



# FCC PART 15 TEST REPORT No.I20Z61117-IOT02

for

**Wingtech Group (Hongkong) Limited**

**Multi-band WCDMA/LTE MIFI with WLAN**

**CT2MHS01**

With

**FCC ID: 2APXW-CT2MHS01**

**Hardware Version: 89323\_1\_21**

**Software Version: CT2MHS01\_0.01.41**

**Issued Date: 2020-09-11**

**Note:**

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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.

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
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## 1. TEST LABORATORY

### 1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

### 1.2. Testing Location

Location: CTTL(huayuan North Road)

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

### 1.3. Testing Environment

Normal Temperature: 15-35°C

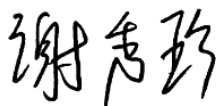
Relative Humidity: 20-75%

### 1.4. Project date

Testing Start Date: 2020-07-29

Testing End Date: 2020-09-11

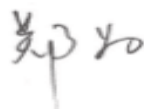
### 1.5. Signature



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Xie Xiuzhen

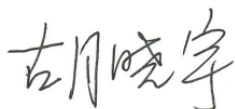
( Prepared this test report )



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Zheng Wei

(Reviewed this test report)



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Hu Xiaoyu

(Approved this test report)

## **2. CLIENT INFORMATION**

### **2.1 Applicant Information**

Company Name: Wingtech Group (Hongkong) Limited  
Address: Flat/RM 1903 ,19/F, Podium Plaza, 5 Hanoi Road, Tsim Sha Tsui,  
Kowloon, Hongkong.  
City: Hongkong.  
Postal Code: /  
Country: China  
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Fax: /

### **2.2 Manufacturer Information**

Company Name: Wingtech Group (Hongkong) Limited  
Address: Flat/RM 1903 ,19/F, Podium Plaza, 5 Hanoi Road, Tsim Sha Tsui,  
Kowloon, Hongkong.  
City: Hongkong.  
Postal Code: /  
Country: China  
Telephone: +86-13917939276  
Fax: /

### 3. EQUIPMENT UNDER TEST (EUT) AND

#### ANCILLARY EQUIPMENT(AE)

#### 3.1. About EUT

Description	Multi-band WCDMA/LTE MIFI with WLAN
Model name	CT2MHS01
FCC ID	2APXW-CT2MHS01
WLAN Frequency Band	ISM Bands: -5150MHz~5250MHz -5250MHz~5350MHz -5470MHz~5725MHz
Type of modulation	OFDM
Antenna	Integral Antenna
Voltage	3.85V

#### 3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	353929580015637	89323_1_21	CT2MHS01_0.01.41
EUT2	353929580002510	89323_1_21	CT2MHS01_0.01.41

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

#### 3.3. Internal Identification of AE used during the test

AE ID*	Description	SN
AE1	Battery	/
AE2	charger	/
AE3	USB cable	/
AE4	USB cable	/
AE1		
Type	MF01	
Manufacturer	Jiade Energy Technology (Zhuhai) Co.,Ltd.	
Capacity	/	
Nominal Voltage	/	
AE2		
Model	PA-US5V2A-036	
Manufacturer	Huizhou puan electronics co., ltd	
Length of cable	/	
AE3		
Type	USB TYPE A to C 2.0 Cable (1.0m)	
Manufacturer	Huizhou Washin Electronics Co.,Ltd	
Length of cable	/	

AE4

Type	USB TYPE A to C 2.0 Cable (1.0m)
Manufacturer	Shenzhen BRL Technology Co.,Ltd.
Length of cable	/

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

### 3.4. General Description

The Equipment under Test (EUT) is a model of Multi-band WCDMA/LTE MIFI with WLAN with integrated antenna and inbuilt battery.

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.

### 3.5. 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.

FCC Part15	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices	2018
ANSI C63.10	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2013
UNII: KDB 789033 D02	General U-NII Test Procedures New Rules v02r01	2017-12
KDB 558074 D01	Federal Communications Commission Office of Engineering and Technology Laboratory Division GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID	2019



SYSTEM DEVICES OPERATING UNDER SECTION  
15.247 OF THE FCC RULES

## 5. LABORATORY ENVIRONMENT

Conducted RF performance testing is performed in shielding room.

