FCC CFR47 PART 15 SUBPART E
INDUSTRY CANADA RSS-210 ISSUE 8
(Permissive Change Class II Application)

CERTIFICATION TEST REPORT

FOR

WIFI MODULE

MODEL NUMBER: DWM-W052

FCC ID: EW4DWMW052
IC: 4250A-DWMW052

REPORT NUMBER: 33LE0037-HO-B

ISSUE DATE: August 26, 2013

Prepared for
MITSUMI ELECTRIC CO., LTD.
1601, SAKAI, ATSUGI-SHI,
KANAGAWA, 243-8533 JAPAN

Prepared by
UL Japan, Inc.
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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

Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/26/13	Initial Issue	T. Hatakeda

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MITSUMI ELECTRIC CO., LTD.
1601, SAKAI, ATSUGI-SHI,
KANAGAWA, 243-8533 JAPAN

EUT DESCRIPTION: WIFI MODULE

MODEL: DWM-W052

SERIAL NUMBER: 9CE635BB6451

DATE TESTED: August 5 to 8, 2013

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 9	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL Japan, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Japan, Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Japan, Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Japan, Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL Japan, Inc. By:

T. Hatakeda

Takahiro Hatakeda
Leader of WiSE Japan
UL Verification Services
UL Japan, Inc.

Tested By:

T. Shimada

Takumi Shimada
Engineer of WiSE Japan
UL Verification Services
UL Japan, Inc.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, FCC KDB 789033, ANSI C63.10-2009, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN.

UL Japan, Inc. is accredited by NVLAP, Laboratory Code 200572-0
The full scope of accreditation can be viewed at
http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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4.3. MEASUREMENT 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)	**Radiated emission (10m*)(±dB)**		
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz
No.1	4.2dB	5.0dB	4.8dB
No.2	-	-	-
No.3	-	-	-
No.4	-	-	-

*10m = Measurement distance

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	4.3dB	5.0dB	5.1dB	4.9dB	5.8dB	4.4dB	4.3dB
No.2	4.3dB	5.2dB	5.1dB	5.0dB	5.7dB	4.3dB	4.2dB
No.3	4.6dB	5.0dB	5.1dB	5.0dB	5.7dB	4.5dB	4.2dB
No.4	4.8dB	5.2dB	5.0dB	5.0dB	5.7dB	5.2dB	4.2dB

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

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11n (HT20) transceiver module.

5.2. DESCRIPTION OF CHANGE

The major changes filed under this application are noted in the following table:

Parts of change	Previous specification	Changed new specification
Capacitor (C43)	33pF	12pF
Capacitor (C44)	33pF	12pF
Resistor (R2)	1.5K Ohm	422 Ohm
X'tal (Y1)	Model: 8Z20070005	Model: 8Z20070013

5.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum average conducted output power as follows. All power measurements are less than 0.5dB higher than the output power measurements from the original report. Reference Document no. 33BE0378-HO-B.

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)	Output Power (dBm) - Doc no. 33BE0378-HO-B	Output Power (mW) - Doc no. 33BE0378-HO-B
5180 - 5240	802.11n SISO HT20 (MCS0 -MCS7)	13.28	21.28	13.09	20.37
5180 - 5240	802.11n MIMO HT20 (MCS8 - MCS15)	14.01	25.18	13.86	24.32

*Output power was set using the test utility to be within 0.5dB of the original application for the purposes of evaluating compliance of this device with the proposed changes installed. The proposed changes will not modify the output power from that reported in the original filing.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna, with a maximum gain of 1.23 dBi (Ant 0/Ant 1).

5.5. SOFTWARE AND FIRMWARE

The software/firmware version is BCM43237_5_91_100_35_XP.

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5.6. WORST-CASE CONFIGURATION AND MODE

The worst-case data rate for each mode is determined to be as follows, based on preliminary tests of the chipset utilized in this radio.

All final tests in the 802.11n SISO 20MHz mode were made at MCS3 (Antenna 1) & MCS2 (Antenna 0).
All final tests in the 802.11n MIMO 20MHz mode were made at MCS8.

For radiated emissions below 1 GHz the worst-case configuration is determined to be the mode and channel with the highest output power.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z, it was determined that the following orientation was worst-case; therefore, all final radiated testing was performed with the following orientation:

- Module: Horizontal X-orientation, Vertical X-orientation
- Antenna: Horizontal Z-orientation, Vertical X-orientation

The report number of original model is 33BE0378-HO-B.
Only Average Power, Band Edge Compliance, and Spurious Emission (Radiated) test were performed in this report.
For other tests, please see the test report number 33BE0378-HO-B issued by UL Japan, Inc.

