



FCC CFR47 PART 15 SUBPART C

**BLUETOOTH LOW ENERGY
CERTIFICATION TEST REPORT**

FOR

10.1" TABLET WITH LTE/CELLULAR AND WLAN RADIO WITH BLUETOOTH

MODEL NUMBER: TP00043A

FCC ID: PU5-TP00043ASF

REPORT NUMBER: 12U14463

ISSUE DATE: 2012-10-11

Prepared for
WISTRON CORPORATION
21F, 88, SEC. 1, HSIN TAI WU RD., HSICHIH
TAIPEI HSIEN 221,
TAIWAN
R.O.C

Prepared by
UL LLC
1285 WALT WHITMAN RD
MELVILLE, NY 11747, U.S.A.
TEL: (631) 271-6200
FAX: (877) 854-3577



NVLAP LAB CODE 100255-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/11/12	Initial Issue	M. Antola

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	4
2. TEST METHODOLOGY	5
3. FACILITIES AND ACCREDITATION	5
4. CALIBRATION AND UNCERTAINTY	5
4.1. MEASURING INSTRUMENT CALIBRATION	5
4.2. SAMPLE CALCULATION	5
4.3. MEASUREMENT UNCERTAINTY	5
5. EQUIPMENT UNDER TEST	6
5.1. DESCRIPTION OF EUT	6
5.2. MAXIMUM OUTPUT POWER.....	6
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	6
5.4. SOFTWARE AND FIRMWARE.....	6
5.5. WORST-CASE CONFIGURATION AND MODE.....	7
5.6. DESCRIPTION OF TEST SETUP.....	7
6. TEST AND MEASUREMENT EQUIPMENT	9
7. RADIATED TEST RESULTS.....	11
7.1. LIMITS AND PROCEDURE	11
7.2. TRANSMITTER ABOVE 1 GHz	12
7.2.1. TX ABOVE 1 GHz FOR BLUETOOTH LOW ENERGY MODE IN THE 2.4 GHz BAND 12	
7.3. WORST-CASE BELOW 1 GHz.....	17
8. AC POWER LINE CONDUCTED EMISSIONS	19
9. SETUP PHOTOS.....	23

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: WISTRON CORPORATION
21F, 88, SEC. 1, HSIN TAI WU RD., HSICHIH
TAIPEI HSIEN 221, TAIWAN R.O.C

EUT DESCRIPTION: 10.1" TABLET WITH LTE/CELLULAR AND WLAN RADIO WITH
BLUETOOTH

MODEL: TP00043ASF

SERIAL NUMBER: NON-SERIALIZED PROTOTYPE

DATE TESTED: 2012-10-01 to 2012-10-04

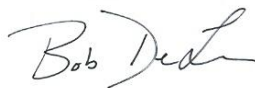
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

UL LLC 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 LLC 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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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 LLC By:

Tested By:



Bob DeLisi
WiSE Principle Engineer
UL LLC

Mike Antola
WiSE Project Lead
UL LLC

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 1285 Walt Whitman Rd. Melville, NY 11747, USA.

UL Melville is accredited by NVLAP, Laboratory Code 100255-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/1002550.htm>.

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:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamplifier Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	± 3.3 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.00 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a transceiver which utilizes 802.11abgn 1x1 + BT4.0.

The radio module is manufactured by Broadcom, model BCM94330LGA.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
2402	4.33	2.71
2440	5.67	3.69
2480	5.55	3.59

Note: Output power measurements are peak power measurements and used to confirm the device was operating within expected tolerances (+/- 0.5dB) of the power during original tests

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna, with a maximum gain of 1.88 dBi in the 2.4GHz band and 0.17 dBi in the 5GHz band.

Wistron NeWeb Corporation

Main Antenna : 25.90ADN.001 PIFA Antenna Gain: 1.88

Aux Antenna : 25.90ADP.001 PIFA Antenna Gain: 0.17

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom version 5.93.97.48.

