

Variant FCC RF Test Report

APPLICANT : Lenovo (Shanghai) Electronics
Technology Co., Ltd.
EQUIPMENT : Tablet PC IdeaTab A1000-F
BRAND NAME : lenovo
MODEL NAME : 60027
MARKETING NAME : IDEATAB A1000-F
FCC ID : O57A1000F
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

This is a variant report which is only valid together with the original test report. The product was received on May 03, 2013 and completely tested on May 11, 2013. We, SPORTON INTERNATIONAL (SHENZHEN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (SHENZHEN) INC., the test report shall not be reproduced except in full.



Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL (SHENZHEN) INC.

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SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(b)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 4.26 dB at 49.740 MHz
3.3	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

Lenovo (Shanghai) Electronics Technology Co., Ltd.
No. 68 Building, 199 Fenju Road, Wai Gao Qiao FTZ, Shanghai, China

1.2 Manufacturer

Lenovo PC HK Limited
23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Tablet PC IdeaTab A1000-F
Brand Name	lenovo
Model Name	60027
Marketing Name	IdeaTab A1000-F
FCC ID	O57A1000F
EUT supports Radios application	WLAN 11bgn / Bluetooth 2.1/3.0/4.0
HW Version	A3000_MB_PCB_V3.0
SW Version	A1000T_A412_01_07_130118_CN
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Maximum Output Power to Antenna	802.11b : 18.16 dBm (0.0655 W) 802.11g : 21.76 dBm (0.1500 W) 802.11n HT20 : 22.04 dBm (0.1600 W) 802.11n HT40 : 21.64 dBm (0.1459 W)
Antenna Type	802.11b/g/n : PIFA Antenna type with gain 1 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Site

Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.		
Test Site Location	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P.R.C. TEL: +86-755- 3320-2398		
Test Site No.	Sporton Site No.		FCC/IC Registration No.
	TH01-SZ	03CH01-SZ	831040/4086F-1

Note: The test site complies with ANSI C63.4 2003 requirement.

1.7 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01
- ANSI C63.10-2009

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conducted emission (150 KHz to 30 MHz) and radiated emission (9 KHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.

The final configuration from all the combinations and the worst-case data rates were investigated by measuring the maximum power across all the data rates and modulation modes under section 2.2.

Based on the worst configuration found above, the RF power setting is set individually to meet FCC compliance limit for the final conducted and radiated tests shown in section 2.3.

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		



2.2 Pre-Scanned RF Power

Preliminary tests were performed in different data rate as following table and the highest peak power data rates were chosen for full test in the following tables.

Channel	Frequency	802.11b RF Power (dBm)			
		DSSS Data Rate			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
CH 01	2412 MHz	17.82	17.76	17.67	17.69
CH 06	2437 MHz	17.97	18.01	17.7	18.03
CH 11	2462 MHz	18.16	18.13	17.81	17.94

Channel	Frequency	802.11g RF Power (dBm)							
		OFDM Data Rate							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
CH 01	2412 MHz	21.35	21.29	21.2	21.24	21.28	21.17	21.26	21.27
CH 06	2437 MHz	21.42	21.4	21.3	21.36	21.37	20.85	21.17	21.27
CH 11	2462 MHz	21.76	21.65	21.64	21.66	21.65	21.55	21.54	21.65

Channel	Frequency	2.4GHz 802.11n HT20 RF Power (dBm)							
		OFDM Data Rate							
		6.5 Mbps	13 Mbps	19.5 Mbps	26 Mbps	39 Mbps	52 Mbps	58.5 Mbps	65 Mbps
CH 01	2412 MHz	21.17	21.15	21.19	21.19	21.18	21.17	21.14	21.1
CH 06	2437 MHz	21.25	21.14	21.2	21.16	21.3	21.16	21.1	21.09
CH 11	2462 MHz	22.04	21.7	21.64	21.54	21.5	21.6	21.62	21.46

Channel	Frequency	2.4GHz 802.11n HT40 RF Power (dBm)							
		OFDM Data Rate							
		13.5 Mbps	27 Mbps	40.5 Mbps	54 Mbps	81 Mbps	108 Mbps	121.5 Mbps	135 Mbps
CH 03	2422 MHz	21.09	20.68	20.52	20.45	20.53	20.42	20.31	20.52
CH 06	2437 MHz	21.17	20.94	20.69	20.64	20.57	20.68	20.66	20.68
CH 09	2452 MHz	21.64	21.55	21.3	21.17	21.01	20.79	20.7	20.64





