RADIATED SPURIOUS EMISSIONS PORTIONS OF FCC CFR47 PART 22H & 24E INDUSTRY CANADA RSS-132 ISSUE 2 INDUSTRY CANADA RSS-133 ISSUE 5

CERTIFICATION TEST REPORT

FOR

LENOVO TABLET PC WITH GSM

MODEL NUMBER: TP00043AEF

FCC ID: PU5-TP00043AEF

IC: 4182A-TP00043AEF

REPORT NUMBER: 12U14468-1C

ISSUE DATE: October 29, 2012

Prepared for

WISTRON CORPORATION
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TAIPEI HSIEN 221,
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Revision History

Rev.	Issue Date	Revisions	Revised By
---	08/08/12	Initial Issue	M.Ferrer
A	09/07/12	Revised FCC and IC numbers	M.Ferrer
B	09/14/12	WCDMA data removed	M.Ferrer
C	10/29/12	Updated section 5.2	M.Ferrer

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: Lenovo Tablet PC with GSM

MODEL NUMBER: TP00043AEF

SERIAL NUMBER: Prototype

DATE TESTED: July 31, 2012 – August 2, 2012

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 22H & 24E	Pass
IC RSS132 AND IC RSS133	Pass

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

BART MUCHA
Staff Engineer
UL

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SENIOR PROJECT ENGINEER
UL

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA-603-C, FCC CFR 47 Part 2, FCC CFR 47 Part 22, FCC CFR Part 24, RSS-132 Issue 2, and RSS-133 Issue 5.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 333 Pfingsten Road, Northbrook, IL 60193, USA.

UL NBK is accredited by NVLAP, Laboratory Code 100414-0

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

Sample Calculations
Radiated Field Strength and Conducted Emissions data contained within this report is calculated on the following basis:

Field Strength (dBuV/m) = Meter Reading (dBuV) + AF (dB/m) - Gain (dB) + Cable Loss (dB)
Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable Loss (dB) + LISN IL (dB)
Conducted Current (dBuA) = Meter Reading (dBuV) + Cable Loss (dB) - Transducer Factor (dBohms)

ERP EUT level = Delta EUT and Substitution + ERP level
ERIP EUT level = Delta EUT and Substitution + ERIP level
Delta EUT and Substitution = Substitution Peak field –EUT Measured peak level
ERP Substitution = ERIP level +2.15
ERIP level = Voltage at Antenna + TX ant gain

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	+/- 0.3 dB (k=2)
Radiated Disturbance, 30 to 1000 MHz	+/- 3.17 dB (k=2)

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a tablet PC with GSM

WWAN Card Ericson C5621

5.2. MAXIMUM ERP/ERIP POWER

The transmitter has a maximum ERP/ERIP output powers as follows:

Part 22 Cellular Band

Frequency range (MHz)	Modulation	ERP	
		dBm	mW
824.2 – 848.8	GPRS	31.76	1498.99
	EGPRS	29.60	911.59

Part 24 PCS Band

Frequency range (MHz)	Modulation	ERIP	
		dBm	mW
1850.2-1909.8	GPRS	28.68	738.58
	EGPRS	28.12	649.23

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an integral antenna for the 850MHz and 1900MHz bands with a maximum peak gain as follow:

BANDS	Peak Gain (dBi)
GSM, CELL, 850MHz	-3.79
GSM,PCS, 1900MHz	-0.48
UMTS, 850MHz	-3.79
UMTS, 1900MHZ	-0.48

5.4. SOFTWARE AND FIRMWARE

The EUT is linked with Anritsu MT8820C Communication Test Set.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel for RF radiated emissions below 1GHz and AC conducted emissions are determined as the channel with the AC Power Adapter Source

Based on the investigation results, the highest peak power and enhanced data rate is the worst-case scenario for all measurements.

Worst-case modes below:

- For Cellular and PCS band: GPRS and EGPRS

For the fundamental investigation, since the EUT is a portable device that has three orientations; therefore X, Y and Z orientations have been investigated. The worst case was found to be at Tablet configuration X-position for all modes in cell band, Tablet configuration Z-position on PCS bands for GPRS, EGPRS modes.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT (RF RADIATED TEST)

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Asset	Cal Due
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20121231
Bicon Antenna	Chase	VBA6106A	EMC4078	20130131
Log-P Antenna	Chase	UPA6105	EMC4255	20120928
Log-P Antenna (TX)	Chase	UPA6109	EMC4313	20120731
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182	20121231
Antenna Array	UL	BOMS	EMC4276	20121231
Signal Generator	Rohde & Schwarz	SML 03	EMC 4331	20121231
Signal Generator	Agilent	E8251A	EMC4243	20121231
Call Box	Anritsu	MT8820C	EMC4361	20130910

