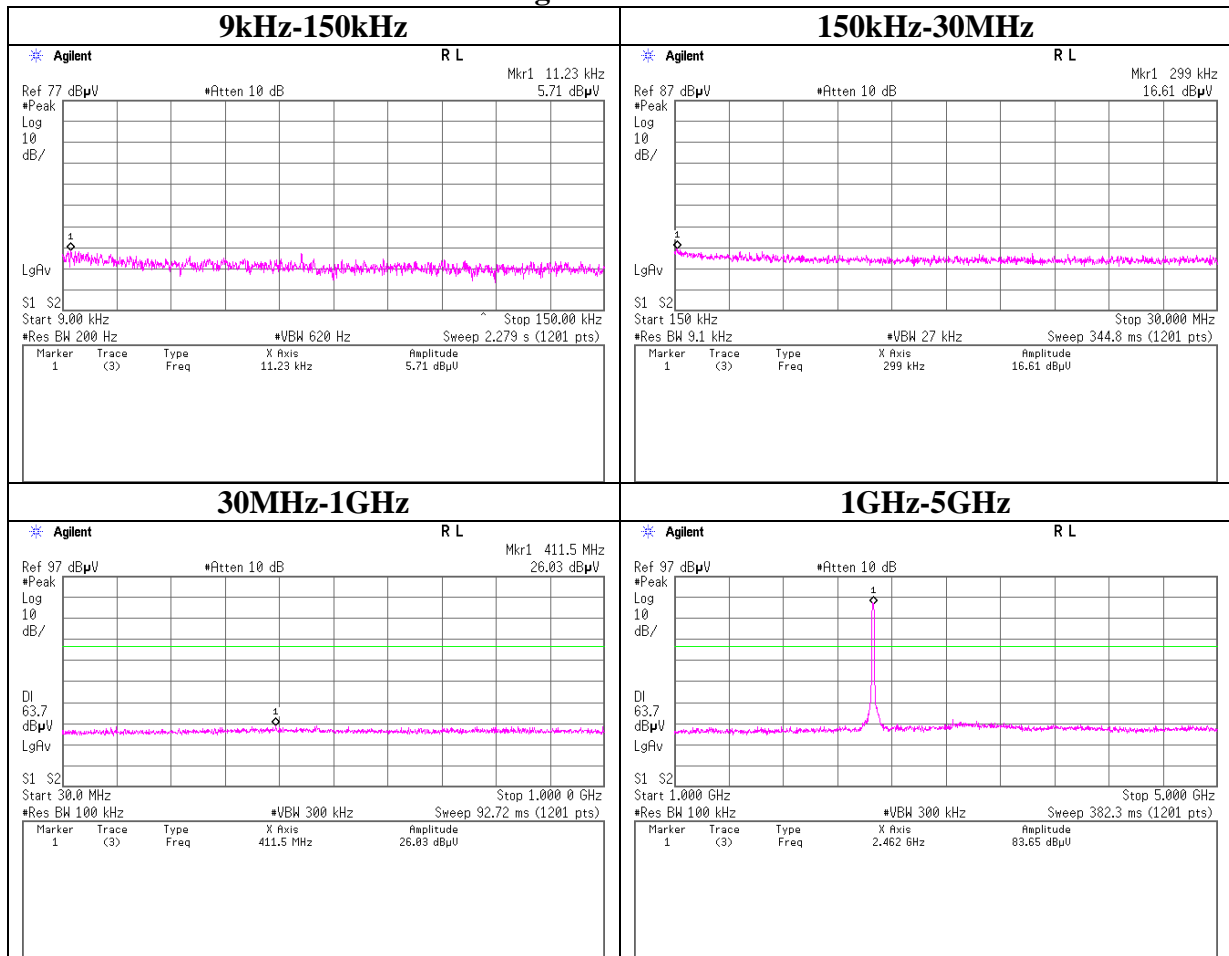
Conducted Spurious Emission

11g Tx 2437MHz



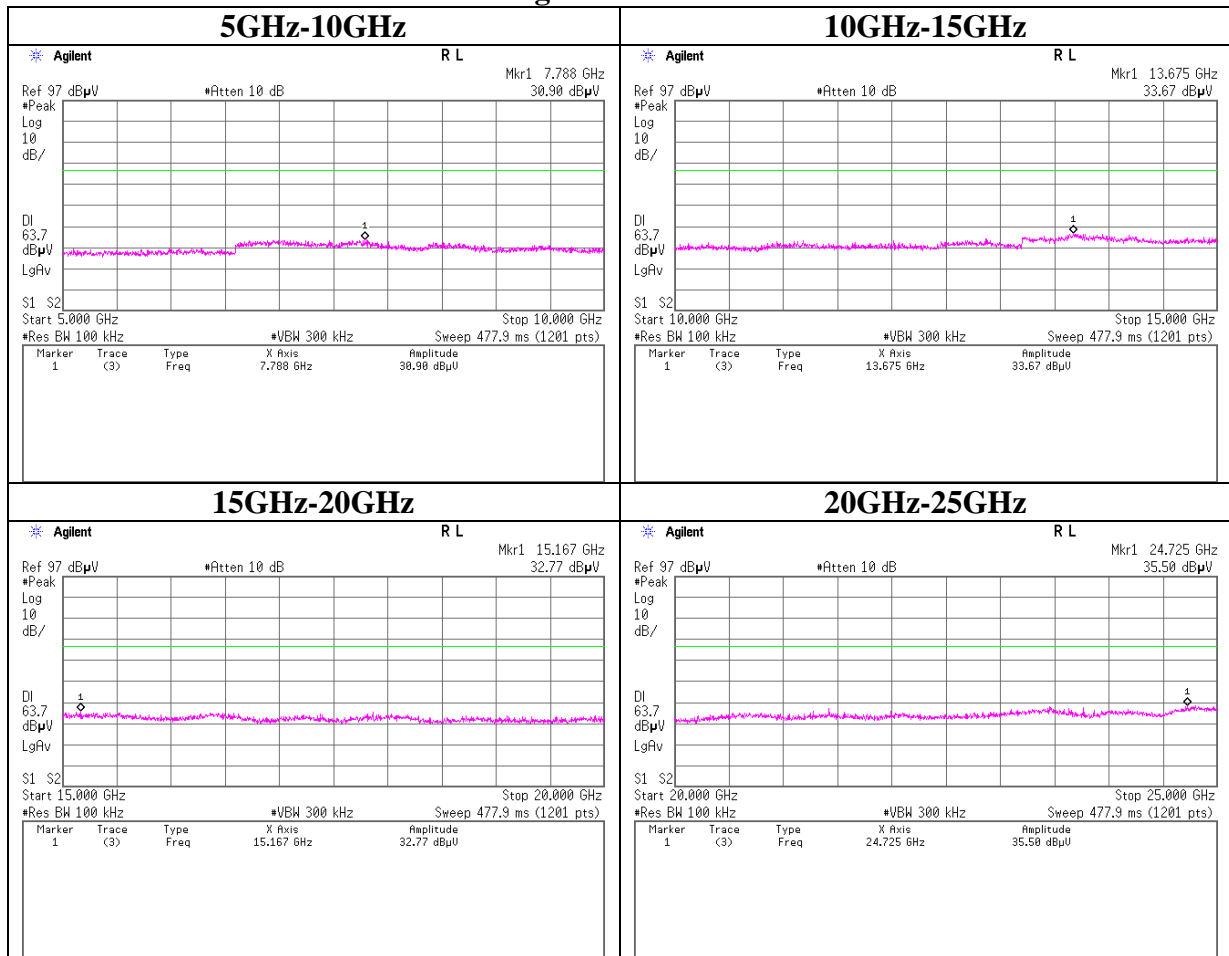
Conducted Spurious Emission

11g Tx 2462MHz



