



**FCC PART 15C
TEST REPORT
No. I18Z60967-IOT03**

for

Lenovo PC HK Limited

Portable Tablet Computer

Lenovo TB-7104I

with

FCC ID: O57TB7104I

Hardware Version: Lenovo Tablet TB-7104I

Software Version: TB-7104I_RF01_180711

Issued Date: 2018-06-29



Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191.

Tel:+86(0)10-62304633-2512, Fax:+86(0)10-62304633-2504

Email: ctl_terminals@caict.ac.cn, website: www.caict.ac.cn



REPORT HISTORY

Report Number	Revision	Description	Issue Date
I18Z60967-IOT03	Rev.0	1st edition	2018-06-29

CONTENTS

1. TEST LABORATORY	5
1.1. TESTING LOCATION	5
1.2. TESTING ENVIRONMENT	5
1.3. PROJECT DATA	5
1.4. SIGNATURE.....	5
2. CLIENT INFORMATION.....	6
2.1. APPLICANT INFORMATION.....	6
2.2. MANUFACTURER INFORMATION.....	6
3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE)	7
3.1. ABOUT EUT	7
3.2. INTERNAL IDENTIFICATION OF EUT	7
3.3. INTERNAL IDENTIFICATION OF AE	7
3.4. EUT SET-UPS	8
3.5. GENERAL DESCRIPTION	8
3.6. INTERPRETATION OF THE TEST ENVIRONMENT	8
4. REFERENCE DOCUMENTS.....	8
4.1. DOCUMENTS SUPPLIED BY APPLICANT	8
4.2. REFERENCE DOCUMENTS FOR TESTING.....	8
5. TEST RESULTS	9
5.1. SUMMARY OF TEST RESULTS	9
5.2. STATEMENTS.....	9
5.3. TEST CONDITIONS.....	9
6. TEST FACILITIES UTILIZED	10
7. MEASUREMENT UNCERTAINTY	11
7.1. MAXIMUM OUTPUT POWER	11
7.2. PEAK POWER SPECTRAL DENSITY.....	11
7.3. DTS 6-DB SIGNAL BANDWIDTH	11
7.4. BAND EDGES COMPLIANCE.....	11
7.5. TRANSMITTER SPURIOUS EMISSION.....	11
7.6. AC POWER-LINE CONDUCTED EMISSION	11
ANNEX A: DETAILED TEST RESULTS.....	12



A.1. MEASUREMENT METHOD.....	12
A.2. MAXIMUM OUTPUT POWER.....	13
A.2.1. PEAK OUTPUT POWER-CONDUCTED	13
A.2.2. AVERAGE OUTPUT POWER-CONDUCTED.....	14
A.3. PEAK POWER SPECTRAL DENSITY.....	16
A.4. DTS 6-DB SIGNAL BANDWIDTH	22
A.5. BAND EDGES COMPLIANCE	28
A.6. TRANSMITTER SPURIOUS EMISSION.....	32
A.6.1 TRANSMITTER SPURIOUS EMISSION – CONDUCTED	32
A.6.2 TRANSMITTER SPURIOUS EMISSION - RADIATED.....	72
A.7. AC POWER-LINE CONDUCTED EMISSION	82
ANNEX B: ACCREDITATION CERTIFICATE.....	86

1. Test Laboratory

1.1. Testing Location

Location 1:CTTL(Huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing,
P. R. China100191

Location 2:CTTL(Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road,
Haidian District, Beijing, P. R. China100191

1.2. Testing Environment

Normal Temperature: 15-35°C
Extreme Temperature: -20/+55°C
Relative Humidity: 20-75%

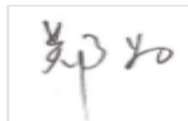
1.3. Project data

Testing Start Date: 2018-05-18
Testing End Date: 2018-06-22

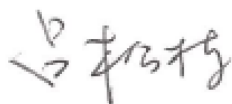
1.4. Signature



Jiang Xue
(Prepared this test report)