2.3 Test Mode

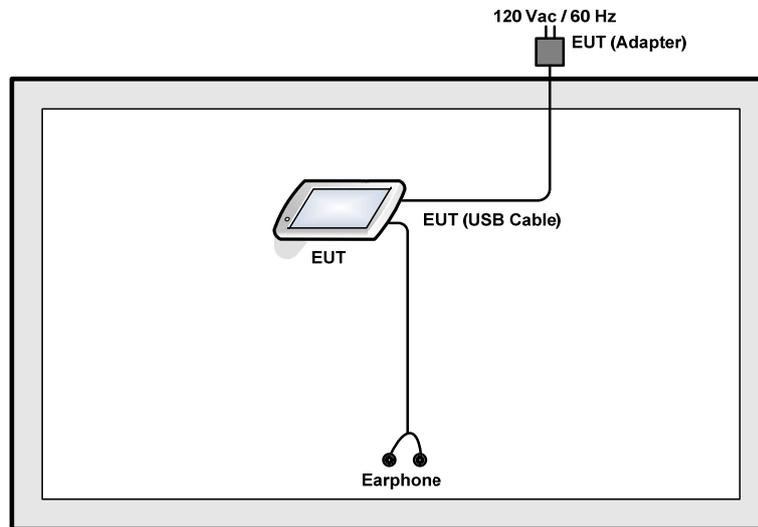
Final results of test modes, data rates and test channels are shown as following table.

<2.4GHz>

Test Cases				
	Test Items	Mode	Data Rate	Test Channel
Conducted TCs	Output Power	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	6.5 Mbps	1/6/11
		802.11n HT40	13.5 Mbps	3/6/9
Radiated TCs	Radiated Band Edge	802.11b	1 Mbps	1/11
		802.11g	6 Mbps	1/11
		802.11n HT20	6.5 Mbps	1/11
		802.11n HT40	13.5 Mbps	3/9
	Radiated Spurious Emission	802.11b	1 Mbps	1/6/11
		802.11g	6 Mbps	1/6/11
		802.11n HT20	6.5 Mbps	1/6/11
		802.11n HT40	13.5 Mbps	3/6/9

2.4 Connection Diagram of Test System

<WLAN Tx Mode>



2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	DC Power Supply	GWINSTEK	GPS-3030D	N/A	N/A	Unshielded, 1.8 m

2.6 Description of RF Function Operation Test Setup

For WLAN function, the engineering test program was provided and enabled to make EUT connect with Bluetooth base station to continuous transmit/receive.



2.7 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 4.2 + 10 = 14.2 \text{ (dB)} \end{aligned}$$

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

$$\text{Offset} = \text{RF cable loss} + \text{attenuator factor}.$$

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

3 Test Result

3.1 Output Power Measurement

3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting Antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the Antenna exceeds 6dBi.

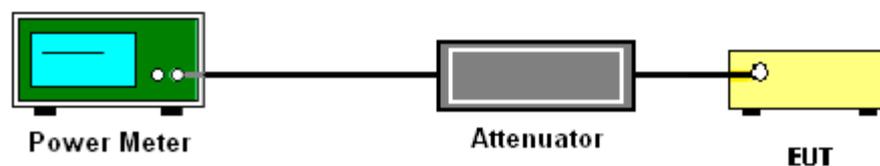
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r01.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.1.4 Test Setup





3.1.5 Test Result of Peak Output Power

Test Mode :	802.11b	Temperature :	24~26°C
Test Engineer :	Fly Chen	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11b Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	17.82	30	Pass
06	2437	17.97	30	Pass
11	2462	18.16	30	Pass

Test Mode :	802.11g	Temperature :	24~26°C
Test Engineer :	Fly Chen	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	21.35	30	Pass
06	2437	21.42	30	Pass
11	2462	21.76	30	Pass

Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Engineer :	Fly Chen	Relative Humidity :	50~53%

Channel	Frequency (MHz)	2.4GHz 802.11n HT20 Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	21.17	30	Pass
06	2437	21.25	30	Pass
11	2462	22.04	30	Pass

Test Mode :	802.11n HT40	Temperature :	24~26°C
Test Engineer :	Fly Chen	Relative Humidity :	50~53%