EMC performance testing is performed in Semi-anechoic chamber.

## 6. SUMMARY OF TEST RESULTS

### 6.1. Summary of Test Results

SUMMARY OF MEASUREMENT RESULTS	Sub-clause of Part15E	Sub-clause of IC	Verdict
Maximum Output Power	15.407	/	P
Peak Power Spectral Density	15.407	/	P
Occupied 26dB Bandwidth	15.403	/	P
Band edge compliance (Radiated)	15.209	/	P
Transmitter spurious emissions (Radiated)	15.407	/	P
AC Powerline Conducted Emission (150kHz- 30MHz)	15.407	/	P
99% Occupied bandwidth	/	/	P
Transmit Power Control	15.407	/	NA

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

Terms used in Verdict column

P	Pass, The EUT complies with the essential requirements in the standard.
NM	Not measured, The test was not measured by CTTL
NA	Not Applicable, The test was not applicable
F	Fail, The EUT does not comply with the essential requirements in the standard

### 6.2. Statements

CTTL has evaluated the test cases requested by the client/manufacturer as listed in section 6.1 of this report for the EUT specified in section 3 according to the standards or reference documents listed in section 4.1.

This report only deals with the WLAN function among the features described in section 3.

### 6.3. 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	3.85V
Humidity	44%

## 7. TEST EQUIPMENTS 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	2021-05-06
2	LISN	ENV216	101200	R&S	1 year	2021-02-26
3	Test Receiver	ESCI	100344	R&S	1 year	2021-05-19
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	1 year	2021-03-03
2	BiLog Antenna	VULB9163	9163-483	Schwarzbeck	1 year	2020-09-17
3	Dual-Ridge Waveguide Horn Antenna	3115	6914	ETS-Lindgren	1 year	2021-01-14
4	Dual-Ridge Waveguide Horn Antenna	3116	2661	ETS-Lindgren	1 year	2020-10-08

## 8. Measurement Uncertainty

### 8.1 Transmitter Output Power

Measurement Uncertainty: 0.387dB, k=1.96

### 8.2 Peak Power Spectral Density

Measurement Uncertainty: 0.705dB, k=1.96

### 8.3 Occupied Channel Bandwidth

Measurement Uncertainty: 60.80Hz, k=1.96

### 8.4 Band Edges Compliance

Measurement Uncertainty : 0.62dB, k=1.96

### 8.5 Spurious Emissions

#### Conducted (k=1.96)

Frequency Range	Uncertainty(dB)
$30\text{MHz} \leq f \leq 2\text{GHz}$	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(dB)
9kHz-30MHz	/
$30\text{MHz} \leq f \leq 1\text{GHz}$	5.16
$1\text{GHz} \leq f \leq 18\text{GHz}$	5.44
$18\text{GHz} \leq f \leq 40\text{GHz}$	5.28

### 8.6. AC Power-line Conducted Emission

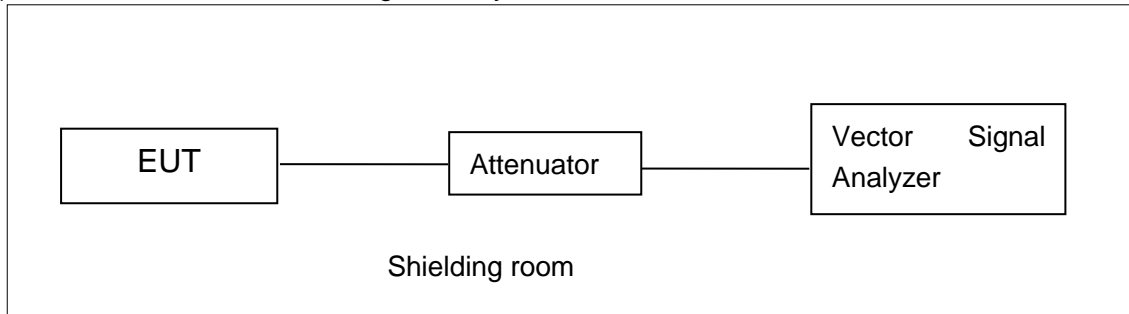
Measurement Uncertainty : 3.08dB, k=2

## ANNEX A: MEASUREMENT RESULTS

### A.1. Measurement Method

#### A.1.1. Conducted Measurements

- 1). Connect the EUT to the test system correctly.
- 2). Set the EUT to the required work mode.
- 3). Set the EUT to the required channel.
- 4). Set the spectrum analyzer to start measurement.
- 5). Record the values. Vector Signal Analyzer