Zheng Wei
(Reviewed this test report)



Lv Songdong
(Approved this test report)



2. Client Information

2.1. Applicant Information

Company Name: Lenovo(Shanghai) Electronics Technology Co., Ltd.
Address: NO.68 BUILDING, 199 FENJU RD, Pilot Free Trade Zone, 200131,
China
City: Shanghai
Postal Code: 200131
Country: China
Telephone: +86-21-50504500-8281
Fax: +86-21-50807240

2.2. Manufacturer Information

Company Name: Lenovo PC HK Limited
Address: 23/F, Lincoln House, TaikooPlace979 King's Road, Quarry Bay, Hong
Kong
City: Hong Kong
Postal Code: /
Country: China
Telephone: +86-21-50504500-8281
Fax: +86-21-50807240



3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	Portable Tablet Computer
Model name	Lenovo TB-7104I
FCC ID	O57TB7104I
IC ID	/
With WLAN Function	Yes
Frequency Range	ISM 2400MHz~2483.5MHz
Type of Modulation	DSSS/CCK/OFDM
Number of Channels	11
Antenna	Integral Antenna
MAX Conducted Power	23.61dBm
Power Supply	3.8V DC by Battery

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	869719030027655	Lenovo Tablet TB-7104I	TB-7104I_RF01_180711
EUT2	869719030027176	Lenovo Tablet TB-7104I	TB-7104I_RF01_180711

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE

AE ID*	Description	SN
AE1	Battery	/
AE2	Battery	/
AE3	Charger	/
AE4	Charger	/
AE1		
Model	SB18C31688	
Manufacturer	ATL	
Capacitance	2750 mAh	
Nominal voltage	3.82 V	
AE2		
Model	SB18C31689	
Manufacturer	SCUD	
Capacitance	2750 mAh	
Nominal voltage	3.82 V	
AE3		
Model	C-P56	
Manufacturer	huntkey	
Length of cable	/	



AE4

Model C-P56
Manufacturer Acbel
Length of cable /

*AE ID: is used to identify the test sample in the lab internally.

3.4. EUT set-ups

EUT set-up No.	Combination of EUT and AE	Remarks
Set.11	EUT1+ AE1+ AE2+ AE3	WIFI

3.5. General Description

The Equipment under Test (EUT) is a model of Portable Tablet Computer with integrated antenna and inbuilt battery.

It has Bluetooth (EDR) function.

It consists of normal options: travel charger, USB cable.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the client.

3.6. Interpretation of the Test Environment

For the test methods, the test environment uncertainty figures correspond to an expansion factor k=2.

Measurement Uncertainty

Parameter	Uncertainty
temperature	0.48°C
humidity	2 %
DC voltages	0.003V

4. Reference Documents

4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part15	FCC CFR 47, Part 15, Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902-928MHz, 2400-2483.5 MHz, and 5725-5850 MHz.	2016
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013

5. Test Results

5.1. Summary of Test Results

SUMMARY OF MEASUREMENT RESULTS	Sub-clause of Part15C	Sub-clause of IC	Verdict
Maximum Peak Output Power	15.247 (b)	/	P
Peak Power Spectral Density	15.247 (e)	/	P
Occupied 6dB Bandwidth	15.247 (a)	/	P
Band Edges Compliance	15.247 (d)	/	P
Transmitter Spurious Emission - Conducted	15.247 (d)	/	P
Transmitter Spurious Emission - Radiated	15.247, 15.205, 15.209	/	P
AC Powerline Conducted Emission	15.107, 15.207	/	P

Please refer to **ANNEX A** for detail.

Terms used in Verdict column

P	Pass, The EUT complies with the essential requirements in the standard.
NP	Not Perform, The test was not performed by CTTL
NA	Not Applicable, The test was not applicable
BR	Re-use test data from basic model report.
F	Fail, The EUT does not comply with the essential requirements in the standard

5.2. Statements

The test cases as listed in section 5.1 of this report for the EUT specified in section 3 was performed by CTTL and according to the standards or reference documents listed in section 4.2 The EUT met all requirements of the standards or reference documents, and only the WLAN function was tested in this report.