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5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	TOSHIBA	PQF32N-01F015	47076597H	DoC
AC Adapter	TOSHIBA	PA3237U-3ACA	7209274	DoC
Test Jig	Mitsumi	N/A	N/A	N/A

I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	1	2 Pong	Un-Shielded	2.0m	N/A
2	DC	1	DC	Un-Shielded	1.8m	N/A
3	DC	1	DC	Un-Shielded	2.0m	N/A
4	Data	1	20 Pins	Un-Shielded	0.5m	Ribbon Cable

TEST SETUP

The EUT is attached to a host laptop computer via ribbon cable during the tests. Test software exercised the radio card.

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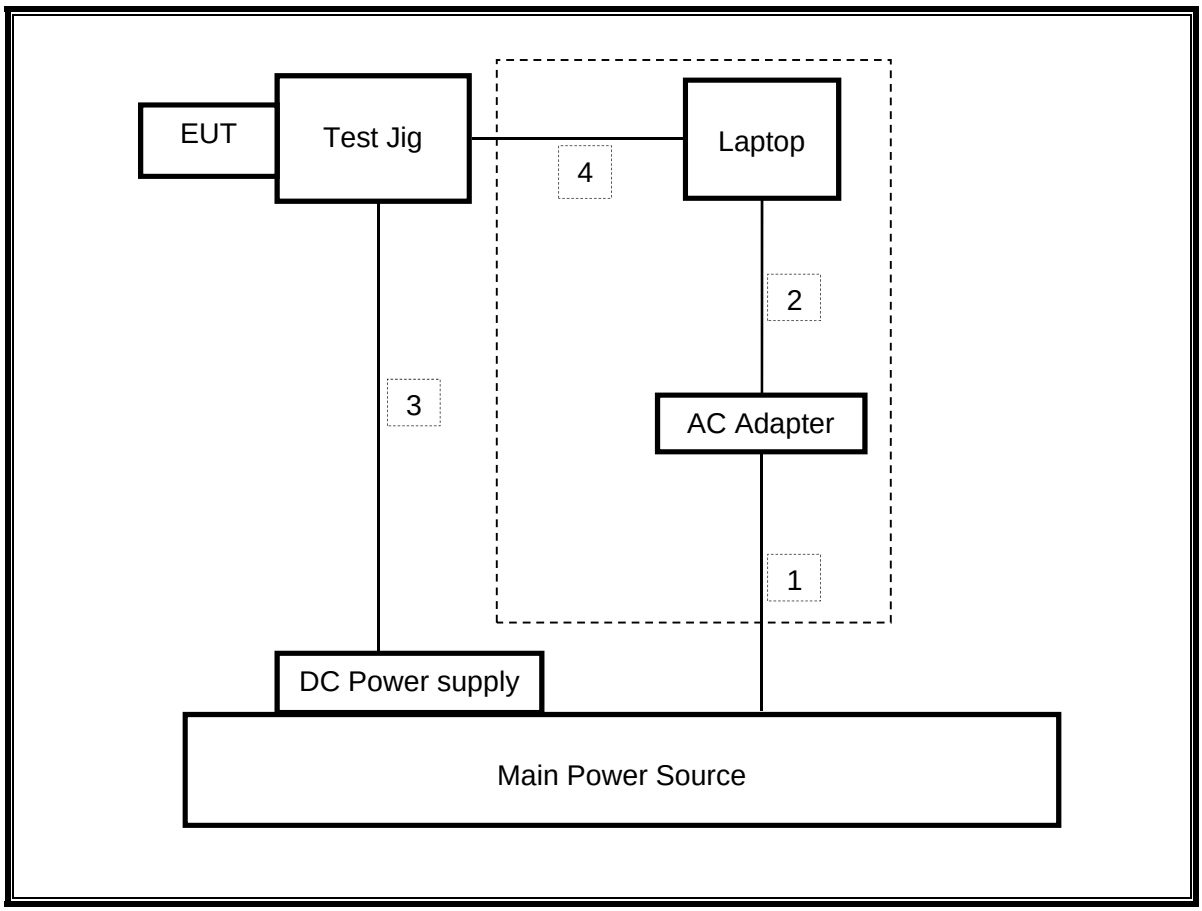
SETUP DIAGRAM FOR TESTS



= These were connected only when the EUT was activated.

