

FCC TEST REPORT

Product Name: Router
Trade Mark: AMTC, Boulanger, STRONG, essentiel b
Model No.: WR1819M
Add. Model No.: WR****M (* from 0 to 9)
Report Number: 220725611RFC-2
Test Standards: FCC 47 CFR Part 15 Subpart E
FCC ID: 2AHVH-WR1819M
Test Result: PASS
Date of Issue: September 7, 2023

Prepared for:

Shen Zhen MTC Co., LTD
MTC Industry Park, 1st Lilang Road, Xialilang community, Nanwan street, Longgang district, Shenzhen, China

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Prepared by:

Kieron Luo

Project Engineer

Reviewed by:

Henry Lu

Team Leader

Approved by:

Kevin Liang

Assistant Manager

Date:

September 7, 2023

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

Version

Version No.	Date	Description
V1.0	September 7, 2023	Original



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

CONTENTS

1. GENERAL INFORMATION	4
1.1 CLIENT INFORMATION	4
1.2 EUT INFORMATION	4
1.2.1 GENERAL DESCRIPTION OF EUT	4
1.2.2 DESCRIPTION OF ACCESSORIES.....	4
1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD	5
1.4 OTHER INFORMATION.....	6
1.5 DESCRIPTION OF SUPPORT UNITS	6
1.6 TEST LOCATION.....	6
1.7 TEST FACILITY.....	7
1.8 DEVIATION FROM STANDARDS	7
1.9 ABNORMALITIES FROM STANDARD CONDITIONS.....	7
1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER	7
1.11 MEASUREMENT UNCERTAINTY	7
2. TEST SUMMARY	8
3. EQUIPMENT LIST	9
4. TEST CONFIGURATION	10
4.1 ENVIRONMENTAL CONDITIONS FOR TESTING	10
4.1.1 NORMAL OR EXTREME TEST CONDITIONS	10
4.1.2 RECORD OF NORMAL ENVIRONMENT AND TEST SAMPLE	10
4.2 TEST CHANNELS	11
4.3 EUT TEST STATUS	11
4.4 PRE-SCAN.....	12
4.5 TEST SETUP	13
4.5.1 FOR RADIATED EMISSIONS TEST SETUP	13
4.5.2 FOR CONDUCTED EMISSIONS TEST SETUP	14
4.5.3 FOR CONDUCTED RF TEST SETUP	15
4.6 SYSTEM TEST CONFIGURATION.....	16
4.7 DUTY CYCLE	17
5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION	19
5.1 REFERENCE DOCUMENTS FOR TESTING	19
5.2 ANTENNA REQUIREMENT	19
5.3 26 DB BANDWIDTH	20
5.4 6 DB BANDWIDTH	54
5.5 MAXIMUM CONDUCTED OUTPUT POWER	66
5.6 PEAK POWER SPECTRAL DENSITY	72
5.7 RADIATED EMISSIONS AND BAND EDGE MEASUREMENT.....	122
5.8 AC POWER LINE CONDUCTED EMISSION	202
APPENDIX 1 PHOTOS OF TEST SETUP	205
APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS.....	205

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Shen Zhen MTC Co., LTD
Address of Applicant:	MTC Industry Park, 1st Lilang Road, Xialilang community, Nanwan street, Longgang district, Shenzhen, China
Manufacturer:	Shen Zhen MTC Co., LTD
Address of Manufacturer:	MTC Industry Park, 1st Lilang Road, Xialilang community, Nanwan street, Longgang district, Shenzhen, China

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Router		
Model No.:	WR1819M		
Add. Model No.:	WR****M (* from 0 to 9)		
Trade Mark:	AMTC, Boulanger, STRONG, essentiel b		
DUT Stage:	Identical Prototype		
EUT Supports Function: (Provided by the customer)	2.4 GHz ISM Band:	IEEE 802.11b/g/n/ax	
	U-NII 5 GHz Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n/ac/ax
		5 250 MHz to 5 350 MHz	IEEE 802.11a/n/ac/ax
		5 470 MHz to 5 725 MHz	IEEE 802.11a/n/ac/ax
		5 725 MHz to 5 850 MHz	IEEE 802.11a/n/ac/ax
Software Version:	v1.0 (Provided by the customer)		
Hardware Version:	WR1819M-ZC01-01 (Provided by the customer)		
Sample Received Date:	July 25, 2022		
Sample Tested Date:	August 22, 2022 to October 27, 2022		
Note: The additional model WR****M (* from 0 to 9) is identical with the test model WR1819M except the model number for marketing purpose.			