5.3. Test Conditions

For this report, all the test cases are tested under normal temperature and normal voltage, and also under norm humidity, the specific condition is shown as follows:

Temperature	26°C
Voltage	3.8V
Humidity	44%

6. Test Facilities Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Vector Signal Analyzer	FSQ40	200089	Rohde & Schwarz	1 year	2019-05-17
2	LISN	ENV216	101200	Rohde & Schwarz	1 year	2018-08-03
3	Test Receiver	ESCI 3	100344	Rohde & Schwarz	1 year	2019-02-28
4	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESU26	100235	Rohde & Schwarz	2018-03-01	2019-03-31
2	Loop antenna	HFH2-Z2	829324/007	Rohde & Schwarz	2017-12-04	2019-01-03
3	BiLog Antenna	VULB9163	301	Schwarzbeck	2018-01-04	2019-02-03
4	Dual-Ridge Waveguide Horn Antenna	3115	6914	EMCO	2017-12-01	2018-12-31
5	Dual-Ridge Waveguide Horn Antenna	3116	2661	ETS-Lindgren	2017-07-28	2020-07-27
6	Vector Signal Analyzer	FSV40	101047	Rohde & Schwarz	2017-06-23	2018-07-22
7	Semi-anechoic chamber	/	CT000332-1 074	Frankonia German	/	/

7. Measurement Uncertainty

7.1. Maximum Output Power

Measurement Uncertainty: 0.387dB,k=1.96

7.2. Peak Power Spectral Density

Measurement Uncertainty: 0.705dBm/MHz,k=1.96

7.3. DTS 6-dB Signal Bandwidth

Measurement Uncertainty: 60.80Hz,k=1.96

7.4. Band Edges Compliance

Measurement Uncertainty : 0.62dBm,k=1.96

7.5. Transmitter Spurious Emission

Conducted (k=1.96)

Frequency Range	Uncertainty(dBm)
$30\text{MHz} \leq f \leq 2\text{GHz}$	1.22
$2\text{GHz} \leq f \leq 3.6\text{GHz}$	1.22
$3.6\text{GHz} \leq f \leq 8\text{GHz}$	1.22
$8\text{GHz} \leq f \leq 12.75\text{GHz}$	1.51
$12.75\text{GHz} \leq f \leq 26\text{GHz}$	1.51
$26\text{GHz} \leq f \leq 40\text{GHz}$	1.59

Radiated (k=2)

Frequency Range	Uncertainty(dBm)
$30\text{MHz} \leq f \leq 1\text{GHz}$	4.86
$1\text{GHz} \leq f \leq 18\text{GHz}$	5.26
$18\text{GHz} \leq f \leq 40\text{GHz}$	5.28

7.6. AC Power-line Conducted Emission

Measurement Uncertainty : 3.38dBm,k=2

ANNEX A: Detailed Test Results

A.1. Measurement Method

A.1.1. Conducted Measurements

Connect the EUT to the test system as Fig.A.1.1.1 shows.

Set the EUT to the required work mode.

Set the EUT to the required channel.

Set the Vector Signal Analyzer and start measurement.