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6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2013/02/28 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2013/02/26 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2013/02/22 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2013/05/17 * 12
MCC-133	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336164/4(1m) / 340640(5m)	RE	2012/09/05 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2013/03/12 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2013/02/28 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2013/02/26 * 12
MJM-09	Measure	KDS	E19-55	-	RE	-
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2012/08/17 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1204S062(5m)	RE	2013/05/28 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2013/03/19 * 12
MHF-23	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCC	603	RE	2013/01/10 * 12
MCC-79	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278923/4	RE	2012/12/24 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2013/05/17 * 12
MPA-03	Microwave System Power Amplifier	Agilent	83050A	3950M00205	RE	2013/06/20 * 12
MCC-54	Microwave Cable	Suhner	SUCOFLEX101	2873(1m) / 2876(5m)	RE	2013/03/19 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2012/12/25 * 12
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2013/06/12 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2013/06/12 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	AT	2013/04/03 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2013/03/21 * 12
MCC-105	Microwave Cable	Hirose Electric	U.FL-2LP-066J1-A(200)	-	AT	2013/06/25 * 12
MCC-35	Microwave Cable	Hirose Electric	U.FL-2LP-066-A-(200)	-	AT	2012/09/05 * 12

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Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2012/08/23 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2012/10/08 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2012/10/08 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2013/07/23 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2013/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2013/03/12 * 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

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7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

7.1.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11n HT20(SISO, Ant 0)	0.4547	0.5470	0.8312	83.12	0.81	2.199
802.11n HT20(SISO, Ant 1)	0.3490	0.4408	0.7917	79.17	1.02	2.865
802.11n HT20(MIMO)	0.6696	0.7592	0.8795	87.95	0.55	1.493

7.1.2. MEASUREMENT METHOD FOR POWER AND PPSD

The Duty Cycle is less than 98% and consistent therefore KDB 789033 Method SA-1 with a video trigger is used.

7.1.3. MEASUREMENT METHOD FOR AVERAGE SPURIOUS EMISSIONS ABOVE 1 GHz

The Duty Cycle is less than 98% and consistent, KDB 789033 Method AD is used.

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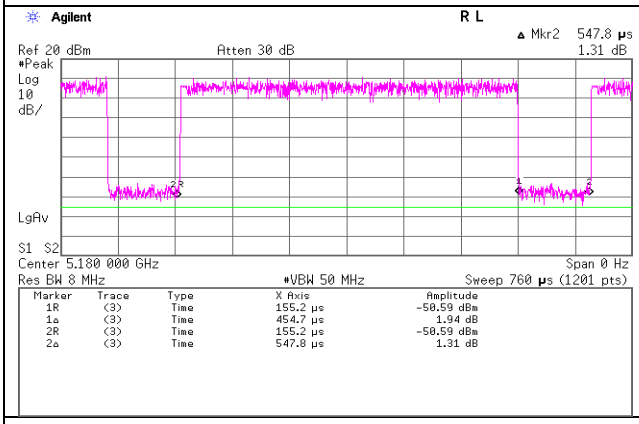
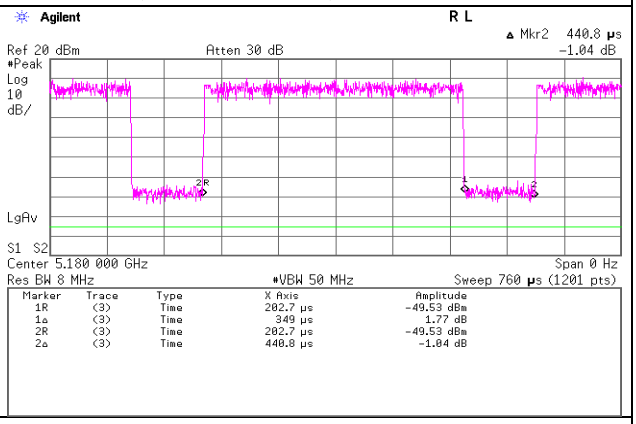
7.1.4. DUTY CYCLE PLOTS

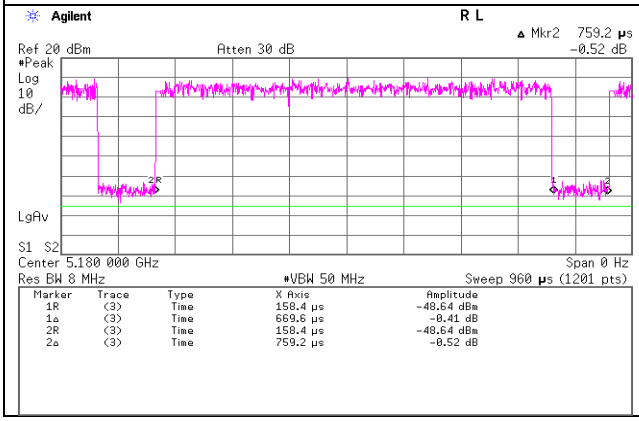
11n-20(SISO) , MCS 2, Antenna 0
Duty Cycle = 454.7/547.8 = 83.0%
Duty factor:10log(1/x)=0.81
x:Tx on/(Tx on+Tx off)=454.7/547.8