The test utility software used during testing was Broadcom BT test mode tool, Win8DUTApp utility.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission was performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

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

Based on the measured conducted power, the worst-case payload was:

All 0 Bits

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Headphone	---	---	---	---
Mouse	Dell	M-UK	---	---

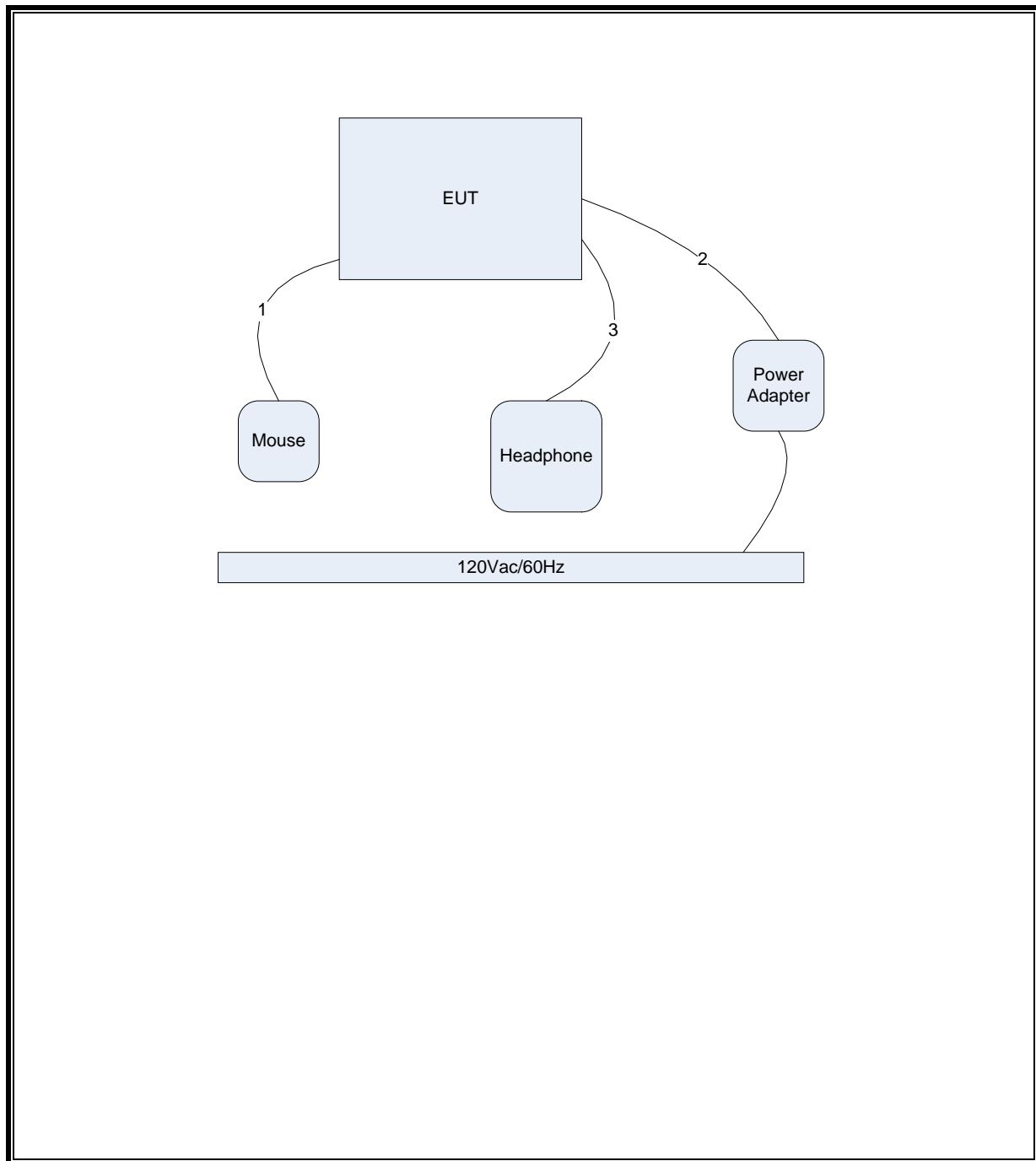
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	USB	USB	<3M	
2	Micro-USB	1	USB	USB	<3M	
3	Headphone	1	Phono	Phono	<3M	

TEST SETUP

The EUT is a stand-alone device. Test software exercised the radio module.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