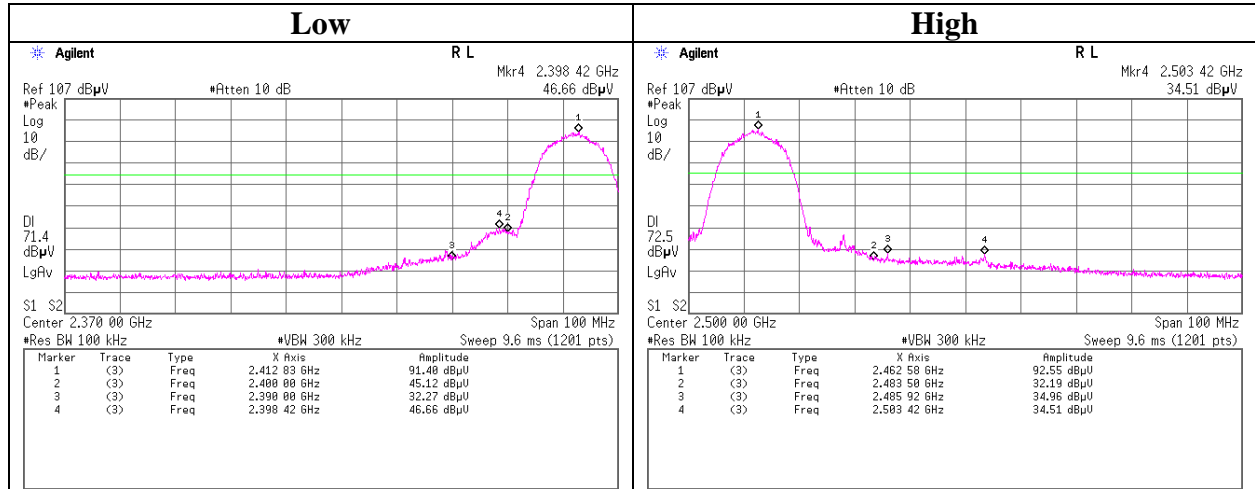
Conducted Spurious Emission

11g Tx 2462MHz

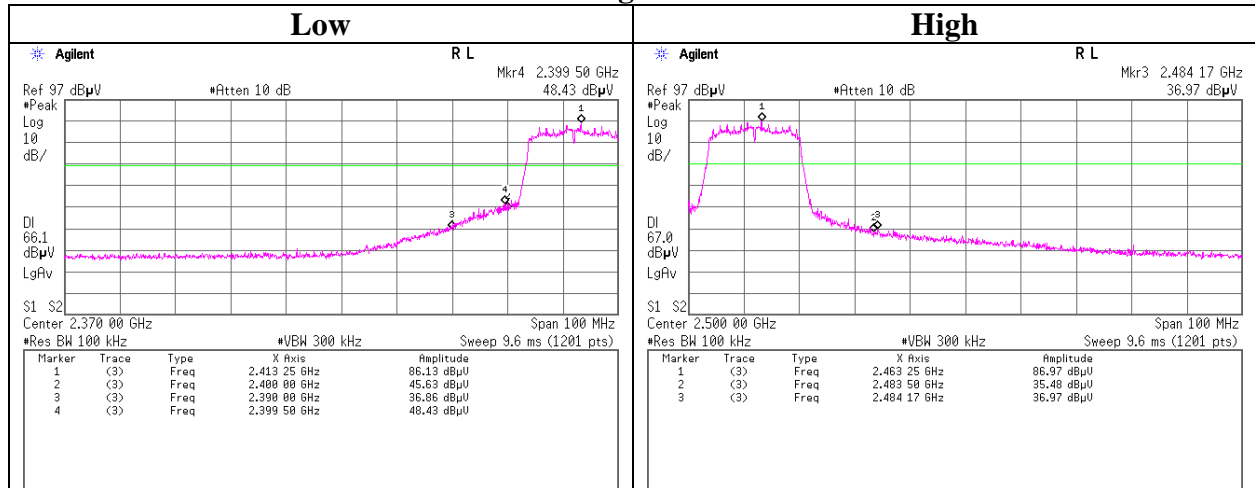


Conducted Emission Band Edge compliance

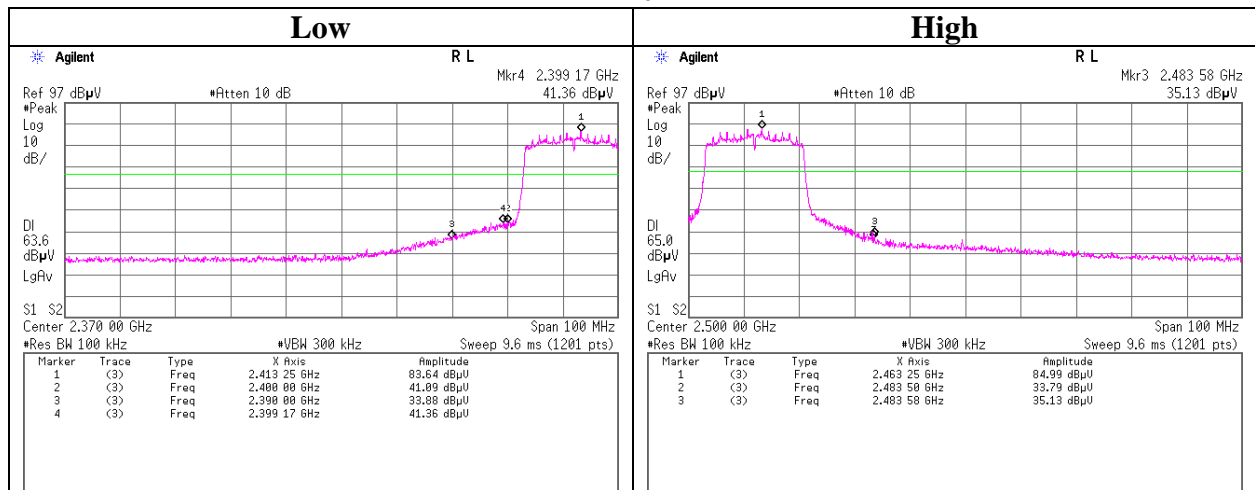
11b Tx



11g Tx



11n-20 Tx



Power Density

Test place Head Office EMC Lab. No.11 Measurement Room
Report No. 32FE0253-HO
Date 02/20/2012
Temperature / Humidity 22 deg. C / 32% RH
Engineer Katsunori Okai
Mode Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-9.60	3.34	10.07	3.81	8.00	4.19
2437.00	-9.13	3.34	10.07	4.28	8.00	3.72
2462.00	-8.63	3.35	10.07	4.79	8.00	3.21