11n-20(SISO) , MCS 3, Antenna 1
Duty Cycle = 349/440.8 = 79.2%
Duty factor:10log(1/x)=1.02
x:Tx on/(Tx on+Tx off)=349/441.8



11n-20(MIMO) , MCS 8
Duty Cycle = 669.6/759.2 = 88.2%
Duty factor:10log(1/x)=0.55
x:Tx on/(Tx on+Tx off)=669.6/759.2



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8. ANTENNA PORT TEST RESULTS

8.1. 802.11n HT20 SISO MODE IN THE 5.2 GHz BAND

8.1.1. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

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RESULTS

Test place	Head Office EMC Lab. No.11 Measurement Room
Report No.	33LE0037-HO
Date	08/08/2013
Temperature/ Humidity	26deg. C / 40% RH
Engineer	Masatoshi Nishiguchi
Mode	11n-20(SISO), Tx

Antenna 0

Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	Result (Cond.) [dBm]	Result (e.i.r.p.) [dBm]
5180.0	1.84	1.12	10.11	1.23	13.07	14.30
5220.0	1.81	1.13	10.11	1.23	13.05	14.28
5240.0	1.80	1.14	10.11	1.23	13.05	14.28

Result(Cond.) = Reading + Cable Loss + Atten.Loss
Result(e.i.r.p.) = Reading + Cable Loss + Atten.Loss + Antenna Gain

Antenna 1

Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	Result (Cond.) [dBm]	Result (e.i.r.p.) [dBm]
5180.0	1.92	1.25	10.11	1.23	13.28	14.51
5220.0	1.47	1.26	10.11	1.23	12.84	14.07
5240.0	1.14	1.27	10.11	1.23	12.52	13.75

Result(Cond.) = Reading + Cable Loss + Atten.Loss
Result(e.i.r.p.) = Reading + Cable Loss + Atten.Loss + Antenna Gain

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8.2. 802.11n HT20 MIMO MODE IN THE 5.2 GHz BAND

8.2.1. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

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RESULTS

Test place	Head Office EMC Lab. No.11 Shielded Room
Report No.	33LE0037-HO
Date	08/08/2013
Temperature/ Humidity	26deg. C / 40% RH
Engineer	Masatoshi Nishiguchi
Mode	11n-20(MIMO) Tx, MCS 8

Antenna 0+1

Freq. [MHz]	Result (Cond.) [dBm]	Result (e.i.r.p.) [dBm]
5180.0	14.01	15.24
5220.0	13.84	15.07
5240.0	13.89	15.12

Result [dBm] = 10 x log (10 ^ (Antenna 1 Result [dBm] / 10) + 10 ^ (Antenna 2 Result [dBm] / 10))

Antenna 0

Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	Result (Cond.) [dBm]	Result (e.i.r.p.) [dBm]
5180.0	-0.19	1.12	10.11	1.23	11.04	12.27
5220.0	-0.15	1.13	10.11	1.23	11.09	12.32
5240.0	-0.18	1.14	10.11	1.23	11.07	12.30

Antenna 1

Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Antenna Gain [dBi]	Result (Cond.) [dBm]	Result (e.i.r.p.) [dBm]
5180.0	-0.41	1.25	10.11	1.23	10.95	12.18
5220.0	-0.81	1.26	10.11	1.23	10.56	11.79
5240.0	-0.69	1.27	10.11	1.23	10.69	11.92

Result(Cond.) = Reading + Cable Loss + Atten.Loss
Result(e.i.r.p.) = Reading + Cable Loss + Atten.Loss + Antenna Gain

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9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN Clause 7.2.5 (Transmitter)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak and average measurements.
For average measurement above 1GHz, the Duty Cycle is less than 98% and consistent, KDB 789033 Method AD is used.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

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9.2. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.2 GHz BAND

9.2.1. 802.11n HT20 SISO MODE IN THE LOWER 5.2 GHz BAND

Test place	Head Office EMC Lab. No.3 and 4 Anechoic Chamber		
Report No.	33LE0037-HO		
Date	08/05/2013	08/06/2013	08/07/2013
Temperature/ Humidity	22deg. C / 60%	23deg. C / 56%	23deg. C / 58%
Engineer	Takumi Shimada (1-10GHz)	Takumi Shimada (10-18GHz)	Takumi Shimada (18-40GHz)
Mode	11n-20(SISO) Tx 5180MHz ANT0		