Radiated Emissions					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
30-1000MHz					
EMI Receiver	Rohde & Schwarz	ESIB26	ME5B-081	2012-01-30	2013-01-30
Bicon Antenna	Schaffner	VBA6106A	54	2012-04-10	2013-04-10
Log-P Antenna	Schaffner	UPA6109	44067	2012-05-16	2013-05-16
Switch Driver	HP	11713A	ME7A-627	N/A	N/A
System Controller	Sunol Sciences	SC99V	44396	N/A	N/A
Camera Controller	Panasonic	WV-CU254	44395	N/A	N/A
RF Switch Box	UL	1	44398	N/A	N/A
Measurement Software	UL	Version 9.5	44740	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2010-12-07	2012-12-07
Multimeter	Fluke	83III	ME5B-305	2012-02-01	2013-02-28
Above 1GHz (Band Optimized System)					
EMI Receiver	Rohde & Schwarz	ESIB40	34968	2012-03-06	2013-03-06
Horn Antenna (1-2 GHz)	ETS	3161-01	51442	2008-03-28	See * below
Horn Antenna (2-4 GHz)	ETS	3161-02	48107	2007-09-27	See * below
Horn Antenna (4-8 GHz)	ETS	3161-03	48106	2007-09-27	See * below
Horn Antenna (8-12 GHz)	ETS	3160-07	8933	2008-11-24	See * below
Horn Antenna (12-18 GHz)	ETS	3160-08	8932	2007-09-27	See * below
Horn Antenna (18-26.5 GHz)	ETS	3160-09	8947	2007-09-26	See * below
Signal Path Controller	HP	11713A	50250	N/A	N/A
Gain Controller	HP	11713A	50251	N/A	N/A
RF Switch / Preamp Fixture	UL	BOMS1	50249	N/A	N/A
System Controller	UL	BOMS2	50252	N/A	N/A
Measurement Software	UL	Version 9.5	44740	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2010-12-07	2012-12-07
Multimeter	Fluke	83III	ME5B-305	2012-02-01	2013-02-28
<p>* - Note: As allowed by the calibration standard ANSI C63.4 Section 4.4.2, standard gain horns need only a one-time calibration. Only if physical damage occurs will the horn antenna require re-calibration.</p> <p>* Gain standard horn antennas (sometimes called standard gain horn antennas) need not be calibrated beyond that which is provided by the manufacturer unless they are damaged or deterioration is suspected, or they are used at a distance closer than $2D^2/\lambda$. Gain standard horn antennas have gains that are fixed by their dimensions and dimensional tolerances.</p>					

Conducted Emissions					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Conducted Emissions – GP 1					
EMI Receiver	Rohde & Schwarz	ESCI 7	75141	2012-01-05	2013-01-05
LISN	Solar	9252-50-R-24-BNC	ME5A-636	2012-02-03	2013-02-28
Switch Driver	HP	11713A	44397	N/A	N/A
RF Switch Box	UL	4	44404	N/A	N/A
Measurement Software	UL	Version 9.5	44736	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43734	2012-03-13	2014-03-13
Multimeter	Fluke	83III	ME5B-305	2012-02-01	2013-02-28

7. RADIATED TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

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. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

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, then the video bandwidth is set to 1 MHz for peak measurements and 1 kHz* for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

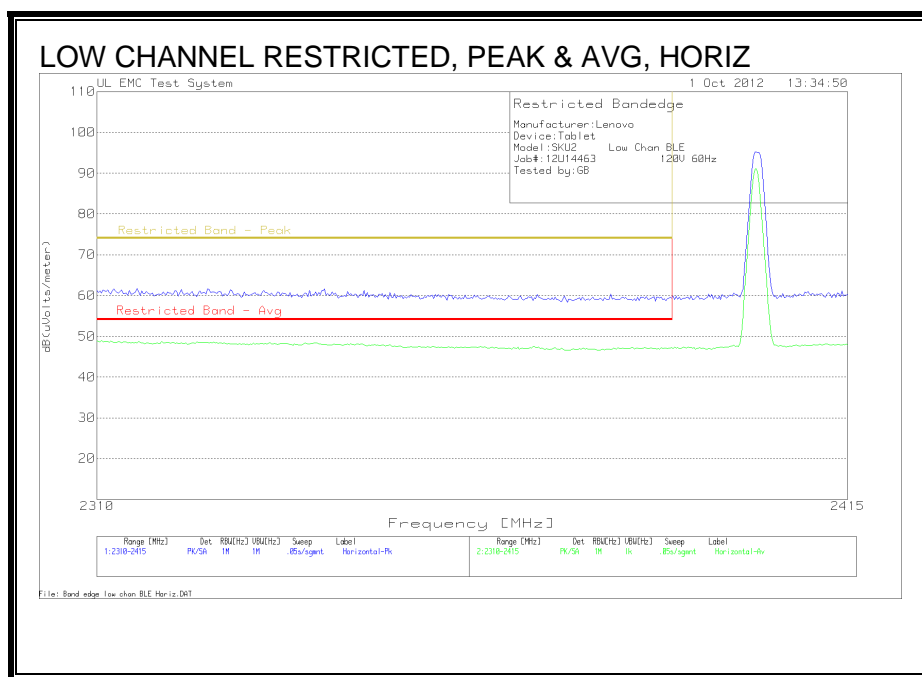
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

*- Based on the measured duty cycle of the product.