Channel	Frequency (MHz)	2.4GHz 802.11n HT40 Peak Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
03	2422	21.09	30	Pass
06	2437	21.17	30	Pass
09	2452	21.64	30	Pass



3.1.6 Test Result of Average output Power (Reporting Only)

Test Mode :	802.11b	Temperature :	24~26°C
Test Engineer :	Fly Chen	Relative Humidity :	50~53%
Duty Cycle:	98.59%	Duty Factor:	0.06dB

Channel	Frequency (MHz)	802.11b Average Output Power (dBm)
01	2412	14.25
06	2437	14.32
11	2462	14.95

Test Mode :	802.11g	Temperature :	24~26°C
Test Engineer :	Fly Chen	Relative Humidity :	50~53%
Duty Cycle:	93.34%	Duty Factor:	0.30dB

Channel	Frequency (MHz)	802.11g Average Output Power (dBm)
01	2412	11.28
06	2437	11.22
11	2462	11.49



Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Engineer :	Fly Chen	Relative Humidity :	50~53%
Duty Cycle:	92.32%	Duty Factor:	0.35dB

Channel	Frequency (MHz)	2.4GHz 802.11n HT20 Average Output Power (dBm)
01	2412	11.27
06	2437	11.18
11	2462	11.57

Test Mode :	802.11n HT40	Temperature :	24~26°C
Test Engineer :	Fly Chen	Relative Humidity :	50~53%
Duty Cycle:	85.75%	Duty Factor:	0.67dB

Channel	Frequency (MHz)	2.4GHz 802.11n HT40 Average Output Power (dBm)
03	2422	10.96
06	2437	10.91
09	2452	10.93

3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(KHz)	300
0.490 – 1.705	24000/F(KHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2 Measuring Instruments

See list of measuring instruments of this test report.



3.2.3 Test Procedures

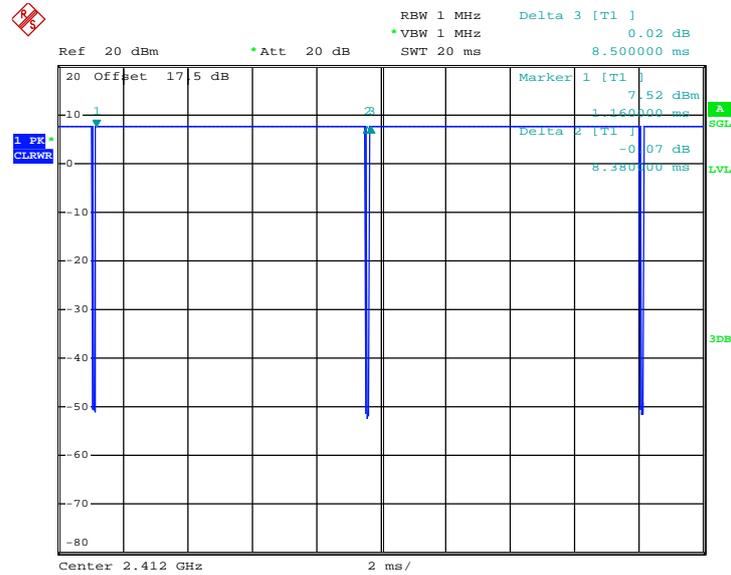
1. The testing follows the guidelines in ANSI C63.10-2009.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; $VBW \geq RBW$; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.
For average measurement:
 - $VBW = 10$ Hz, when duty cycle is no less than 98 percent.
 - $VBW \geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	98.588	8.380	-	10Hz
802.11g	92.257	1.394	0.717	1kHz
2.4GHz 802.11n HT20	92.351	1.304	0.767	1kHz
2.4GHz 802.11n HT40	86.207	0.650	1.538	3kHz

Note: For average measurement with duty cycle < 98%, use reduced VBW measurement method 4.2.3.2.3 in ANSI C63.10.