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]	Inside or Outside of Restricted Bands	Remark
Hori	3453.335	PK	52.1	29.0	2.7	31.9	0.0	51.9	68.2	16.3	Outside	
Hori	5150.000	PK	52.0	31.1	3.4	31.4	0.0	55.1	68.2	13.1	Bandedge	
Hori	10360.000	PK	55.5	39.3	-2.1	33.6	0.0	59.1	68.2	9.1	Outside	
Hori	15540.000	PK	44.3	39.5	-0.4	32.6	0.0	50.8	73.9	23.1	Inside	
Hori	5150.000	AV	41.6	31.1	3.4	31.4	0.8	45.5	53.9	8.4	Bandedge	
Hori	15540.000	AV	34.6	39.5	-0.4	32.6	0.8	41.9	53.9	12.0	Inside	
Vert	3453.335	PK	46.6	29.0	2.7	31.9	0.0	46.4	68.2	21.8	Outside	
Vert	5150.000	PK	46.9	31.1	3.4	31.4	0.0	50.0	68.2	18.2	Bandedge	
Vert	10360.000	PK	53.5	39.3	-2.1	33.6	0.0	57.1	68.2	11.1	Outside	
Vert	15540.000	PK	44.5	39.5	-0.4	32.6	0.0	51.0	73.9	22.9	Inside	
Vert	5150.000	AV	37.4	31.1	3.4	31.4	0.8	41.3	53.9	12.6	Bandedge	
Vert	15540.000	AV	34.5	39.5	-0.4	32.6	0.8	41.8	53.9	12.1	Inside	

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

*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: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

UL Japan, Inc. Head Office EMC Lab.
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Test place	Head Office EMC Lab. No.3 and 4 Anechoic Chamber		
Report No.	33LE0037-HO		
Date	08/05/2013	08/06/2013	08/07/2013
Temperature/ Humidity	22deg. C / 60%	23deg. C / 56%	23deg. C / 58%
Engineer	Takumi Shimada	Takumi Shimada	Takumi Shimada
	(1-10GHz)	(10-18GHz)	(18-40GHz)
Mode	11n-20(SISO) Tx 5220MHz ANT0		

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]	Inside or Outside of Restricted Bands	Remark
Hori	3480.007	PK	46.0	29.0	2.7	31.9	0.0	45.8	68.2	22.4	Outside	
Hori	10440.000	PK	51.3	39.4	-2.1	33.6	0.0	55.0	68.2	13.2	Outside	
Hori	15660.000	PK	43.1	39.0	-0.3	32.5	0.0	49.3	73.9	24.6	Inside	
Hori	15660.000	AV	34.6	39.0	-0.3	32.5	0.8	41.6	53.9	12.3	Inside	
Vert	3480.007	PK	46.2	29.0	2.7	31.9	0.0	46.0	68.2	22.2	Outside	
Vert	10440.000	PK	52.5	39.4	-2.1	33.6	0.0	56.2	68.2	12.0	Outside	
Vert	15660.000	PK	43.3	39.0	-0.3	32.5	0.0	49.5	73.9	24.4	Inside	
Vert	15660.000	AV	34.6	39.0	-0.3	32.5	0.8	41.6	53.9	12.3	Inside	

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

*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: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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Test place	Head Office EMC Lab. No.3 and 4 Anechoic Chamber		
Report No.	33LE0037-HO		
Date	08/05/2013	08/06/2013	08/07/2013
Temperature/ Humidity	22deg. C / 60%	23deg. C / 56%	23deg. C / 58%
Engineer	Takumi Shimada	Takumi Shimada	Takumi Shimada
	(1-10GHz)	(10-18GHz)	(18-40GHz)
Mode	11n-20(SISO) Tx 5240MHz ANT0		

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]	Inside or Outside of Restricted Bands	Remark
Hori	3493.320	PK	48.5	29.0	2.8	31.9	0.0	48.4	68.2	19.8	Outside	
Hori	5350.000	PK	44.1	31.5	3.4	31.4	0.0	47.6	68.2	20.6	Bandedge	
Hori	10480.000	PK	51.9	39.5	-2.0	33.6	0.0	55.8	68.2	12.4	Outside	
Hori	15720.000	PK	44.3	38.7	-0.3	32.5	0.0	50.2	73.9	23.7	Inside	
Hori	5350.000	AV	35.5	31.5	3.4	31.4	0.8	39.8	53.9	14.1	Bandedge	
Hori	15720.000	AV	35.2	38.7	-0.3	32.5	0.8	41.9	53.9	12.0	Inside	
Vert	3493.320	PK	46.4	29.0	2.8	31.9	0.0	46.3	68.2	21.9	Outside	
Vert	5350.000	PK	42.6	31.5	3.4	31.4	0.0	46.1	68.2	22.1	Bandedge	
Vert	10480.000	PK	52.9	39.5	-2.0	33.6	0.0	56.8	68.2	11.4	Outside	
Vert	15720.000	PK	44.7	38.7	-0.3	32.5	0.0	50.6	73.9	23.3	Inside	
Vert	5350.000	AV	33.3	31.5	3.4	31.4	0.8	37.6	53.9	16.3	Bandedge	
Vert	15720.000	AV	34.7	38.7	-0.3	32.5	0.8	41.4	53.9	12.5	Inside	