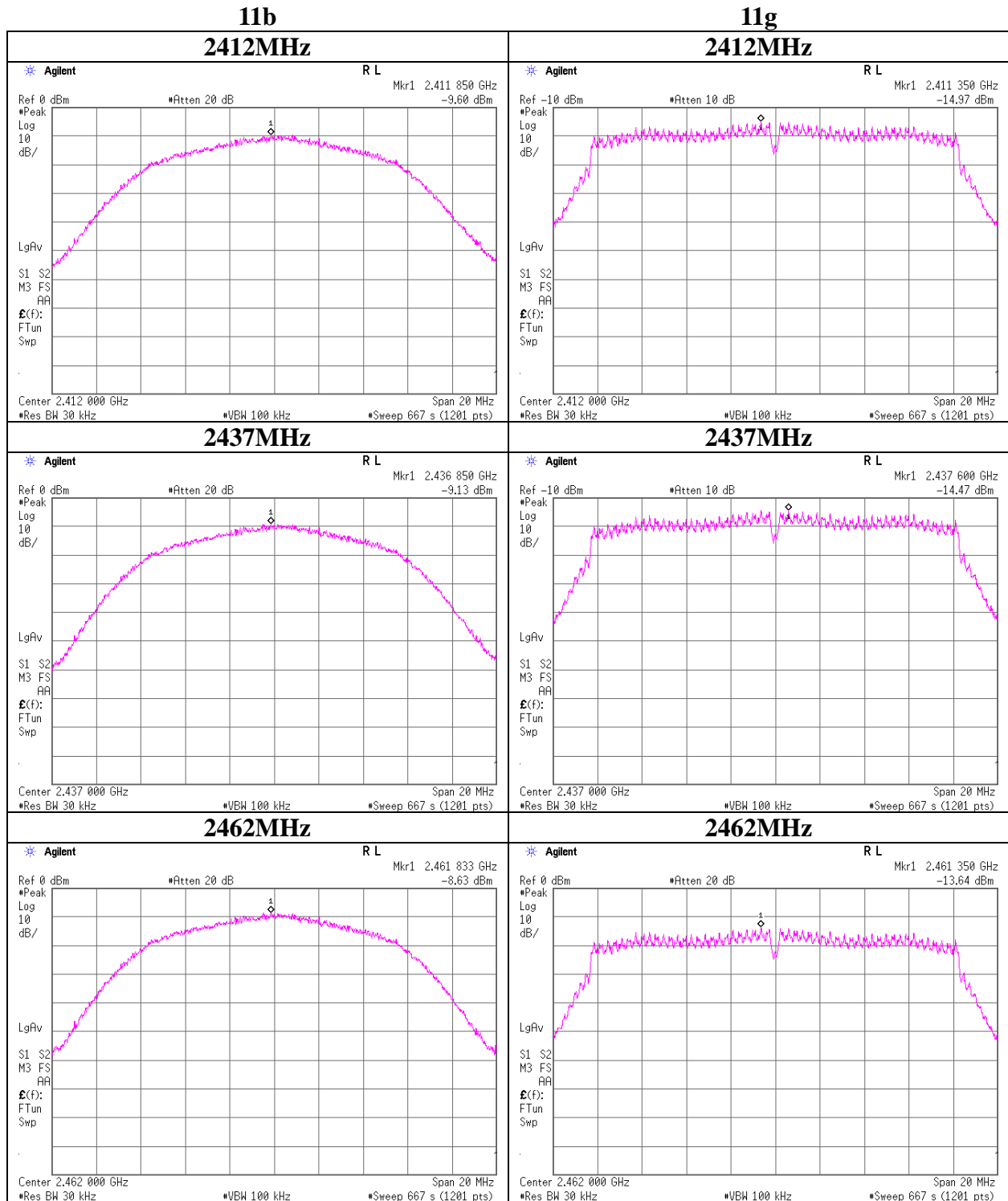
11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-14.97	3.34	10.07	-1.56	8.00	9.56
2437.00	-14.47	3.34	10.07	-1.06	8.00	9.06
2462.00	-13.64	3.35	10.07	-0.22	8.00	8.22