1.2.2 Description of Accessories

Adapter (1)	
Model No.:	MN012K-L120100
Input:	100-240 V~50/60 Hz 0.3 A Max
Output:	12.0 V = 1.0 A
AC Cable:	N/A
DC Cable:	1.5 Meter, Unshielded without ferrite

Adapter (2)	
Model No.:	KL-WA120100-E
Input:	100-240 V~50/60 Hz 0.5 A Max
Output:	12.0 V = 1.0 A 12.0W
AC Cable:	N/A
DC Cable:	1.5 Meter, Unshielded without ferrite

Cable	
Description:	Ethernet Cable
Cable Type:	Unshielded without ferrite

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

Length:	1.5 Meter
---------	-----------

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Bands:	5150 MHz to 5250 MHz (U-NII-1)				
	5250 MHz to 5350 MHz (U-NII-2A)				
	5470 MHz to 5725 MHz (U-NII-2C)				
	5725 MHz to 5850 MHz (U-NII-3)				
Frequency Ranges:	5180 MHz to 5240 MHz				
	5260 MHz to 5320 MHz				
	5500 MHz to 5700 MHz				
	5745 MHz to 5825 MHz				
Support Standards:	IEEE 802.11a/n/ac/ax				
TPC Function:	Not Support				
DFS Operational mode:	Master				
Type of Modulation:	IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK)				
	IEEE 802.11ac: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)				
	IEEE 802.11ax:				
	☒ OFDM (1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK) ☒ OFDMA (1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK)				
Channel Spacing:	IEEE 802.11a/n-HT20/ac-VHT20/ax-HE20: 20 MHz				
	IEEE 802.11n-HT40/ac-VHT40/ax-HE40: 40 MHz				
	IEEE 802.11ac-VHT80/ax-HE80: 80 MHz				
Data Rate:	IEEE 802.11a: Up to 54 Mbps				
	IEEE 802.11n: Up to MCS15				
	IEEE 802.11ac-VHT20: Up to MCS8				
	IEEE 802.11ac-VHT40/VHT80: Up to MCS9				
	IEEE 802.11ax-HE20/HE40/HE80: Up to MCS11				
Number of Channels:	5150 MHz to 5350 MHz:				
	8 for 802.11a/n-HT20/ac-VHT20/ax-HE20				
	4 for 802.11n-HT40/ac-VHT40/ax-HE40				
	2 for 802.11ac-VHT80/ax-HE80				
	5470 MHz to 5725 MHz:				
	11 for 802.11a/n-HT20/ac-VHT20/ax-HE20				
Antenna Type: (Provided by the customer)	5 for 802.11n-HT40/ac-VHT40/ax-HE40				
	2 for 802.11ac-VHT80/ax-HE80				
	5725 MHz to 5850 MHz:				
	5 for IEEE 802.11a/n-HT20/ac-VHT20/ax-HE20				
	2 for IEEE 802.11n-HT40/ac-VHT40/ax-HE40				
	1 for IEEE 802.11ac-VHT80/ax-HE80				
Antenna Gain (dBi): (Provided by the customer)	Antenna 0:	Integral Antenna			
	Antenna 1:	Integral Antenna			
Maximum conducted output power (dBm):	Antenna	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
	Antenna 0:	5	5	5	5
	Antenna 1:	5	5	5	5
	SISO_Ant. 0	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
Maximum conducted output power (dBm):	IEEE 802.11a:	14.68	14.46	14.92	17.23
	SISO_Ant. 1	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
	IEEE 802.11a:	17.62	17.50	15.75	17.31
	MIMO_Ant. 0+1	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