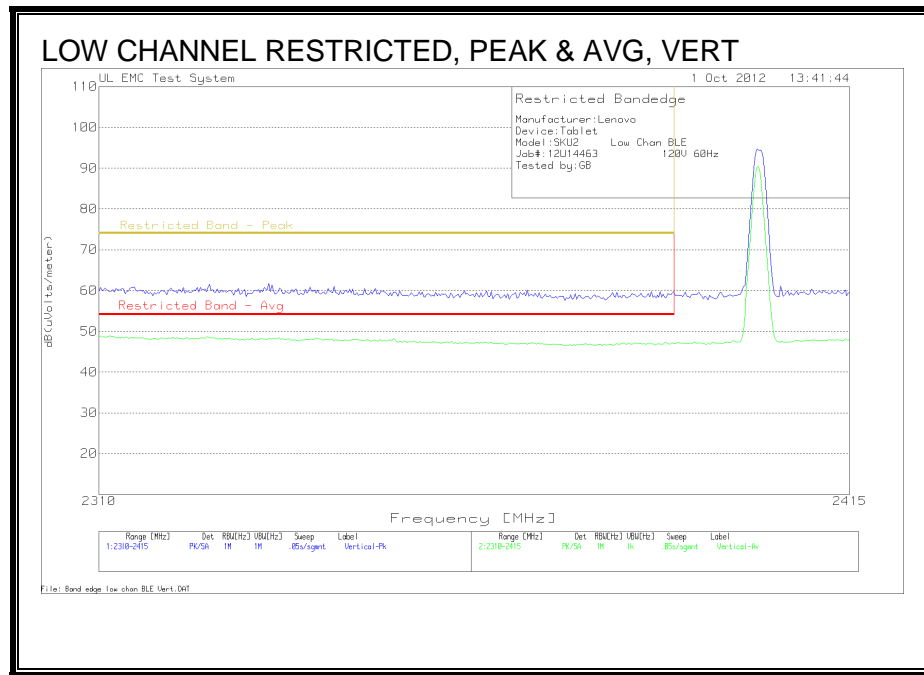
7.2. TRANSMITTER ABOVE 1 GHz

7.2.1. TX ABOVE 1 GHz FOR BLUETOOTH LOW ENERGY MODE IN THE 2.4 GHz BAND

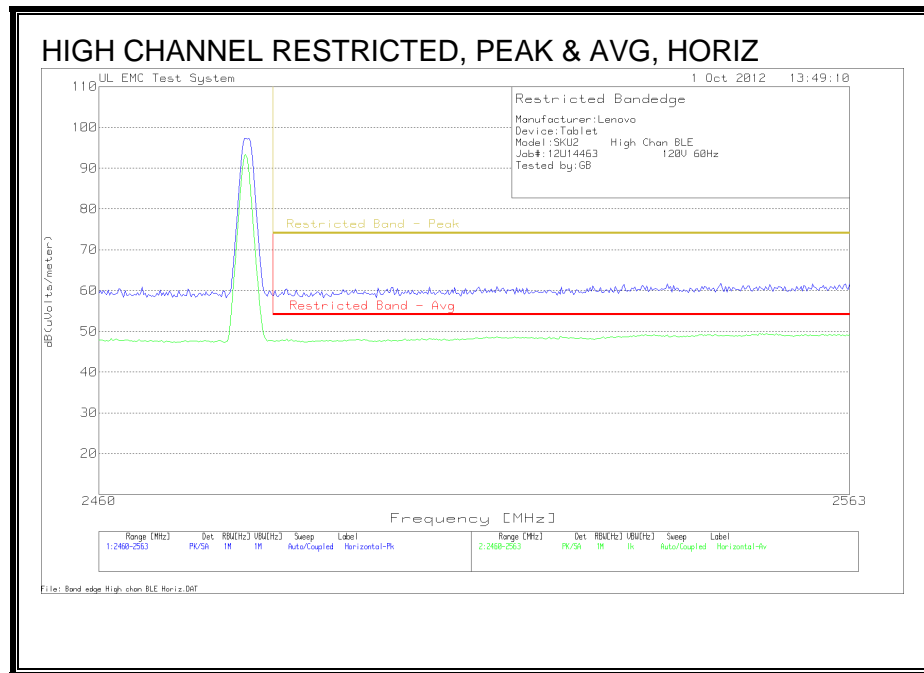
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