802.11b Duty Cycle



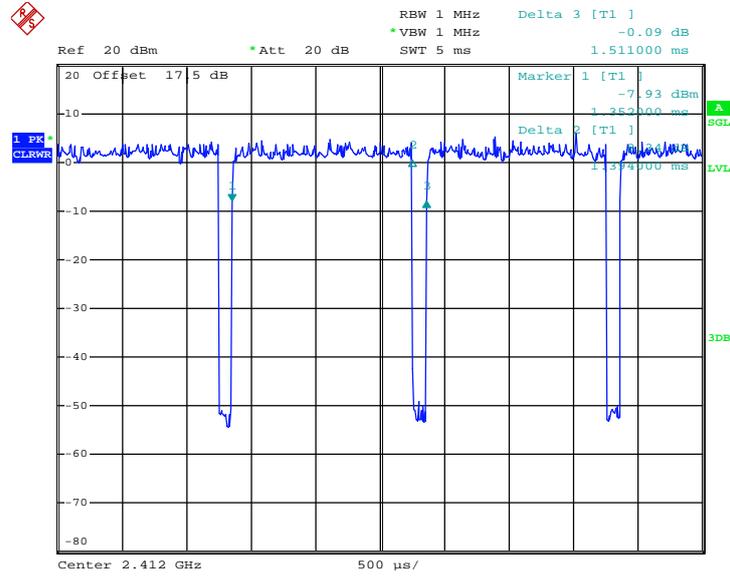
Date: 11.MAY.2013 15:23:17

Note:

The total loss is 17.5dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer by setting into the amplitude level offset. That means the measured result shown on the spectrum analyzer has added the total loss and been compliance with the limit line.



802.11g Duty Cycle



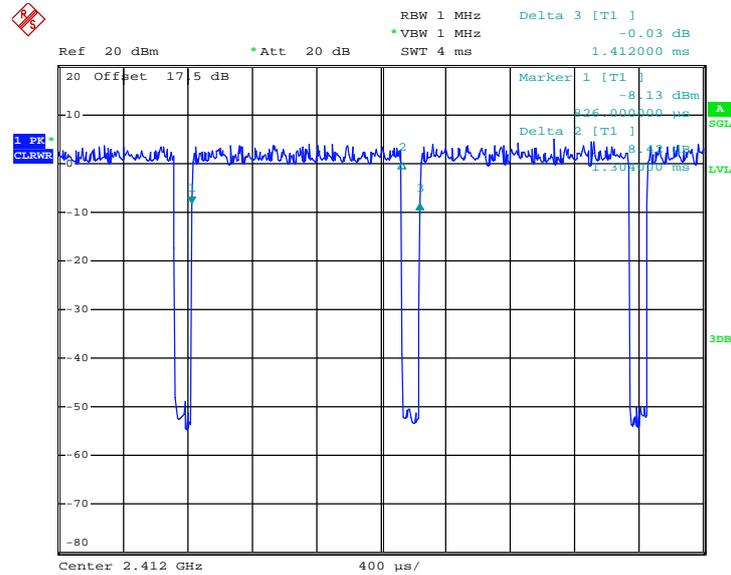
Date: 11.MAY.2013 15:28:01

Note:

The total loss is 17.5dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer by setting into the amplitude level offset. That means the measured result shown on the spectrum analyzer has added the total loss and been compliance with the limit line.



2.4GHz 802.11n HT20 Duty Cycle



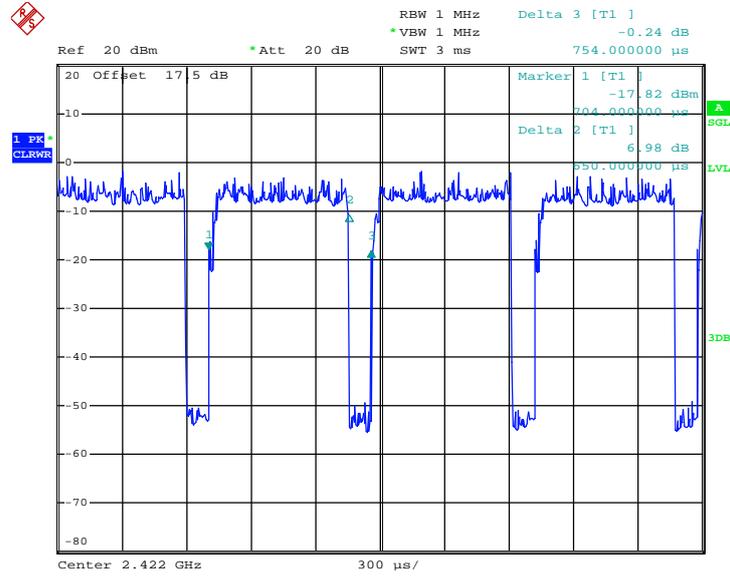
Date: 11.MAY.2013 15:33:13

Note:

The total loss is 17.5dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer by setting into the amplitude level offset. That means the measured result shown on the spectrum analyzer has added the total loss and been compliance with the limit line.