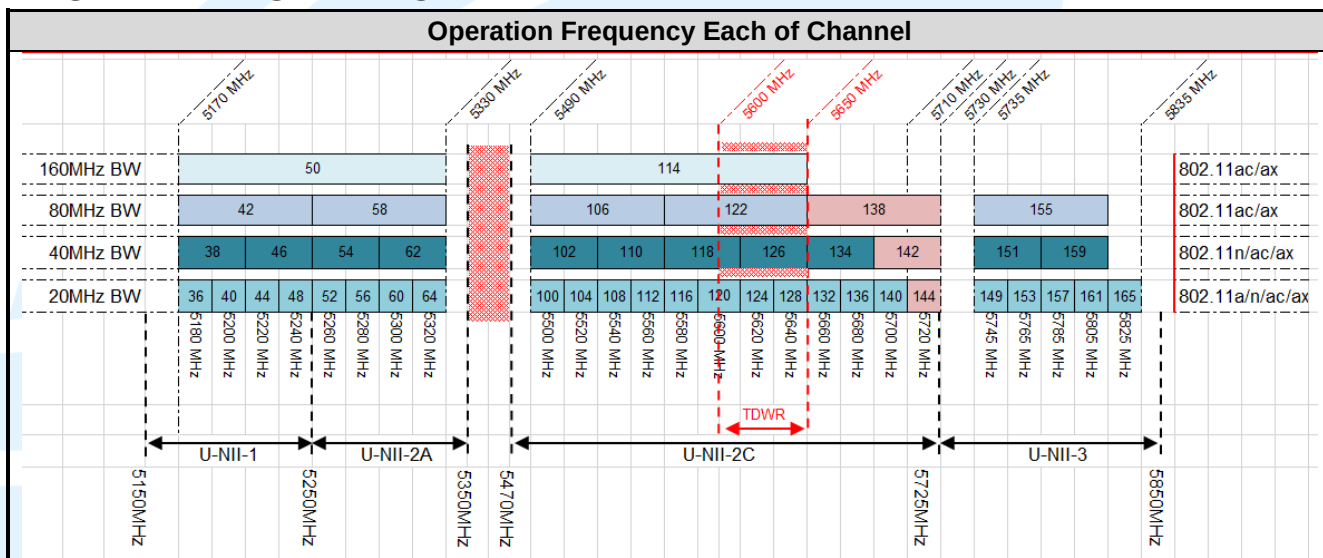
E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

	IEEE 802.11n-HT20:	15.69	15.71	15.60	16.56
	IEEE 802.11n-HT40:	13.38	13.04	14.35	17.58
	IEEE 802.11ac-VHT20:	15.38	15.42	15.43	16.32
	IEEE 802.11ac-VHT40:	13.08	12.74	14.04	17.20
	IEEE 802.11ac-VHT80:	9.51	9.38	9.68	13.21
	IEEE 802.11ax-HE20:	13.64	13.39	13.88	14.87
	IEEE 802.11ax-HE40:	12.21	12.10	12.42	15.12
	IEEE 802.11ax-HE80:	8.08	7.98	8.28	12.96
Normal Test Voltage:		120V~60Hz			

1.4 OTHER INFORMATION



1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	FCC ID	Supplied by
Notebook	DELL	Latitude3400	16238087894	UnionTrust	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	UnionTrust	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.30 Meter	UnionTrust

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China, China 518109
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

1.7 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories

CAB identifier: CN0032

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.2 dB
2	Conducted emission 150KHz-30MHz	±2.7 dB
3	Radiated emission 9KHz-30MHz	± 4.7 dB
4	Radiated emission 30MHz-1GHz	± 4.9 dB
5	Radiated emission 1GHz-18GHz	± 4.8 dB
6	Radiated emission 18GHz-26GHz	± 5.1 dB
7	Radiated emission 26GHz-40GHz	± 5.1 dB
8	Conducted spurious emissions	± 2.7 dB
9	RF Power, Conducted	± 0.68 dB
10	Occupied Bandwidth	± 1.86 %
11	Radio Frequency	5.6 GHz: ± 6.4 x 10 ⁻⁸
12	Transmission Time	± 0.19 %