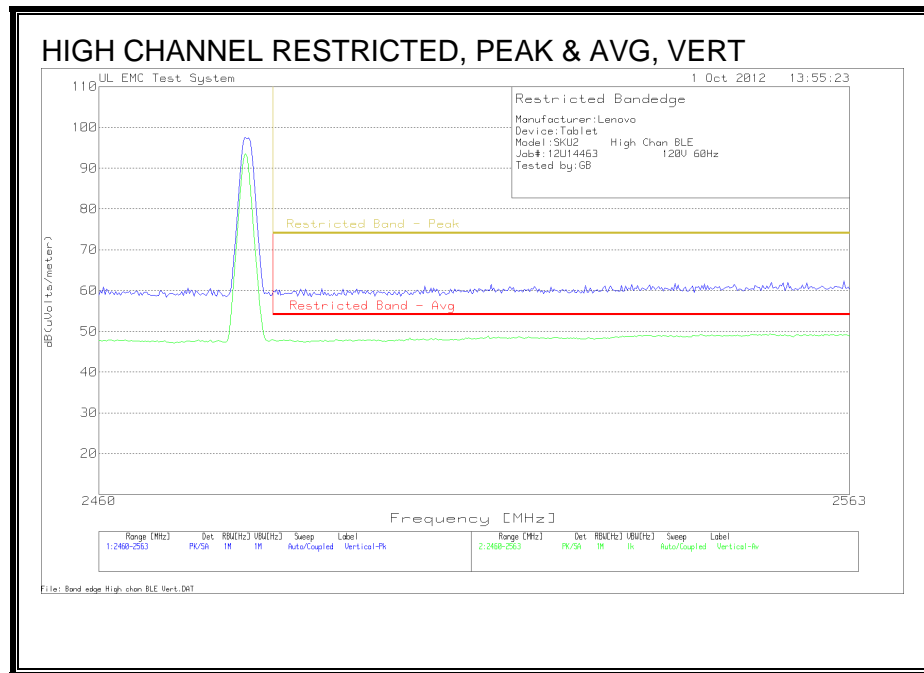
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)