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

*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: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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Test place	Head Office EMC Lab. No.3 and 4 Anechoic Chamber		
Report No.	33LE0037-HO		
Date	08/05/2013	08/06/2013	08/07/2013
Temperature/ Humidity	22deg. C / 60%	23deg. C / 56%	23deg. C / 58%
Engineer	Takumi Shimada	Takumi Shimada	Takumi Shimada
	(1-10GHz)	(10-18GHz)	(18-40GHz)
Mode	11n-20(SISO) Tx 5180MHz ANT1		

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]	Inside or Outside of Restricted Bands	Remark
Hori	3453.315	PK	51.8	29.0	2.7	31.9	0.0	51.6	68.2	16.6	Outside	
Hori	5150.000	PK	55.7	31.1	3.4	31.4	0.0	58.8	68.2	9.4	Bandedge	
Hori	10360.000	PK	49.4	39.3	-2.1	33.6	0.0	53.0	68.2	15.2	Outside	
Hori	15540.000	PK	44.2	39.5	-0.4	32.6	0.0	50.7	73.9	23.2	Inside	
Hori	5150.000	AV	44.1	31.1	3.4	31.4	1.0	48.2	53.9	5.7	Bandedge	
Hori	15540.000	AV	34.4	39.5	-0.4	32.6	1.0	41.9	53.9	12.0	Inside	
Vert	3453.315	PK	46.2	29.0	2.7	31.9	0.0	46.0	68.2	22.2	Outside	
Vert	5150.000	PK	53.8	31.1	3.4	31.4	0.0	56.9	68.2	11.3	Bandedge	
Vert	10360.000	PK	50.2	39.3	-2.1	33.6	0.0	53.8	68.2	14.4	Outside	
Vert	15540.000	PK	44.3	39.5	-0.4	32.6	0.0	50.8	73.9	23.1	Inside	
Vert	5150.000	AV	42.5	31.1	3.4	31.4	1.0	46.6	53.9	7.3	Bandedge	
Vert	15540.000	AV	34.4	39.5	-0.4	32.6	1.0	41.9	53.9	12.0	Inside	

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

*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: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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Test place	Head Office EMC Lab. No.3 and 4 Anechoic Chamber		
Report No.	33LE0037-HO		
Date	08/05/2013	08/06/2013	08/07/2013
Temperature/ Humidity	22deg. C / 60%	23deg. C / 56%	23deg. C / 58%
Engineer	Takumi Shimada	Takumi Shimada	Takumi Shimada
	(1-10GHz)	(10-18GHz)	(18-40GHz)
Mode	11n-20(SISO) Tx 5220MHz ANT1		

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]	Inside or Outside of Restricted Bands	Remark
Hori	3480.064	PK	45.3	29.0	2.7	31.9	0.0	45.1	68.2	23.1	Outside	
Hori	10440.000	PK	48.9	39.4	-2.1	33.6	0.0	52.6	68.2	15.6	Outside	
Hori	15660.000	PK	43.4	39.0	-0.3	32.5	0.0	49.6	73.9	24.3	Inside	
Hori	15660.000	AV	34.5	39.0	-0.3	32.5	1.0	41.7	53.9	12.2	Inside	
Vert	3480.064	PK	44.6	29.0	2.7	31.9	0.0	44.4	68.2	23.8	Outside	
Vert	10440.000	PK	48.8	39.4	-2.1	33.6	0.0	52.5	68.2	15.7	Outside	
Vert	15660.000	PK	44.0	39.0	-0.3	32.5	0.0	50.2	73.9	23.7	Inside	
Vert	15660.000	AV	34.7	39.0	-0.3	32.5	1.0	41.9	53.9	12.0	Inside	

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

*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: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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Test place	Head Office EMC Lab. No.3 and 4 Anechoic Chamber		
Report No.	33LE0037-HO		
Date	08/05/2013	08/06/2013	08/07/2013
Temperature/ Humidity	22deg. C / 60%	23deg. C / 56%	23deg. C / 58%
Engineer	Takumi Shimada	Takumi Shimada	Takumi Shimada
	(1-10GHz)	(10-18GHz)	(18-40GHz)
Mode	11n-20(SISO) Tx 5240MHz ANT1		