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart E Test Cases			
Test Item	Test Requirement	Test Method	Result
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203 FCC 47 CFR Part 15 Subpart E Section 15.407(a)(1) (2)	N/A	PASS
26 dB emission bandwidth	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(2)(5)	KDB 789033 D02 v02r01 Section C.1	PASS
6 dB bandwidth	FCC 47 CFR Part 15 Subpart E Section 15.407 (e)	KDB 789033 D02 v02r01 Section C.2	PASS
Maximum conducted output power	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3)	KDB 789033 D02 v02r01 Section E.3.a (Method PM)	PASS
Peak Power Spectral Density	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3)	KDB 789033 D02 v02r01 Section F	PASS
Radiated Emissions and Band Edge Measurement	FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(1)(2)(3)(4)(6) FCC 47 CFR Part 15 Subpart C Section 15.209/205	KDB 789033 D02 v02r01 Section G.3, G.4, G.5, and G.6	PASS
Dynamic Frequency Selection	FCC 47 CFR Part 15 Subpart E Section 15.407 (h)	KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02	PASS Note2
AC Power Line Conducted Emission	FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(6) FCC 47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013, Section 6.2.	PASS
Note: 1) N/A: In this whole report not applicable. 2) Please refer to Report No.: 220725611RFC-3 for DFS Test report.			
Disclaimer and Explanations: The declared of product specification and data (e.g., antenna gain, RF specification, etc) for EUT presented in the report are provided by the customer, and the customer takes all the responsibilities for the accuracy of product specification.			

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	Euroshiedpn-CT001270-1317	22-Jan-2021	21-Jan-2024
☒	Receiver	R&S	ESIB26	100114	5-Nov-2021	4-Nov-2022
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	11-Nov-2021	10-Nov-2023
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	11-Nov-2021	10-Nov-2023
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	11-Nov-2021	10-Nov-2023
☒	Preamplifier	HP	8447F	2805A02960	5-Nov-2021	4-Nov-2022
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	17-Apr-2022	16-Apr-2024
☒	Pre-amplifier	ETS-LINDGREN	00118385	00201874	6-Nov-2021	5-Nov-2022
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	14-Nov-2020	13-Nov-2022
☒	Pre-amplifier	ETS-LINDGREN	00118384	00202652	17-Nov-2020	16-Nov-2022
☒	Band Rejection Filter (5150MHz~5880MHz)	Micro-Tronics	BRM50716	G186	6-Nov-2021	5-Nov-2022
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	Receiver	R&S	ESR7	1316.3003K07-101181-K3	5-Nov-2021	4-Nov-2022
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	5-Nov-2021	4-Nov-2022
☒	LISN	R&S	ESH2-Z5	860014/024	5-Nov-2021	4-Nov-2022
☐	LISN	ETS-Lindgren	3816/2SH	00201088	5-Nov-2021	4-Nov-2022
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted RF test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	15-Apr-2022	14-Apr-2023
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	5-Nov-2021	4-Nov-2022
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430023	5-Nov-2021	4-Nov-2022
☐	EXG-B RF Analog Signal Generator	KEYSIGHT	N5171B	MY53051777	5-Nov-2021	4-Nov-2022
☒	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	5-Nov-2021	4-Nov-2022

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage	Relative Humidity (%)
NT/NV	+15 to +35	120V~60Hz	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment and Test Sample

Test Item	Temp. (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
AC Power Line Conducted Emission	21.2	61.1	98.69	S20220725243-ZJA03/4	David Zhang
26 dB emission bandwidth	24.2	46.5	100.3	S20220725243-ZJA02/4	Rain Wang
Maximum conducted output power	24.2	46.5	100.3	S20220725243-ZJA02/4	Rain Wang
Peak Power Spectral Density	24.2	46.5	100.3	S20220725243-ZJA02/4	Rain Wang
6 dB bandwidth	24.2	46.5	100.3	S20220725243-ZJA02/4	Rain Wang
Dynamic Frequency Selection	24.2	46.5	100.3	S20220725243-ZJA02/4	Rain Wang
Radiated Emissions and Band Edge Measurement	24.4	51.	100.2	S20220725243-ZJA03/4	Fire Huo