2.4GHz 802.11n HT40 Duty Cycle



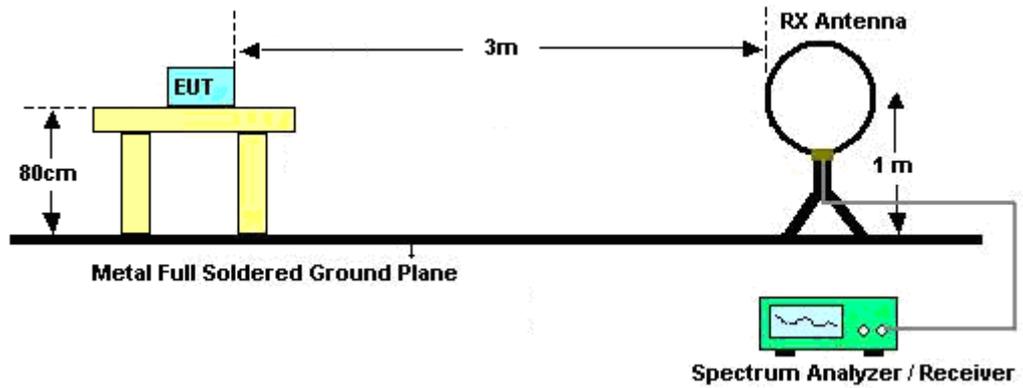
Date: 11.MAY.2013 15:39:32

Note:

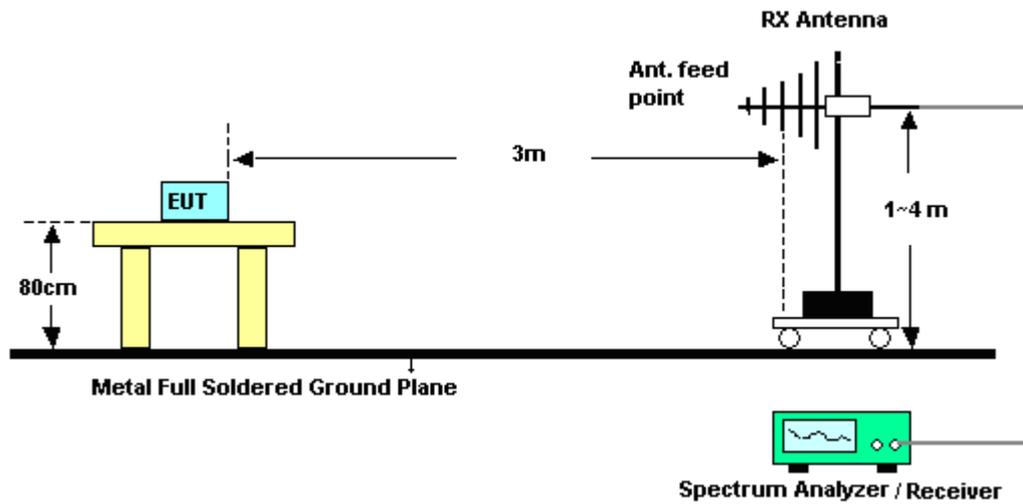
The total loss is 17.5dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer by setting into the amplitude level offset. That means the measured result shown on the spectrum analyzer has added the total loss and been compliance with the limit line.