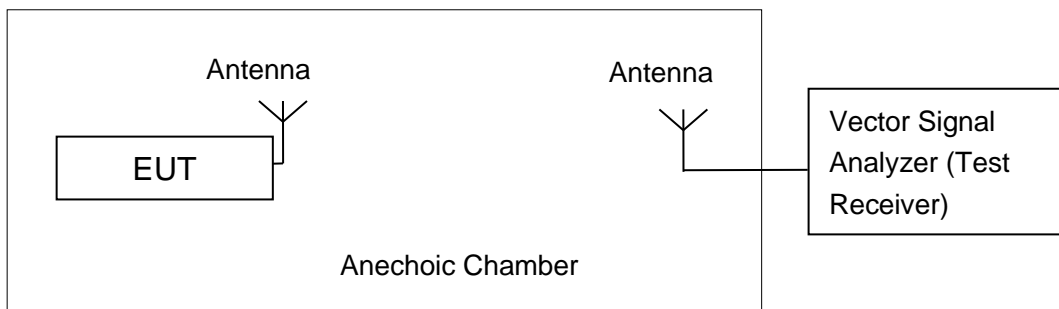


#### A.1.2. Radiated Emission Measurements

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;



The measurement is made according to KDB 789033

The radiated emission test is performed in semi-anechoic chamber. The distance from the EUT to the reference point of measurement antenna is 3m. The test is carried out on both vertical and horizontal polarization and only maximization result of both polarizations is kept. During the test, the turntable is rotated 360° and the measurement antenna is moved from 1m to 4m to get the maximization result.

## A.2. Maximum output Power

### Measurement Limit and Method:

Standard	Frequency (MHz)	Limit (dBm)
FCC CRF Part 15.407(a)	5150MHz~5250MHz	24dBm
	5250MHz~5350MHz	24dBm or 11+10logB
	5470MHz~5725MHz	24dBm or 11+10logB

Limit use the less value, and B is the 26dB bandwidth.

The measurement method SA-2 is made according to KDB 789033

### Measurement Results:

#### 802.11a mode

Mode	Rate	Test Result (dBm)								
		Frequency (MHz)								
		5180	5200	5240	5260	5280	5320	5500	5580	5700
802.11a	6Mbps	16.90	16.81	16.62	16.41	16.42	16.69	16.45	17.18	17.61

The data rate 6Mbps is selected as worse condition, and the following cases are performed with this condition.

#### 802.11n-HT20 mode

Mode	Rate	Test Result (dBm)								
		Frequency (MHz)								
		5180	5200	5240	5260	5280	5320	5500	5580	5700
802.11n(HT20)	MCS0	16.75	16.66	17.05	17.02	16.86	16.61	16.57	16.75	16.56

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

#### 802.11ac-HT20 mode

Mode	Rate	Test Result (dBm)								
		Frequency (MHz)								
		5180	5200	5240	5260	5280	5320	5500	5580	5700
802.11ac(HT20)	MCS0	16.72	16.63	17.03	16.99	16.84	16.56	16.56	16.74	16.52

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

**802.11n-HT40 mode**

Mode	Rate	Test Result (dBm)						
		Frequency (MHz)						
		5190	5230	5270	5310	5510	5550	5670
802.11n(HT40)	MCS0	16.32	16.55	16.51	16.18	16.03	16.16	16.47

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

**802.11ac-HT40 mode**

Mode	Rate	Test Result (dBm)						
		Frequency (MHz)						
		5190	5230	5270	5310	5510	5550	5670
802.11ac(HT40)	MCS0	16.25	16.54	16.53	16.18	16.00	16.16	16.46