4.2 TEST CHANNELS

Mode	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
IEEE 802.11a IEEE 802.11n-HT20 IEEE 802.11ac-VHT20 IEEE 802.11ax-HE20	5150 - 5250 MHz	Channel 36	Channel 44	Channel 48
		5180 MHz	5220 MHz	5240 MHz
	5250 - 5350 MHz	Channel 52	Channel 60	Channel 64
		5260 MHz	5300 MHz	5320 MHz
	5470 - 5725 MHz	Channel 100	Channel 120	Channel 140
		5500 MHz	5600 MHz	5700 MHz
	5725 - 5850 MHz	Channel 149	Channel 157	Channel 165
		5745 MHz	5785 MHz	5825 MHz
IEEE 802.11n-HT40 IEEE 802.11ac-VHT40 IEEE 802.11ax-HE40	5150 - 5250 MHz	Channel 38	--	Channel 46
		5190 MHz	--	5230 MHz
	5250 - 5350 MHz	Channel 54	--	Channel 62
		5270 MHz	--	5310 MHz
	5470 - 5725 MHz	Channel 102	Channel 118	Channel 134
		5510 MHz	5590 MHz	5670 MHz
	5725 - 5850 MHz	Channel 151	--	Channel 159
		5755 MHz	--	5795 MHz
IEEE 802.11ac-VHT80 IEEE 802.11ax-HE80	5150 - 5250 MHz	--	Channel 42	--
		--	5210 MHz	--
	5250 - 5350 MHz	--	Channel 58	--
		--	5290 MHz	--
	5470 - 5725 MHz	Channel 106	--	Channel 122
		5530 MHz	--	5610 MHz
	5725 - 5850 MHz	--	Channel 155	--
		--	5775 MHz	--

4.3 EUT TEST STATUS

Mode	Tx/Rx Function	Description
IEEE 802.11a	1Tx/1Rx	1. Keep the EUT in continuously transmitting or receiving with modulation and data rates test single. 2. Keep the equipment in normal operation and achieve a certain throughput.
IEEE 802.11n	2Tx/2Rx	
IEEE 802.11ac		
IEEE 802.11ax		

Power Setting (Provided by the customer)				
Mode	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
IEEE 802.11a	16	16	15	17
IEEE 802.11n-HT20	13	13	13	14
IEEE 802.11n-HT40	11	11	12	15
IEEE 802.11ax-VHT20	13	13	13	14
IEEE 802.11ax-VHT40	11	11	12	15
IEEE 802.11ax-VHT80	12	12	12	16
IEEE 802.11ax-HE20 (26RU)	11	10	10	10
IEEE 802.11ax-HE20 (52RU)	11	10	10	11
IEEE 802.11ax-HE20 (106RU)	11	11	11	12

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

IEEE 802.11ax-HE20 (SU)	11	11	11	12
IEEE 802.11ax-HE40 (SU)	10	10	10	13
IEEE 802.11ax-HE80 (SU)	10	10	10	15

Test Software (Provided by the customer)
Test software name: QATool_Dbg.exe;