I/O CABLES (RF RADIATED TEST)

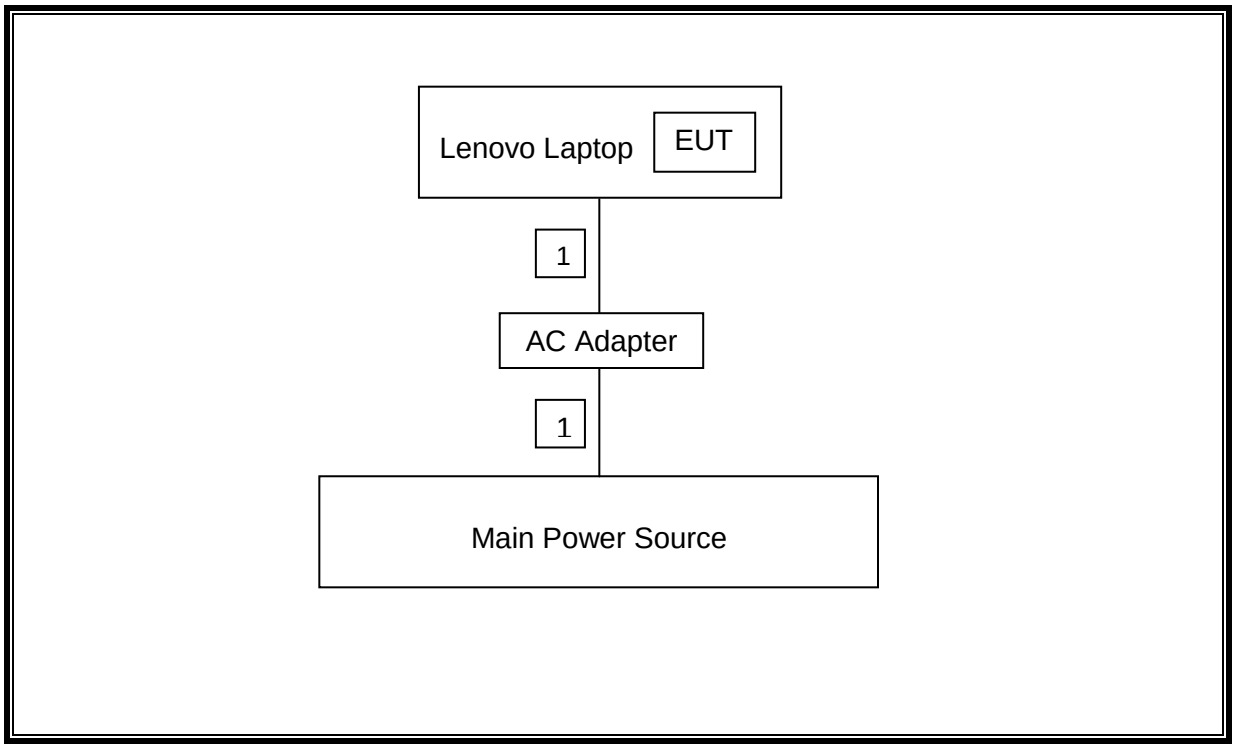
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	DC	1	DC	Un-shielded	8 ft	AC adapter

TEST SETUP

The EUT is a stand-alone device. A link is established between the EUT and the communication test set

Call Box was set for tablet to transmit at highest level possible.

SETUP DIAGRAM FOR RF RADIATED TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20121231
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Call Box	Anritsu	MT8820C	EMC4361	20130910

7. RADIATED TEST RESULTS

7.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913, §24.232
RSS132 & RSS133

LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

TEST PROCEDURE

ANSI / TIA / EIA 603C Clause 2.2.17

MODES TESTED

- GPRS and EGPRS

RESULTS

In the table of results the Voltage at the antenna includes signal generator level and cable loss

EUT level will be EUT measured level – Substitution measured +ERP Level (or EIRP level)

ERP CELL BANDS

Mode	Channel	f (MHz)	ERP	
			dBm	mW
GPRS	128	824.20	28.86	769.84
	190	836.60	31.19	1315.22
	251	848.80	31.76	1498.99
EGRS	128	824.20	26.77	475.38
	190	836.60	28.44	698.23
	251	848.80	29.60	911.59

EIRP PCS BANDS

EUT	Channel	f (MHz)	EIRP	
			dBm	mW
GPRS	512	1850.20	27.95	623.92
	661	1880.00	28.68	738.58
	810	1909.80	27.10	512.39
EGPRS	512	1850.20	27.53	566.41
	661	1880.00	28.12	649.23
	810	1909.80	26.82	480.40