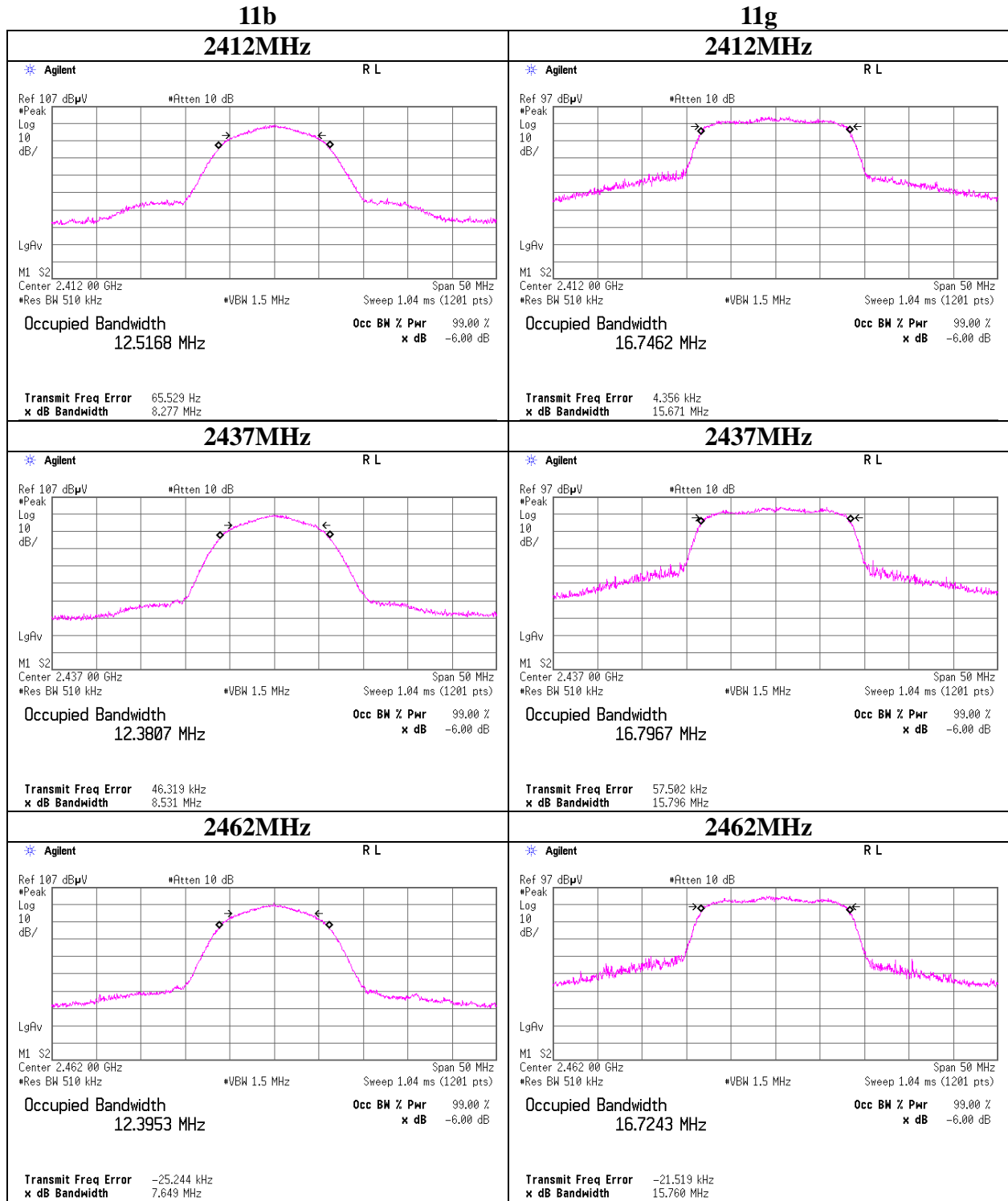
Sample Calculation:

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

Power Density



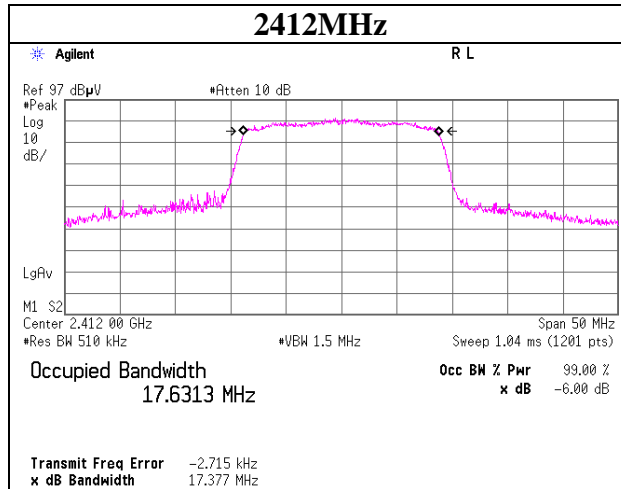
99%Occupied Bandwidth



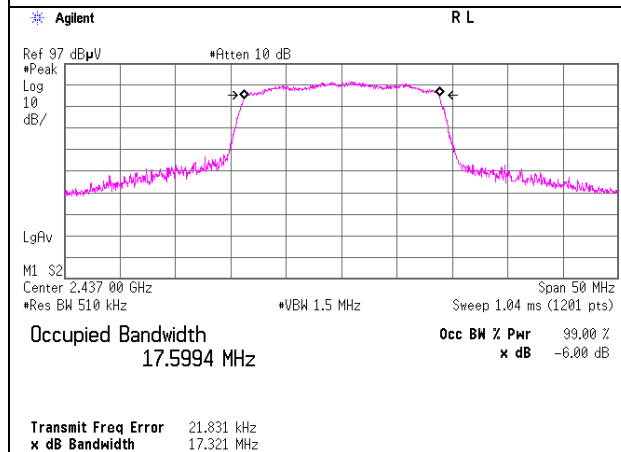
99%Occupied Bandwidth

11n-20

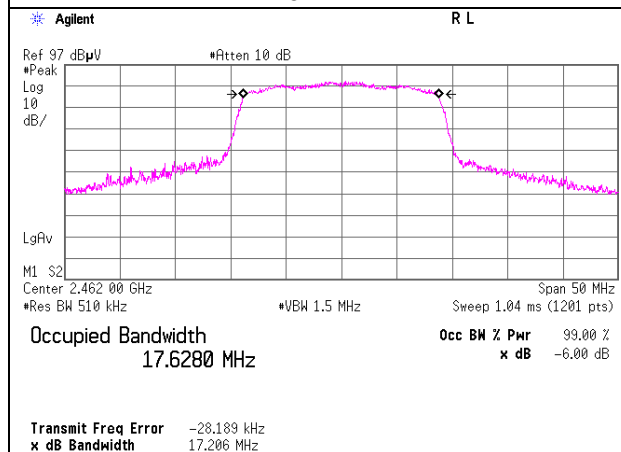
2412MHz



2437MHz



2462MHz



APPENDIX 2: Test instruments

EMI test equipment (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	AT	2012/02/03 * 12
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	AT	2011/09/13 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	AT	2011/09/13* 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2011/03/14 * 12
MCC-96	Microwave Cable 1G-40GHz	Schner	SUCOFLEX102	30817/2	AT	2011/05/27 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	AT	2012/02/06 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2011/06/21 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2012/02/06 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2011/04/08 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2011/08/11 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2012/01/25 * 12
MCC-132	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336161/4(1m) / 340639(5m)	RE	2011/09/06 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2011/03/01 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE/CE	2012/02/06 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE/CE	-
MRENT-95	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE/CE	2011/06/30 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE/CE	2011/10/19 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2011/11/16 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2011/11/16 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2011/03/25 * 12
MAT-32	Attenuator(6dB)	TME	UFA-01	-	RE	2011/03/02 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2011/03/04 * 12
MCC-56	Microwave Cable	Suhner	SUCOFLEX104	270875/4(1m) / 284655(5m)	RE	2011/03/02 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2011/03/10 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2011/05/16 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2011/06/17 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(EUT)	2012/02/06 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2012/01/11 * 12
MAT-67	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2012/01/28 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(5m)/421-010(1m)/sucoform141-PE(1m)/RFM-E121(Switcher)	-/04178	CE	2011/07/04 * 12

EMI test equipment (2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2011/12/09 * 12
MCC-137	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37954/2	AT	2011/10/28 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2011/03/14 * 12
MAT-25	Attenuator(10dB)(above 1GHz)	Agilent	8493C	71642	AT	2011/06/23 * 12
MSA-03	Spectrum Analyzer	Advantest	R3273	160400285	RE	2011/11/23 * 12

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

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

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

Test Item: CE: Conducted Emission

RE: Radiated Emission

AT: Antenna Terminal Conducted test

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