Record the values. Vector Signal Analyzer

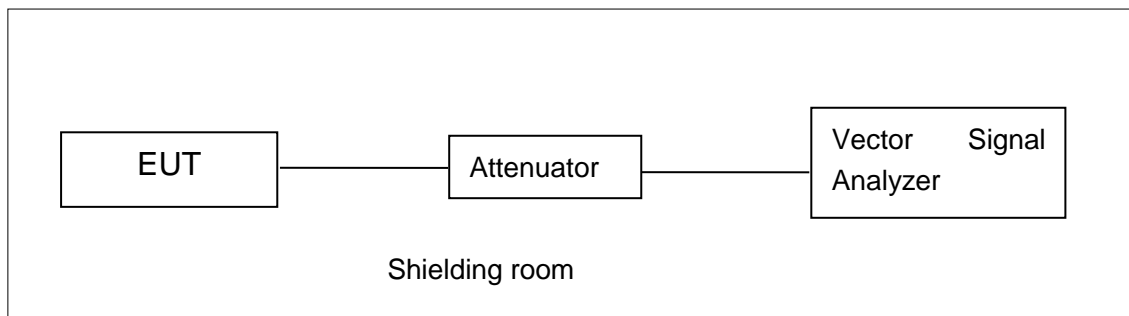


Fig.A.1.1.1: Test Setup Diagram for Conducted Measurements

A.1.2. Radiated Emission Measurements

In the case of radiated emission, the used settings are as follows,

Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;

Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 10Hz;

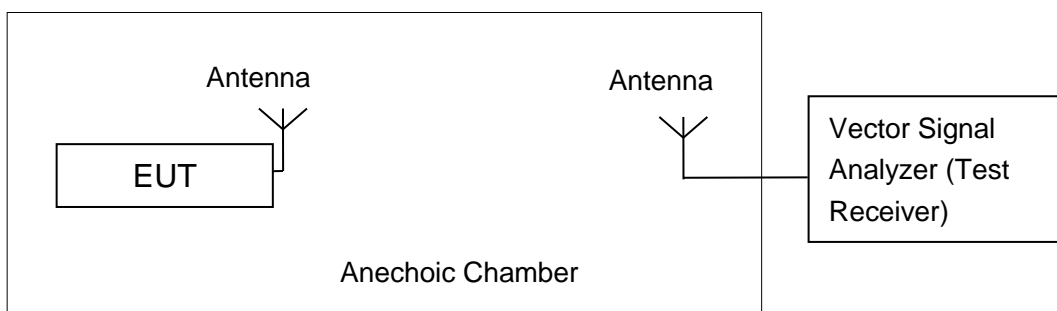


Fig.A.1.2.1: Test Setup Diagram for Radiated Measurements



A.2. Maximum Output Power

Method of Measurement: See ANSI C63.10-2013-clause 11.9.1.2

- a) Set the RBW = 1 MHz.
- b) Set the VBW = 3 MHz.
- c) Set the span $\geq [1.5 \times \text{DTS bandwidth}]$.
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select the peak detector).

Measurement Limit:

Standard	Limit (dBm)
FCC CRF Part 15.247(b)	< 30

EUT ID: EUT2

A.2.1. Peak Output Power-conducted

Measurement Results:

802.11b/g mode

Mode	Data Rate (Mbps)	Test Result (dBm)		
		2412MHz (Ch1)	2437MHz (Ch6)	2462 MHz (Ch11)
802.11b	1	20.34	/	/
	2	20.65	/	/
	5.5	22.25	/	/
	11	23.41	23.61	23.25
802.11g	6	23.14	/	/
	9	23.02	/	/
	12	22.97	/	/
	18	22.64	/	/
	24	23.18	23.61	22.73
	36	23.11	/	/
	48	22.09	/	/
	54	22.99	/	/

The data rate 11Mbps and 24Mbps are selected as worse condition, and the following cases are performed with this condition.

802.11n-HT20 mode

Mode	Data Rate (Index)	Test Result (dBm)		
		2412MHz (Ch1)	2437MHz (Ch6)	2462 MHz (Ch11)
802.11n (20MHz)	MCS0	23.27	/	/
	MCS1	22.86	/	/
	MCS2	22.66	/	/
	MCS3	23.32	23.31	22.96
	MCS4	23.09	/	/
	MCS5	22.34	/	/
	MCS6	22.56	/	/
	MCS7	22.68	/	/

The data rate MCS3 is selected as worse condition, and the following cases are performed with this condition.