GPRS (Cellular Band)

Description	Freq. MHz	Polarization	Voltage at anntena dBm	Substitution Peak Filed Strenght Measured dBuV/m	TX ant dBi	EIRP Level	ERP Level dBm	EUT Measured Peak Level dBuV/m	Delta EUT and Substitution dB	ERP EUT Level dBm	Limit dBm/MHz	Margin dB
GPRS Slot 1												
Low	824.2	Horizontal	-51.38	54.83	5.584	-45.796	-43.646	127.15	72.32	28.674	38.45	-9.776
		Vertical	-51.38	53.07	5.284	-46.096	-43.946	123.76	70.69	26.744	38.45	-11.706
Mid	836.6	Horizontal	-51.42	54.28	5.5	-45.92	-43.77	129.24	74.96	31.19	38.45	-7.26
		Vertical	-51.42	53.78	5.334	-46.086	-43.936	124.63	70.85	26.914	38.45	-11.536
Hi	848.8	Horizontal	-51.43	54.55	5.588	-45.842	-43.692	130	75.45	31.758	38.45	-6.692
		Vertical	-51.43	53.02	5.476	-45.954	-43.804	124.96	71.94	28.136	38.45	-10.314
GPRS Slot 2												
Low	824.2	Horizontal	-51.38	54.83	5.584	-45.796	-43.646	127.34	72.51	28.864	38.45	-9.586
		Vertical	-51.38	53.07	5.284	-46.096	-43.946	123.39	70.32	26.374	38.45	-12.076
Mid	836.6	Horizontal	-51.42	54.28	5.5	-45.92	-43.77	128.47	74.19	30.42	38.45	-8.03
		Vertical	-51.42	53.78	5.334	-46.086	-43.936	123.94	70.16	26.224	38.45	-12.226
Hi	848.8	Horizontal	-51.43	54.55	5.588	-45.842	-43.692	129.62	75.07	31.378	38.45	-7.072
		Vertical	-51.43	53.02	5.476	-45.954	-43.804	124.84	71.82	28.016	38.45	-10.434

EGPRS (Cellular Band)

Description	Freq. MHz	Polarization	Voltage at anntena dBm	Substitution Peak Filed Strenght Measured dBuV/m	TX ant dBi	EIRP Level	ERP Level dBm	EUT Measured Peak Level dBuV/m	Delta EUT and Substitution dB	ERP EUT Level dBm	Limit dBm/MHz	Margin dB
EGPRS Slot 1												
Low	824.2	Horizontal	-51.38	54.83	5.584	-45.796	-43.646	125.14	70.31	26.664	38.45	-11.786
		Vertical	-51.38	53.07	5.284	-46.096	-43.946	121.62	68.55	24.604	38.45	-13.846
Mid	836.6	Horizontal	-51.42	54.28	5.5	-45.92	-43.77	126.49	72.21	28.44	38.45	-10.01
		Vertical	-51.42	53.78	5.334	-46.086	-43.936	122.4	68.62	24.684	38.45	-13.766
Hi	848.8	Horizontal	-51.43	54.55	5.588	-45.842	-43.692	127.84	73.29	29.598	38.45	-8.852
		Vertical	-51.43	53.02	5.476	-45.954	-43.804	122.99	69.97	26.166	38.45	-12.284
EGPRS Slot 2												
Low	824.2	Horizontal	-51.38	54.83	5.7004	-45.68	-43.53	125.13	70.3	26.7704	38.45	-11.6796
		Vertical	-51.38	53.07	5.7148	-45.665	-43.515	121.61	68.54	25.0248	38.45	-13.4252
Mid	836.6	Horizontal	-51.42	54.28	5.713	-45.707	-43.557	126.44	72.16	28.603	38.45	-9.847
		Vertical	-51.42	53.78	5.6785	-45.742	-43.592	122.45	68.67	25.0785	38.45	-13.3715
Hi	848.8	Horizontal	-51.43	54.55	5.7256	-45.704	-43.554	127.63	73.08	29.5256	38.45	-8.9244
		Vertical	-51.43	53.02	5.6427	-45.787	-43.637	122.85	69.83	26.1927	38.45	-12.2573

GPRS (PCS Band)