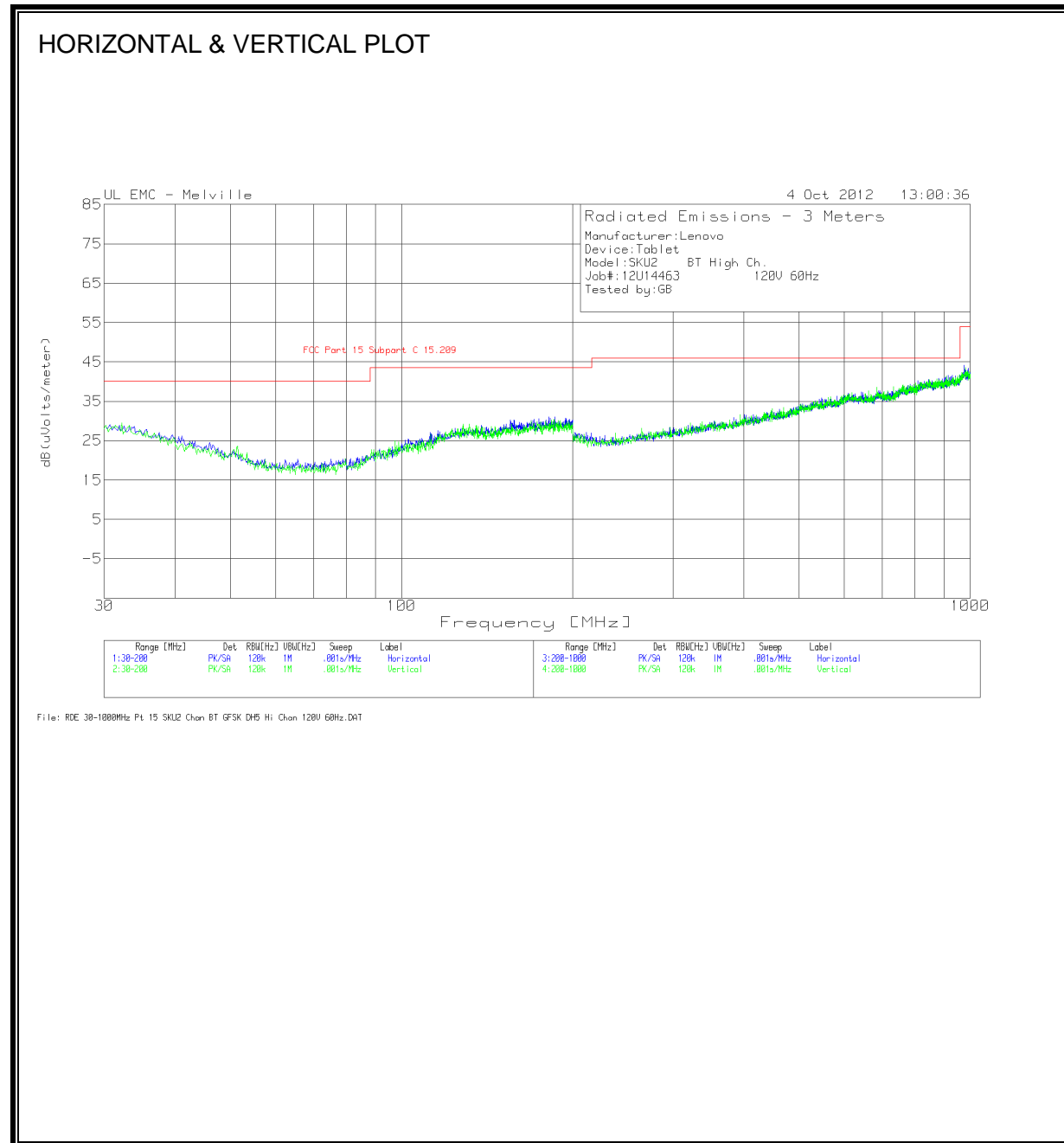


HARMONICS AND SPURIOUS EMISSIONS

Manufacturer:Lenovo											
Device:Tablet											
Model:SKU2 BLE Mode											
Job#:12U14463 120V 60Hz											
Tested by:GB											
Low Channel - 2402MHz											
Test Frequency	Meter Reading	Detector	AF-48106 [dB]	BOMS Factor [dB]	dB(uVolts/meter)	FCC Part 15 Subpart C 15.209	Margin	FCC Part 15 Subpart C Peak	Margin	Azimuth [Degs]	Height [cm] Polarity
4803.7395	63.06	PK	27.1	-52.7	37.46	54	-16.54	74	-36.54	301	249 Vert
4803.7395	62.26	PK	27.1	-52.7	36.66	54	-17.34	74	-37.34	252	202 Horz
Mid Channel - 2440MHz											
Test Frequency	Meter Reading	Detector	AF-48106 [dB]	BOMS Factor [dB]	dB(uVolts/meter)	FCC Part 15 Subpart C 15.209	Margin	FCC Part 15 Subpart C Peak	Margin	Azimuth [Degs]	Height [cm] Polarity
4879.5992	62.27	PK	27.2	-52.5	36.97	54	-17.03	74	-37.03	263	205 Horz
4879.5992	64.35	PK	27.2	-52.5	39.05	54	-14.95	74	-34.95	38	231 Vert
High Channel - 2480MHz											
Test Frequency	Meter Reading	Detector	AF-48106 [dB]	BOMS Factor [dB]	dB(uVolts/meter)	FCC Part 15 Subpart C 15.209	Margin	FCC Part 15 Subpart C Peak	Margin	Azimuth [Degs]	Height [cm] Polarity
4959.5741	64.9	PK	27.3	-52.36	39.84	54	-14.16	74	-34.16	109	187 Horz
4959.5741	64.92	PK	27.3	-52.36	39.86	54	-14.14	74	-34.14	35	267 Vert
PK - Peak detector (Maximized)											
Note: No other emissions detected above the system noise floor.											