Conclusion: Pass

A.2.2. Average Output Power-conducted

Method of Measurement: See ANSI C63.10-2013-clause 11.9.2.2.2

The procedure for this method is as follows:

- a) Set span = 1.5OBW.
- b) Set RBW = 1MHz.
- c) Set VBW = 3MHz
- d) Number of points in sweep = 625
- e) Sweep time = auto.
- f) Detector = RMS.
- g) If transmit duty cycle < 98%, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at the maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no OFFintervals) or at duty cycle $\geq 98\%$, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run."
- h) Trace average 100 traces in power averaging (rms) mode.
- i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

802.11b/g mode

Mode	Test Result (dBm)		
	2412MHz (Ch1)	2437MHz (Ch6)	2462 MHz (Ch11)
802.11b	16.27	16.24	16.19
802.11g	16.55	16.27	15.93



802.11n-HT20 mode

Mode	Test Result (dBm)		
	2412MHz (Ch1)	2437MHz (Ch6)	2462 MHz (Ch11)
802.11n (20MHz)	15.98	16.33	15.54

Conclusion: Pass



A.3. Peak Power Spectral Density

Method of Measurement: See ANSI C63.10-2013-clause 11.10.2

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to RBW = 3 kHz.
- d) Set the VBW = 10 kHz.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.

Measurement Limit:

Standard	Limit
FCC CRF Part 15.247(e)	< 8 dBm/3 kHz

Measurement Results:

802.11b/g mode

Mode	Channel	Power Spectral Density (dBm/3 kHz)		Conclusion
802.11b	1	Fig.A.3.1	-5.19	P
	6	Fig.A.3.2	-4.62	P
	11	Fig.A.3.3	-5.65	P
802.11g	1	Fig.A.3.4	-9.30	P
	6	Fig.A.3.5	-9.42	P
	11	Fig.A.3.6	-9.85	P

802.11n-HT20 mode

Mode	Channel	Power Spectral Density (dBm/3 kHz)		Conclusion
802.11n (HT20)	1	Fig.A.3.7	-10.57	P
	6	Fig.A.3.8	-10.36	P
	11	Fig.A.3.9	-10.78	P

Conclusion: Pass

Test graphs as below:

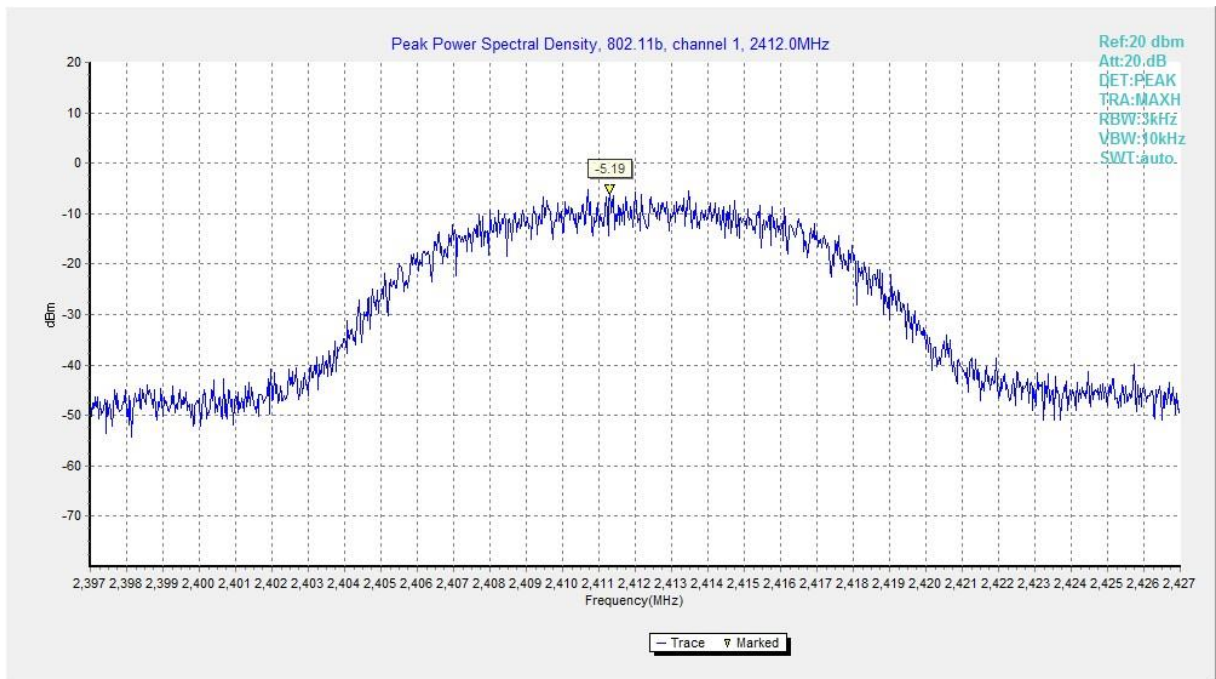


Fig.A.3.1 Power Spectral Density(802.11b,Ch1)

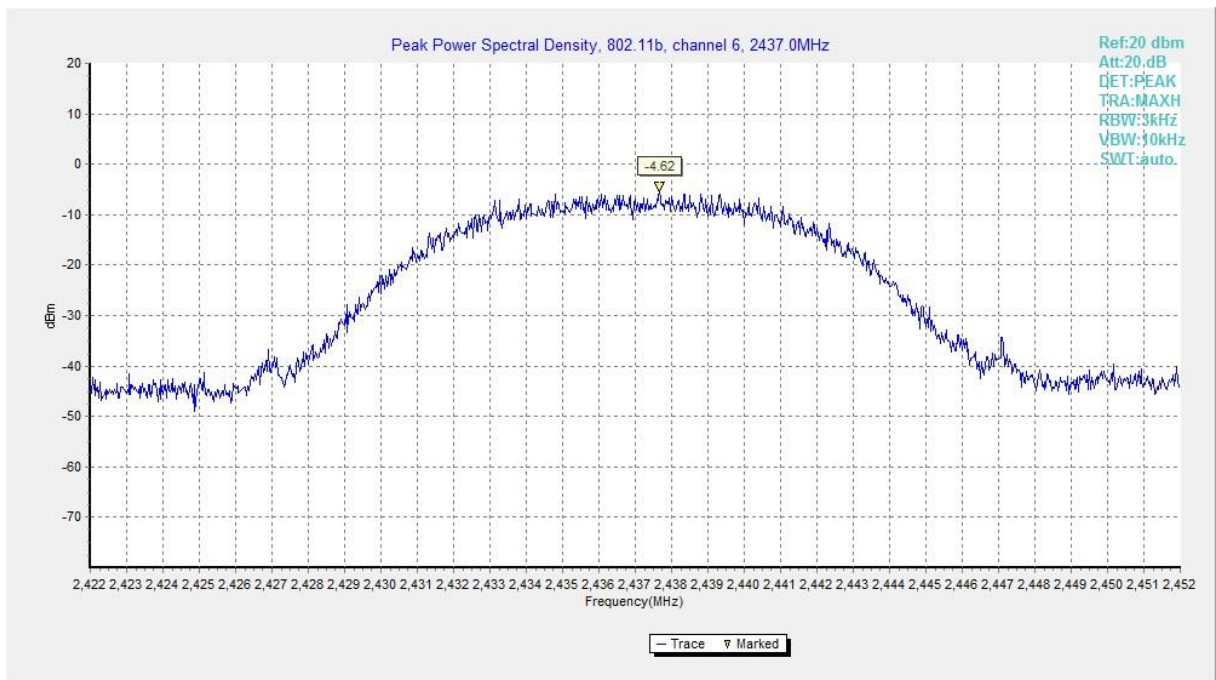


Fig.A.3.2 Power Spectral Density (802.11b, Ch 6)