3.2.4 Test Setup

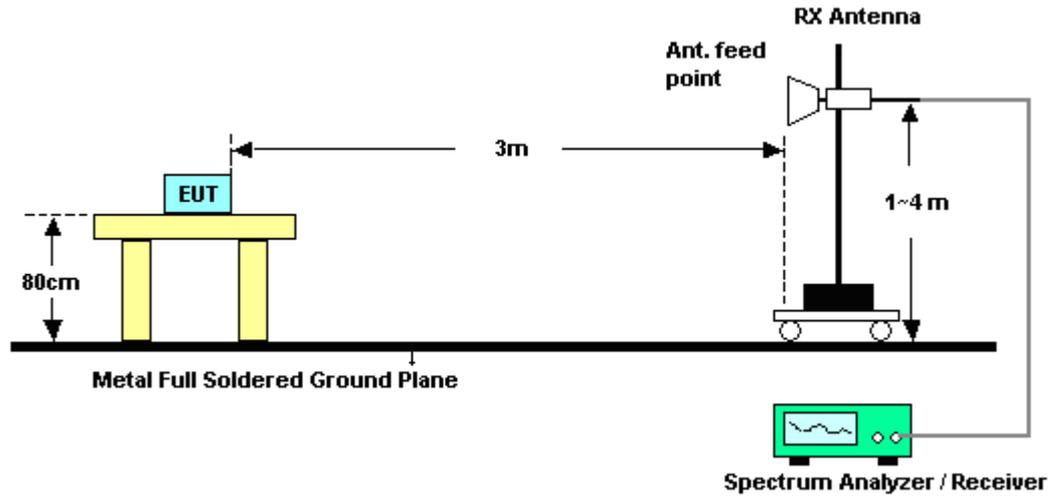
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.2.5 Test Results of Radiated Emissions (9kHz ~ 30MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.



3.2.6 Test Result of Radiated Band Edges

Test Mode :	802.11b	Temperature :	24~25°C
Test Band :	High	Relative Humidity :	54~56%
Test Channel :	11	Test Engineer :	John Zheng

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.77	54.02	-19.98	74	47.04	32.27	4.47	29.76	113	211	Peak
2483.5	43.68	-10.32	54	36.7	32.27	4.47	29.76	113	211	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2484.4	54.56	-19.44	74	47.58	32.27	4.47	29.76	143	249	Peak
2483.5	44.42	-9.58	54	37.44	32.27	4.47	29.76	143	249	Average



Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	High	Relative Humidity :	54~56%
Test Channel :	11	Test Engineer :	John Zheng

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2485.45	61.76	-12.24	74	54.78	32.27	4.47	29.76	141	201	Peak
2483.65	43.48	-10.52	54	36.5	32.27	4.47	29.76	141	201	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2487.58	62.5	-11.5	74	55.5	32.29	4.47	29.76	144	241	Peak
2483.5	45.12	-8.88	54	38.14	32.27	4.47	29.76	144	241	Average



Test Mode :	802.11n HT20	Temperature :	24~25°C
Test Band :	High	Relative Humidity :	54~56%
Test Channel :	11	Test Engineer :	John Zheng

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.83	59.78	-14.22	74	52.8	32.27	4.47	29.76	142	199	Peak
2483.53	43.97	-10.03	54	36.99	32.27	4.47	29.76	142	199	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.68	59.97	-14.03	74	52.99	32.27	4.47	29.76	100	256	Peak
2483.59	44.02	-9.98	54	37.04	32.27	4.47	29.76	100	256	Average



Test Mode :	802.11n HT40	Temperature :	24~25°C
Test Band :	High	Relative Humidity :	54~56%
Test Channel :	09	Test Engineer :	John Zheng

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2491	60.55	-13.45	74	53.53	32.29	4.49	29.76	139	312	Peak
2484.82	46.02	-7.98	54	39.04	32.27	4.47	29.76	139	312	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2487.22	64.06	-9.94	74	57.08	32.27	4.47	29.76	121	250	Peak
2484.97	49.74	-4.26	54	42.76	32.27	4.47	29.76	121	250	Average



3.2.7 Test Result of Radiated Emission (30MHz ~ 10th Harmonic)

Note: Below 1GHz for radiated emission measurement, pre-scanned all test modes and only choose the worst case mode was recorded in the report.

Test Mode :	802.11b	Temperature :	24~25°C
Test Channel :	11	Relative Humidity :	54~56%
Test Engineer :	John Zheng	Polarization :	Horizontal
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	107.12	-	-	100.17	32.24	4.47	29.76	113	211	Peak
2462	101.57	-	-	94.62	32.24	4.47	29.76	113	211	Average
4924	40.81	-33.19	74	57.98	33.92	6.1	57.19	200	0	Peak
7386	40.77	-33.23	74	55.24	35.35	8.12	57.94	100	360	Peak

Test Mode :	802.11b	Temperature :	24~25°C
Test Channel :	11	Relative Humidity :	54~56%
Test Engineer :	John Zheng	Polarization :	Vertical
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	108.96	-	-	102.01	32.24	4.47	29.76	143	249	Peak
2462	103.3	-	-	96.35	32.24	4.47	29.76	143	249	Average
4924	36.22	-37.78	74	53.39	33.92	6.1	57.19	100	360	Peak
7386	40.28	-33.72	74	54.75	35.35	8.12	57.94	200	300	Peak