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

**802.11ac-HT80 mode**

Mode	Rate	Test Result (dBm)			
		Frequency (MHz)			
		5210	5290	5530	5610
802.11ac(HT80)	MCS0	16.17	16.07	15.80	16.16

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

### A.3. Peak Power Spectral Density (conducted)

#### Measurement Limit:

Standard	Frequency (MHz)	Limit (dBm/MHz)
FCC CRF Part 15.407(a)	5150MHz~5250MHz	11
	5250MHz~5350MHz	11
	5470MHz~5725MHz	11

The output power measurement method Section F is made according to KDB 789033

#### Measurement Results:

Mode	Frequency	Power Spectral Density (dBm/MHz)	Conclusion
802.11a	5180 MHz	6.41	P
	5200 MHz	6.37	P
	5240 MHz	6.62	P
	5260 MHz	6.58	P
	5280 MHz	6.42	P
	5320 MHz	6.21	P
	5500 MHz	6.14	P
	5580 MHz	6.26	P
802.11n HT20	5180 MHz	5.99	P
	5200 MHz	5.94	P
	5240 MHz	6.21	P
	5260 MHz	6.12	P
	5280 MHz	5.99	P
	5320 MHz	5.73	P
	5500 MHz	5.74	P
	5580 MHz	5.84	P
802.11ac HT20	5180 MHz	5.99	P
	5200 MHz	5.91	P
	5240 MHz	6.20	P
	5260 MHz	6.10	P
	5280 MHz	5.97	P
	5320 MHz	5.75	P
	5500 MHz	5.74	P
	5580 MHz	4.74	P
802.11n HT40	5190 MHz	2.52	P
	5230 MHz	2.63	P
	5270 MHz	2.61	P
	5310 MHz	2.30	P

	5510 MHz	2.23	P
	5550 MHz	2.19	P
	5670 MHz	2.54	P
802.11ac HT40	5190 MHz	2.48	P
	5230 MHz	2.62	P
	5270 MHz	2.58	P
	5310 MHz	2.25	P
	5510 MHz	2.27	P
	5550 MHz	2.16	P
	5670 MHz	2.52	P
802.11ac HT80	5210MHz	-0.74	P
	5290MHz	-0.91	P
	5530MHz	-1.18	P
	5610MHz	-1.01	P

**Conclusion: PASS**



#### A.4. Occupied 26dB Bandwidth(conducted)

##### Measurement Limit:

Standard	Limit (kHz)
FCC 47 CFR Part 15.403 (i)	/

The measurement is made according to KDB 789033

##### Measurement Uncertainty:

Measurement Uncertainty	60.80Hz
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##### Measurement Result:

Mode	Frequency	Occupied 26dB Bandwidth ( MHz)		conclusion
		Fig.	Value	
802.11a	5180 MHz	Fig.1	20.30	P
	5200 MHz	Fig.2	20.25	P
	5240 MHz	Fig.3	20.35	P
	5260 MHz	Fig.4	20.20	P
	5280 MHz	Fig.5	20.20	P
	5320 MHz	Fig.6	20.20	P
	5500 MHz	Fig.7	20.20	P
	5580 MHz	Fig.8	20.20	P
	5700 MHz	Fig.9	20.15	P
802.11n HT20	5180 MHz	Fig.10	20.95	P
	5200 MHz	Fig.11	21.00	P
	5240 MHz	Fig.12	21.00	P
	5260 MHz	Fig.13	21.05	P
	5280 MHz	Fig.14	21.00	P
	5320 MHz	Fig.15	21.05	P
	5500 MHz	Fig.16	20.95	P
	5580 MHz	Fig.17	21.05	P
	5700 MHz	Fig.18	21.05	P

802.11ac HT20	5180 MHz	Fig.19	21.00	P
	5200 MHz	Fig.20	21.05	P
	5240 MHz	Fig.21	21.05	P
	5260 MHz	Fig.22	21.00	P
	5280 MHz	Fig.23	20.95	P
	5320 MHz	Fig.24	21.1	P
	5500 MHz	Fig.25	21.05	P
	5580 MHz	Fig.26	21.00	P
	5700 MHz	Fig.27	21.00	P