Description	Freq. MHz	Polarization	Voltage at anntena dBm	Substitution Peak Filed Strenght Measured dBuV/m	TX ant dBi	EIRP Level	EUT Measured Peak Level dBuV/m	Delta EUT and Substitution dB	EIRP EUT Level dBm	Limit dBm/MHz	Margin dB
GPRS Slot 1											
Low	1850.2	Horizontal	-50.96	53.32	4.7313	-46.229	127.5	74.18	27.9513	33	-5.0487
		Vertical	-50.96	51.52	4.628	-46.332	118.98	67.46	21.128	33	-11.872
Mid	1880	Horizontal	-51.08	52.73	4.694	-46.386	127.8	75.07	28.684	33	-4.316
		Vertical	-51.08	50.56	4.4192	-46.661	120.74	70.18	23.5192	33	-9.4808
Hi	1909.8	Horizontal	-51.1	52.8	4.676	-46.424	126.32	73.52	27.096	33	-5.904
		Vertical	-51.1	51.02	4.332	-46.768	119.96	68.94	22.172	33	-10.828
GPRS Slot 2											
Low	1850.2	Horizontal	-50.96	53.32	4.7313	-46.229	127.33	74.01	27.7813	33	-5.2187
		Vertical	-50.96	51.52	4.628	-46.332	119.51	67.99	21.658	33	-11.342
Mid	1880	Horizontal	-51.08	52.73	4.694	-46.386	127.58	74.85	28.464	33	-4.536
		Vertical	-51.08	50.56	4.4192	-46.661	120.47	69.91	23.2492	33	-9.7508
Hi	1909.8	Horizontal	-51.1	52.8	4.676	-46.424	126.05	73.25	26.826	33	-6.174
		Vertical	-51.1	51.02	4.332	-46.768	119.82	68.8	22.032	33	-10.968

EGPRS (PCS Band)

Description	Freq. MHz	Polarization	Voltage at anntena dBm	Substitution Peak Filed Strenght Measured dBuV/m	TX ant dBi	EIRP Level	EUT Measured Peak Level dBuV/m	Delta EUT and Substitution dB	EIRP EUT Level dBm	Limit dBm/MHz	Margin dB
EGPRS Slot 1											
Low	1850.2	Horizontal	-50.96	53.32	4.7313	-46.229	127.08	73.76	27.5313	33	-5.4687
		Vertical	-50.96	51.52	4.628	-46.332	119.21	67.69	21.358	33	-11.642
Mid	1880	Horizontal	-51.08	52.73	4.694	-46.386	127.24	74.51	28.124	33	-4.876
		Vertical	-51.08	50.56	4.4192	-46.661	120.5	69.94	23.2792	33	-9.7208
Hi	1909.8	Horizontal	-51.1	52.8	4.676	-46.424	126.04	73.24	26.816	33	-6.184
		Vertical	-51.1	51.02	4.332	-46.768	119.46	68.44	21.672	33	-11.328
EGPRS Slot 2											
Low	1850.2	Horizontal	-50.96	53.32	4.7313	-46.229	126.8	73.48	27.2513	33	-5.7487
		Vertical	-50.96	51.52	4.628	-46.332	119.2	67.68	21.348	33	-11.652
Mid	1880	Horizontal	-51.08	52.73	4.694	-46.386	127.09	74.36	27.974	33	-5.026
		Vertical	-51.08	50.56	4.4192	-46.661	120.31	69.75	23.0892	33	-9.9108
Hi	1909.8	Horizontal	-51.1	52.8	4.676	-46.424	125.92	73.12	26.696	33	-6.304
		Vertical	-51.1	51.02	4.332	-46.768	119.53	68.51	21.742	33	-11.258

7.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238
IC: RSS-132, 4.5; RSS-133, 6.5

LIMIT

§22.917 (e) and §24.238 (a): Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB

TEST PROCEDURE

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

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For PCS equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

MODES TESTED:

- GPRS and EGPRS

RESULTS

The highest power for Channel and mode was used (GPRS Slot 2 Mid) to determine any harmonics above noise floor. All harmonics found have a minimum margin of 31 dB or more to the -13dBm limit. Measurements at more than one mode were considered not necessary. For Cell band no harmonics were found above the noise floor.

GPRS (PCS Band)

Description	Freq. MHz	Polarization	Voltage at anntena dBm	Substitution Peak Filed Strenght Measured dBuV/m	TX ant dBi	EIRP Level	EUT Measured Peak Level dBuV/m	Delta EUT and Substitution dB	EIRP EUT Level dBm	Limit dBm/MHz	Margin dB
GPRS Slot 1 Mid	1880										
3rd Harmonic	5640	Horizontal	-51.69	54.01	10.14	-41.546	45.97	-8.04	-49.5864	-13	-36.5864
		Vertical	-51.69	54.69	10.2	-41.489	47.35	-7.34	-48.8288	-13	-35.8288
4th Harmonic	7520	Horizontal	-52.17	52.5	11.91	-40.259	46.96	-5.54	-45.7992	-13	-32.7992
		Vertical	-52.17	54.03	11.95	-40.223	50.2	-3.83	-44.0528	-13	-31.0528