7.3. WORST-CASE BELOW 1 GHz

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



HORIZONTAL & VERTICAL DATA

Manufacturer:Lenovo										
Device:Tablet										
Model:SKU2 BT High Ch.										
Job#:12U14463 120V 60Hz										
Tested by:GB										
Horizontal 30 - 200MHz										
Test Frequency	Meter Reading	Detector	AF-54 (dB)	GL-3M (dB)	dB(uVolts/meter)	FCC Part 15 Subpart C 15.209	Margin	Azimuth [Degs]	Height [cm]	Polarity
31.8719	11.45	PK	16.9	0.5	28.85	40	-11.15	0	100	Horz
Vertical 30 - 200MHz										
Test Frequency	Meter Reading	Detector	AF-54 (dB)	GL-3M (dB)	dB(uVolts/meter)	FCC Part 15 Subpart C 15.209	Margin	Azimuth [Degs]	Height [cm]	Polarity
32.2122	12.24	PK	16.8	0.5	29.54	40	-10.46	255	100	Vert
Horizontal 200 - 1000MHz										
Test Frequency	Meter Reading	Detector	AF-44067 (dB)	GL-3M (dB)	dB(uVolts/meter)	FCC Part 15 Subpart C 15.209	Margin	Azimuth [Degs]	Height [cm]	Polarity
914.3572	15.23	PK	22.8	3.5	41.53	46	-4.47	180	300	Horz
931.1656	14.91	PK	23.1	3.5	41.51	46	-4.49	29	100	Horz
Vertical 200 - 1000MHz										
Test Frequency	Meter Reading	Detector	AF-44067 (dB)	GL-3M (dB)	dB(uVolts/meter)	FCC Part 15 Subpart C 15.209	Margin	Azimuth [Degs]	Height [cm]	Polarity
907.954	15.06	PK	22.8	3.5	41.36	46	-4.64	330	200	Vert
957.5788	14.85	PK	23.3	3.6	41.75	46	-4.25	57	100	Vert
Horizontal 200 - 1000MHz										
Test Frequency	Meter Reading	Detector	AF-44067 (dB)	GL-3M (dB)	dB(uVolts/meter)	FCC Part 15 Subpart C 15.209	Margin	Azimuth [Degs]	Height [cm]	Polarity
931.155	8.94	QP	23.1	3.5	35.54	46	-10.46	280	318	Horz
914.354	8.84	QP	22.8	3.5	35.14	46	-10.86	179	291	Horz
Vertical 200 - 1000MHz										
Test Frequency	Meter Reading	Detector	AF-44067 (dB)	GL-3M (dB)	dB(uVolts/meter)	FCC Part 15 Subpart C 15.209	Margin	Azimuth [Degs]	Height [cm]	Polarity
907.954	8.78	QP	22.8	3.5	35.08	46	-10.92	24	153	Vert
957.578	9.04	QP	23.3	3.6	35.94	46	-10.06	283	330	Vert
PK - Peak detector										
QP - Quasi-Peak detector										

8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

^{*} Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

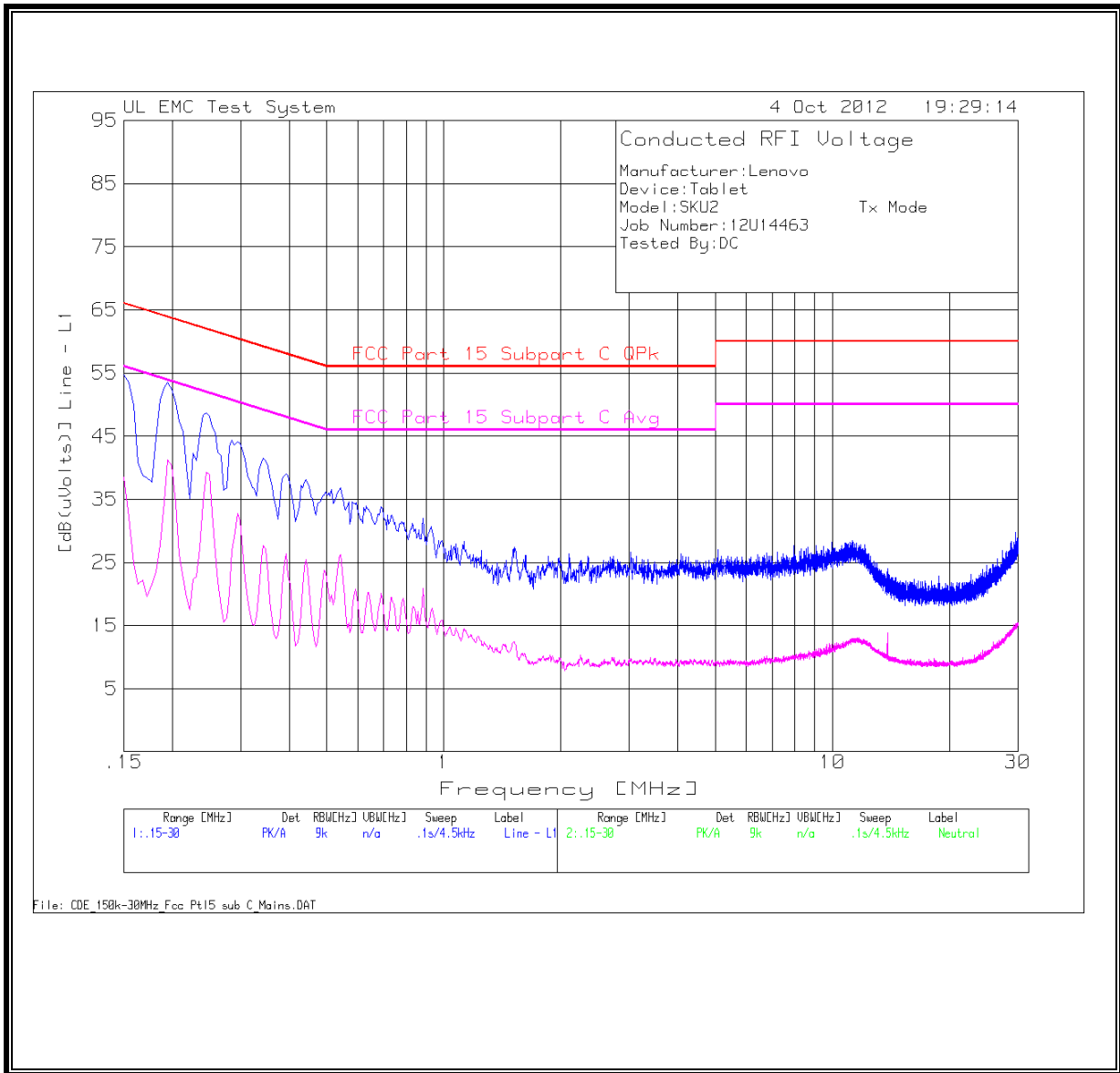
Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