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]	Inside or Outside of Restricted Bands	Remark
Hori	3493.314	PK	47.3	29.0	2.8	31.9	0.0	47.2	68.2	21.0	Outside	
Hori	5350.000	PK	41.7	31.5	3.4	31.4	0.0	45.2	68.2	23.0	Bandedge	
Hori	10480.000	PK	47.0	39.5	-2.0	33.6	0.0	50.9	68.2	17.3	Outside	
Hori	15720.000	PK	44.1	38.7	-0.3	32.5	0.0	50.0	73.9	23.9	Inside	
Hori	5350.000	AV	32.7	31.5	3.4	31.4	1.0	37.2	53.9	16.7	Bandedge	
Hori	15720.000	AV	34.9	38.7	-0.3	32.5	1.0	41.8	53.9	12.1	Inside	
Vert	3493.314	PK	45.6	29.0	2.8	31.9	0.0	45.5	68.2	22.7	Outside	
Vert	5350.000	PK	41.8	31.5	3.4	31.4	0.0	45.3	68.2	22.9	Bandedge	
Vert	10480.000	PK	45.8	39.5	-2.0	33.6	0.0	49.7	68.2	18.5	Outside	
Vert	15720.000	PK	44.5	38.7	-0.3	32.5	0.0	50.4	73.9	23.5	Inside	
Vert	5350.000	AV	32.5	31.5	3.4	31.4	1.0	37.0	53.9	16.9	Bandedge	
Vert	15720.000	AV	34.2	38.7	-0.3	32.5	1.0	41.1	53.9	12.8	Inside	

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

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

26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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9.2.2. 802.11n HT20 MIMO MODE IN THE LOWER 5.2 GHz BAND

Test place	Head Office EMC Lab. No.3 and 4 Anechoic Chamber		
Report No.	33LE0037-HO		
Date	08/05/2013	08/06/2013	08/07/2013
Temperature/ Humidity	22deg. C / 60%	23deg. C / 56%	23deg. C / 58%
Engineer	Takumi Shimada (1-10GHz)	Takumi Shimada (10-18GHz)	Takumi Shimada (18-40GHz)
Mode	11n-20(MIMO) Tx 5180MHz		

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]	Inside or Outside of Restricted Bands	Remark
Hori	3453.357	PK	52.1	29.0	2.7	31.9	0.0	51.9	68.2	16.3	Outside	
Hori	5150.000	PK	52.1	31.1	3.4	31.4	0.0	55.2	68.2	13.0	Bandedge	
Hori	10360.000	PK	52.4	39.3	-2.1	33.6	0.0	56.0	68.2	12.2	Outside	
Hori	15540.000	PK	44.2	39.5	-0.4	32.6	0.0	50.7	73.9	23.2	Inside	
Hori	5150.000	AV	42.0	31.1	3.4	31.4	0.6	45.7	53.9	8.3	Bandedge	
Hori	15540.000	AV	34.7	39.5	-0.4	32.6	0.6	41.8	53.9	12.2	Inside	
Vert	3453.357	PK	46.6	29.0	2.7	31.9	0.0	46.4	68.2	21.8	Outside	
Vert	5150.000	PK	48.0	31.1	3.4	31.4	0.0	51.1	68.2	17.1	Bandedge	
Vert	10360.000	PK	52.5	39.3	-2.1	33.6	0.0	56.1	68.2	12.1	Outside	
Vert	15540.000	PK	44.6	39.5	-0.4	32.6	0.0	51.1	73.9	22.8	Inside	
Vert	5150.000	AV	38.6	31.1	3.4	31.4	0.6	42.3	53.9	11.7	Bandedge	
Vert	15540.000	AV	34.8	39.5	-0.4	32.6	0.6	41.9	53.9	12.1	Inside	

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

*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: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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Test place	Head Office EMC Lab. No.3 and 4 Anechoic Chamber		
Report No.	33LE0037-HO		
Date	08/05/2013	08/06/2013	08/07/2013
Temperature/ Humidity	22deg. C / 60%	23deg. C / 56%	23deg. C / 58%
Engineer	Takumi Shimada (1-10GHz)	Takumi Shimada (10-18GHz)	Takumi Shimada (18-40GHz)
Mode	11n-20(MIMO) Tx 5220MHz		