Test Mode :	802.11g	Temperature :	24~25°C
Test Channel :	11	Relative Humidity :	54~56%
Test Engineer :	John Zheng	Polarization :	Horizontal
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	104.94	-	-	97.99	32.24	4.47	29.76	140	201	Peak
2462	93.54	-	-	86.59	32.24	4.47	29.76	140	201	Average
4924	37.71	-36.29	74	54.88	33.92	6.1	57.19	100	21	Peak
7386	41.17	-32.83	74	55.64	35.35	8.12	57.94	200	12	Peak

Test Mode :	802.11g	Temperature :	24~25°C
Test Channel :	11	Relative Humidity :	54~56%
Test Engineer :	John Zheng	Polarization :	Vertical
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	105.92	-	-	98.97	32.24	4.47	29.76	143	240	Peak
2462	95.06	-	-	88.11	32.24	4.47	29.76	143	240	Average
4924	38	-36	74	55.17	33.92	6.1	57.19	200	145	Peak
7386	40.48	-33.52	74	54.95	35.35	8.12	57.94	100	254	Peak



Test Mode :	2.4GHz 802.11n HT20	Temperature :	24~25°C
Test Channel :	11	Relative Humidity :	54~56%
Test Engineer :	John Zheng	Polarization :	Horizontal
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	104.08	-	-	97.13	32.24	4.47	29.76	142	199	Peak
2462	92.56	-	-	85.61	32.24	4.47	29.76	142	199	Average
4924	37.98	-36.02	74	55.15	33.92	6.1	57.19	100	213	Peak
7386	40.77	-33.23	74	55.24	35.35	8.12	57.94	100	360	Peak

Test Mode :	2.4GHz 802.11n HT20	Temperature :	24~25°C
Test Channel :	11	Relative Humidity :	54~56%
Test Engineer :	John Zheng	Polarization :	Vertical
Remark :	1. 2462 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2462	105.13	-	-	98.18	32.24	4.47	29.76	100	256	Peak
2462	93.69	-	-	86.74	32.24	4.47	29.76	100	256	Average
4924	37.7	-36.3	74	54.87	33.92	6.1	57.19	100	254	Peak
7386	40.28	-33.72	74	54.75	35.35	8.12	57.94	200	300	Peak



Test Mode :	2.4GHz 802.11n HT40	Temperature :	24~25°C
Test Channel :	09	Relative Humidity :	54~56%
Test Engineer :	John Zheng	Polarization :	Horizontal
Remark :	1. 2452 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
62.67	27.26	-12.74	40	51.42	5.53	0.85	30.54	-	-	Peak
105.6	33.59	-9.91	43.5	51.26	11.8	1.18	30.65	100	120	Peak
186.33	26.79	-16.71	43.5	46.84	9	1.33	30.38	-	-	Peak
352.5	27.86	-18.14	46	41.09	14.77	1.83	29.83	-	-	Peak
531.7	24.22	-21.78	46	33.22	18.1	2.19	29.29	-	-	Peak
696.9	36.23	-9.77	46	43.49	19.38	2.43	29.07	-	-	Peak
2452	101.34	-	-	94.43	32.22	4.45	29.76	138	311	Peak
2452	90.44	-	-	83.53	32.22	4.45	29.76	138	311	Average
4904	37.98	-36.02	74	55.3	33.88	6.06	57.26	100	213	Peak
7356	40.77	-33.23	74	55.38	35.33	8.01	57.95	100	360	Peak



Test Mode :	2.4GHz 802.11n HT40	Temperature :	24~25°C
Test Channel :	09	Relative Humidity :	54~56%
Test Engineer :	John Zheng	Polarization :	Vertical
Remark :	1. 2452 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
84	24.22	-15.78	40	45.66	8.1	1.08	30.62	-	-	Peak
95.88	31.31	-12.19	43.5	50.41	10.4	1.16	30.66	-	-	Peak
172.56	31.61	-11.89	43.5	51.12	9.63	1.28	30.42	120	210	Peak
353.9	28.66	-17.34	46	41.87	14.77	1.84	29.82	-	-	Peak
533.1	25.37	-20.63	46	34.37	18.1	2.19	29.29	-	-	Peak
898.5	29.93	-16.07	46	34.81	21.22	2.71	28.81	-	-	Peak
2452	103.95	-	-	97.04	32.22	4.45	29.76	120	250	Peak
2452	92.79	-	-	85.88	32.22	4.45	29.76	120	250	Average
4904	37.7	-36.3	74	55.02	33.88	6.06	57.26	100	254	Peak
7356	40.28	-33.72	74	54.89	35.33	8.01	57.95	200	300	Peak