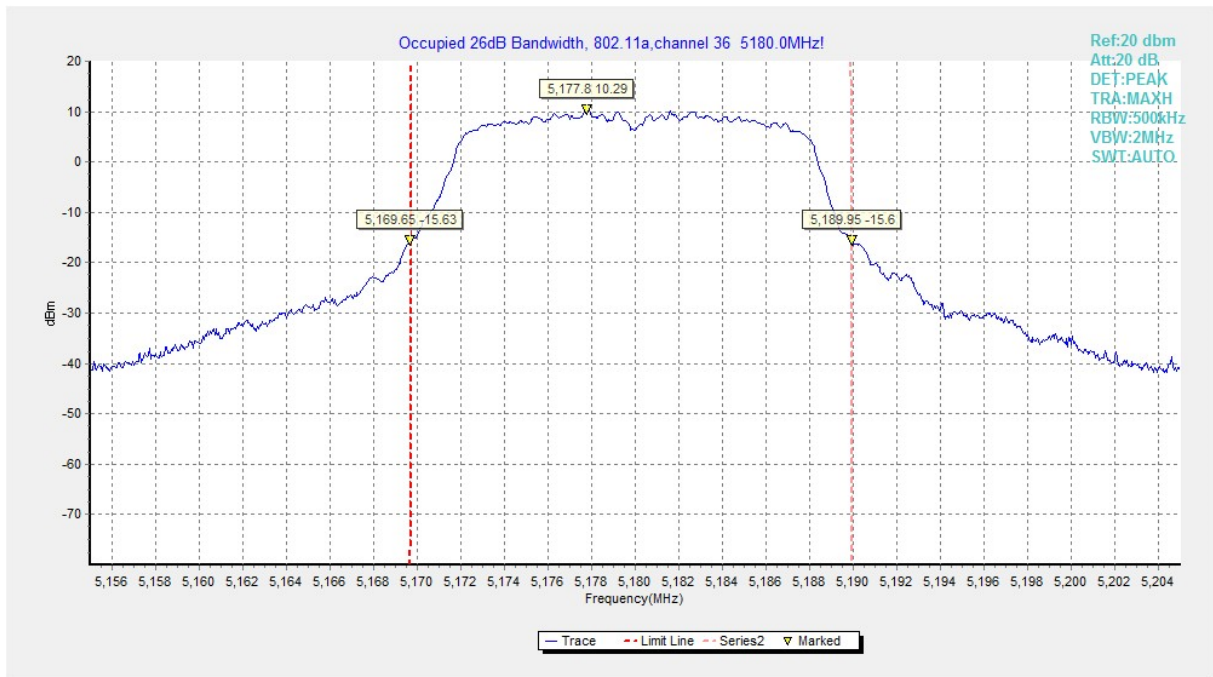
802.11n HT40	5190 MHz	Fig.28	41.04	P
	5230 MHz	Fig.29	40.96	P
	5270 MHz	Fig.30	41.04	P
	5310 MHz	Fig.31	41.04	P
	5510 MHz	Fig.32	41.12	P
	5550 MHz	Fig.33	40.96	P
	5670 MHz	Fig.34	41.04	P

802.11ac HT40	5190 MHz	Fig.35	40.96	P
	5230 MHz	Fig.36	40.80	P
	5270 MHz	Fig.37	40.96	P
	5310 MHz	Fig.38	41.12	P
	5510 MHz	Fig.39	40.96	P
	5550 MHz	Fig.40	40.88	P
	5670 MHz	Fig.41	40.88	P

802.11ac HT80	5210MHz	Fig.42	83.68	P
	5290MHz	Fig.43	83.52	P
	5530MHz	Fig.44	83.84	P
	5610MHz	Fig.45	83.52	P

**Conclusion: PASS**

**Test graphs as below:**



**Fig.1 Occupied 26dB Bandwidth (802.11a, 5180MHz)**