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]	Inside or Outside of Restricted Bands	Remark
Hori	3478.442	PK	46.4	29.0	2.7	31.9	0.0	46.2	68.2	22.0	Outside	
Hori	10440.000	PK	49.4	39.4	-2.1	33.6	0.0	53.1	68.2	15.1	Outside	
Hori	15660.000	PK	43.0	39.0	-0.3	32.5	0.0	49.2	73.9	24.7	Inside	
Hori	15660.000	AV	34.8	39.0	-0.3	32.5	0.6	41.6	53.9	12.4	Inside	
Vert	3478.442	PK	45.0	29.0	2.7	31.9	0.0	44.8	68.2	23.4	Outside	
Vert	10440.000	PK	48.8	39.4	-2.1	33.6	0.0	52.5	68.2	15.7	Outside	
Vert	15660.000	PK	43.3	39.0	-0.3	32.5	0.0	49.5	73.9	24.4	Inside	
Vert	15660.000	AV	34.8	39.0	-0.3	32.5	0.6	41.6	53.9	12.4	Inside	

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

*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: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

UL Japan, Inc. Head Office EMC Lab.
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Test place	Head Office EMC Lab. No.3 and 4 Anechoic Chamber		
Report No.	33LE0037-HO		
Date	08/05/2013	08/06/2013	08/07/2013
Temperature/ Humidity	22deg. C / 60%	23deg. C / 56%	23deg. C / 58%
Engineer	Takumi Shimada	Takumi Shimada	Takumi Shimada
	(1-10GHz)	(10-18GHz)	(18-40GHz)
Mode	11n-20(MIMO) Tx 5240MHz		

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]	Inside or Outside of Restricted Bands	Remark
Hori	3493.351	PK	48.7	29.0	2.8	31.9	0.0	48.6	68.2	19.6	Outside	
Hori	5350.000	PK	44.0	31.5	3.4	31.4	0.0	47.5	68.2	20.7	Bandedge	
Hori	10480.000	PK	49.9	39.5	-2.0	33.6	0.0	53.8	68.2	14.4	Outside	
Hori	15720.000	PK	44.2	38.7	-0.3	32.5	0.0	50.1	73.9	23.8	Inside	
Hori	5350.000	AV	35.4	31.5	3.4	31.4	0.6	39.5	53.9	14.5	Bandedge	
Hori	15720.000	AV	35.0	38.7	-0.3	32.5	0.6	41.5	53.9	12.5	Inside	
Vert	3493.351	PK	46.2	29.0	2.8	31.9	0.0	46.1	68.2	22.1	Outside	
Vert	5350.000	PK	42.7	31.5	3.4	31.4	0.0	46.2	68.2	22.0	Bandedge	
Vert	10480.000	PK	50.1	39.5	-2.0	33.6	0.0	54.0	68.2	14.2	Outside	
Vert	15720.000	PK	44.8	38.7	-0.3	32.5	0.0	50.7	73.9	23.2	Inside	
Vert	5350.000	AV	33.4	31.5	3.4	31.4	0.6	37.5	53.9	16.5	Bandedge	
Vert	15720.000	AV	34.8	38.7	-0.3	32.5	0.6	41.3	53.9	12.7	Inside	

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

*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: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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9.3. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)

Test place	Head Office EMC Lab. No.3 Anechoic Chamber
Report No.	33LE0037-HO
Date	08/08/2013
Temperature/ Humidity	24deg. C / 56%
Engineer	Takumi Shimada
	(30-1000MHz)

HORIZONTAL AND VERTICAL DATA

SISO Antenna0

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	160.000	QP	33.7	15.4	8.7	32.1	25.7	43.5	17.8	
Hori	174.369	QP	32.0	15.9	8.8	32.1	24.6	43.5	18.9	
Vert	166.270	QP	27.8	15.6	8.8	32.1	20.1	43.5	23.4	
Vert	174.369	QP	27.0	15.9	8.8	32.1	19.6	43.5	23.9	

SISO Antenna1

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	160.000	QP	33.9	15.4	8.7	32.1	25.9	43.5	17.6	
Hori	174.372	QP	32.1	15.9	8.8	32.1	24.7	43.5	18.8	
Vert	166.273	QP	27.4	15.6	8.8	32.1	19.7	43.5	23.8	
Vert	174.372	QP	26.8	15.9	8.8	32.1	19.4	43.5	24.1	

MIMO Antenna0+1

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	160.000	QP	33.7	15.4	8.7	32.1	25.7	43.5	17.8	
Hori	174.370	QP	32.0	15.9	8.8	32.1	24.6	43.5	18.9	
Vert	166.271	QP	27.4	15.6	8.8	32.1	19.7	43.5	23.8	
Vert	174.370	QP	26.7	15.9	8.8	32.1	19.3	43.5	24.2	

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