3.3 Antenna Requirements

3.3.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.3.2 Antenna Connected Construction

Non-standard connector used.

3.3.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP30	101400	9kHz~30GHz	Mar. 28, 2013	May 11, 2013	Mar. 27, 2014	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	N/A	Mar. 28, 2013	May 11, 2013	Mar. 27, 2014	Conducted (TH01-SZ)
Power Sensor	Anritsu	MA2411B	1207253	N/A	Mar. 28, 2013	May 11, 2013	Mar. 27, 2014	Conducted (TH01-SZ)
ESCI TEST Receiver	R&S	ESCI	100724	9kHz -3GHz	Mar. 28, 2013	May 11, 2013	Mar. 27, 2014	Radiation (03CH01-SZ)
Spectrum Analyzer	R&S	FSP30	101362	9kHz~30GHz	Oct. 11, 2012	May 11, 2013	Oct. 10, 2013	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS Lindgren	3117	00119436	1GHz~18GHz	Oct. 12, 2012	May 11, 2013	Oct. 11, 2013	Radiation (03CH01-SZ)
Bilog Antenna	SCHAFFNER	CBL6112B	2614	30MHz ~2GHz	Nov. 03, 2012	May 11, 2013	Nov. 02, 2013	Radiation (03CH01-SZ)
Amplifier	ADVANTEST	BB525C	E9007003	9kHz-3000MHz GAIN 30db	Mar. 28, 2013	May 11, 2013	Mar. 27, 2014	Radiation (03CH01-SZ)
Amplifier	Yiai	AV3860B	04030	2GHz~26.5GHz	Mar. 28, 2013	May 11, 2013	Mar. 27, 2014	Radiation (03CH01-SZ)
SHF-EHF-Horn	Schwarzbeck	BBHA9170	BBHA9170249	14GHz~40GHz	Nov. 23, 2012	May 11, 2013	Nov. 22, 2013	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz-30MHz	Oct. 22, 2012	May 11, 2013	Oct. 21, 2013	Radiation (03CH01-SZ)
Turn Table	EM Electronic	EM 1000	N/A	0 ~ 360 degree	N/A	May 11, 2013	N/A	Radiation (03CH01-SZ)
Antenna Mast	EM Electronic	EM 1000	N/A	1 m - 4 m	N/A	May 11, 2013	N/A	Radiation (03CH01-SZ)



5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150KHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.26
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Uncertainty of Radiated Emission Measurement (30MHz ~ 1000MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.54
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Uncertainty of Radiated Emission Measurement (1GHz ~ 40GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.72
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Appendix A. Photographs of EUT

Please refer to Sporton report number EP312802-01 as below.



Appendix C. Product Equality Declaration

Lenovo (Shanghai) Electronics Technology Co., Ltd.

No. 68 Building, 199 Fenju Road, Wai Gao Qiao FTZ , Shanghai , China

Tel: 86-21-50504500-8237

Date: July 19, 2013

Product Equality Declaration

We, Lenovo (Shanghai) Electronics Technology Co., Ltd., declare on our sole responsibility for the product of **lenovo 60027** below:

The differences between previous and current model of **lenovo 60027** are as below:

1. BT/ WIFI Antenna difference:

Original Antenna(BT/WIFI)	New Antenna(Change shape and add absorbing material) (BT/WIFI)
	

2. GPS Antenna difference :

Original Antenna (GPS)	New Antenna(Change shape) (GPS)
	

Except for the antenna shape changes listed above, and adding absorbing material beside BT/WIFI antenna, antenna type, material and the gain of antenna and matching are in all relevant parts identical to the original product.

Should you have any questions or comments regarding this matter, please have my best attention.

Spring Zhou

Declared by :

on behalf of Lenovo (Shanghai) Electronics Technology Co., Ltd.