6 WORST EMISSIONS

Manufacturer:Lenovo								
Device:Tablet								
Model:SKU2 Tx Mode								
Job Number:12U14463								
Tested By:DC								
Line - L1 .15 - 30MHz								
Test Frequency	Meter Reading	Detector	LISN 5A636 L1 [dB]	[dB(uVolts)]	FCC Part 15 Subpart C QPk	Margin	FCC Part 15 Subpart C Avg	Margin
0.1545	43.42	PK	10.1	53.52	65.8	-12.28	55.8	-2.28
0.1545	22.07	Av	10.1	32.17	65.8	-33.63	55.8	-23.63
0.195	43.38	PK	10.1	53.48	63.8	-10.32	53.8	-0.32
0.195	31.13	Av	10.1	41.23	63.8	-22.57	53.8	-12.57
0.249	38.09	PK	10.1	48.19	61.8	-13.61	51.8	-3.61
0.249	28.73	Av	10.1	38.83	61.8	-22.97	51.8	-12.97
0.294	34.06	PK	10.1	44.16	60.4	-16.24	50.4	-6.24
0.294	22.69	Av	10.1	32.79	60.4	-27.61	50.4	-17.61
0.3435	31.48	PK	10	41.48	59.1	-17.62	49.1	-7.62
0.3435	17.73	Av	10	27.73	59.1	-31.37	49.1	-21.37
0.4425	28.01	PK	10.1	38.11	57	-18.89	47	-8.89
0.4425	15.4	Av	10.1	25.5	57	-31.5	47	-21.5
Neutral .15 - 30MHz								
Test Frequency	Meter Reading	Detector	LISN 5A636 L2 [dB]	[dB(uVolts)]	FCC Part 15 Subpart C QPk	Margin	FCC Part 15 Subpart C Avg	Margin
0.1725	52.14	PK	10.1	62.24	64.8	-2.56	54.8	7.44
0.1725	30.38	Av	10.1	40.48	64.8	-24.32	54.8	-14.32
0.1815	49.52	PK	10.1	59.62	64.4	-4.78	54.4	5.22
0.1815	23.09	Av	10.1	33.19	64.4	-31.21	54.4	-21.21
0.2355	45.9	PK	10.1	56	62.3	-6.3	52.3	3.7
0.2355	22.55	Av	10.1	32.65	62.3	-29.65	52.3	-19.65
0.267	42.49	PK	10.1	52.59	61.2	-8.61	51.2	1.39
0.267	21.69	Av	10.1	31.79	61.2	-29.41	51.2	-19.41
0.3345	38.59	PK	10.1	48.69	59.3	-10.61	49.3	-0.61
0.3345	18.83	Av	10.1	28.93	59.3	-30.37	49.3	-20.37
0.501	33.53	PK	10.1	43.63	56	-12.37	46	-2.37
0.501	17	Av	10.1	27.1	56	-28.9	46	-18.9
Neutral .15 - 30MHz								
Test Frequency	Meter Reading	Detector	LISN 5A636 L2 [dB]	[dB(uVolts)]	FCC Part 15 Subpart C QPk	Margin	FCC Part 15 Subpart C Avg	Margin
0.168	37.49	QP	10.1	47.59	65.06	-17.47	55.06	-7.47
0.186	24.36	QP	10.1	34.46	64.21	-29.75	54.21	-19.75
0.231	25.21	QP	10.1	35.31	62.41	-27.1	52.41	-17.1
PK - Peak detector								
QP - Quasi-Peak detector								
Av - Average detector								

LINE 1 RESULTS



LINE 2 RESULTS