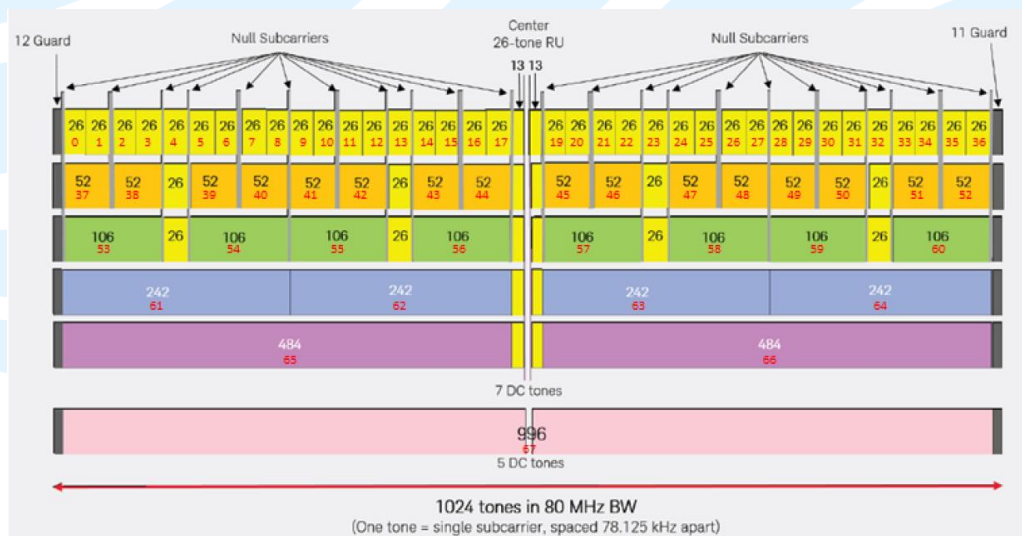
4.4PRE-SCAN

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Following data rate was (were) selected for the final test as listed below

Mode	Worst-case data rates
IEEE 802.11a	6 Mbps
IEEE 802.11n-HT20	MCS0
IEEE 802.11n-HT40	MCS0
IEEE 802.11ac-VHT20	MCS0
IEEE 802.11ac-VHT40	MCS0
IEEE 802.11ac-VHT80	MCS0
IEEE 802.11ax-HE20	MCS0
IEEE 802.11ax-HE40	MCS0
IEEE 802.11ax-HE80	MCS0

Note:

1. Pre-scan all RUs at 20MHz bandwidth to find the worst case mode selection report; the full RU is the worst case mode. For 40 bandwidths and 80 bandwidths, only the worst full RU mode is shown in the report.
2. IEEE 802.11ax supports the following RU configurations:



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

4.5 TEST SETUP

4.5.1 For Radiated Emissions test setup

Figure 1. Below 30MHz

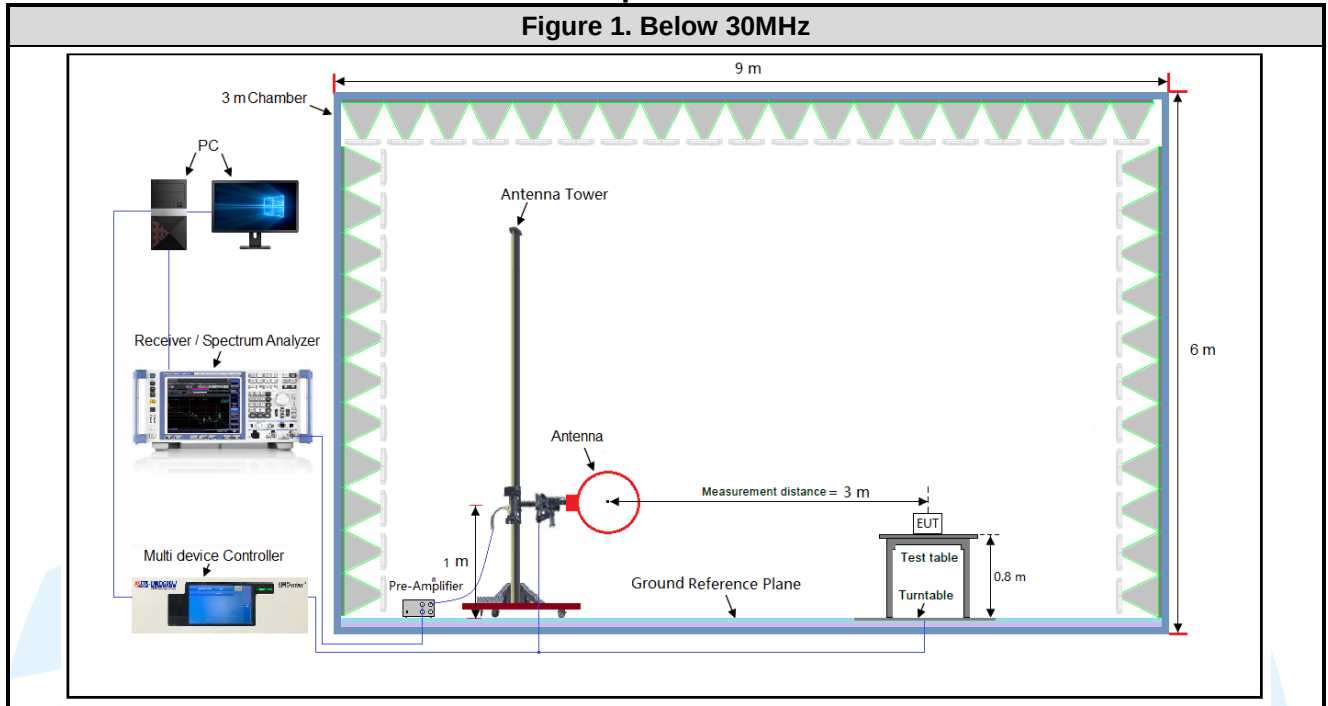
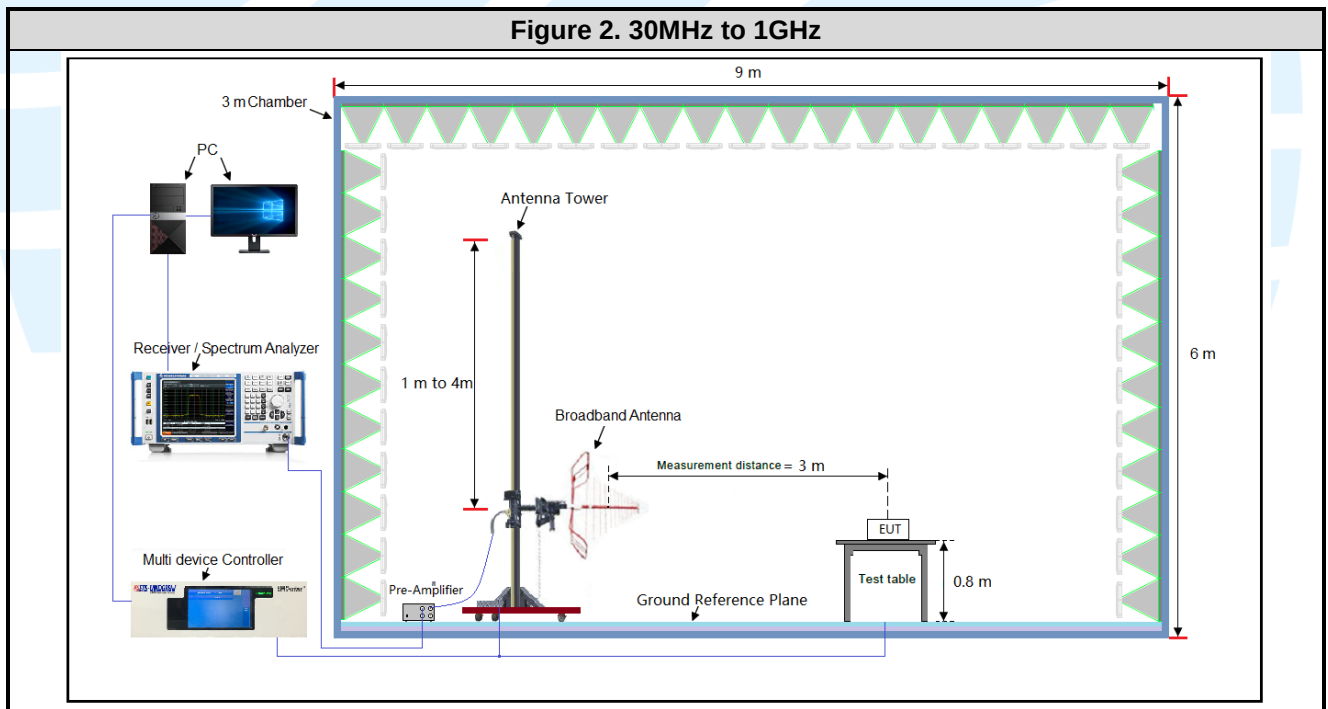
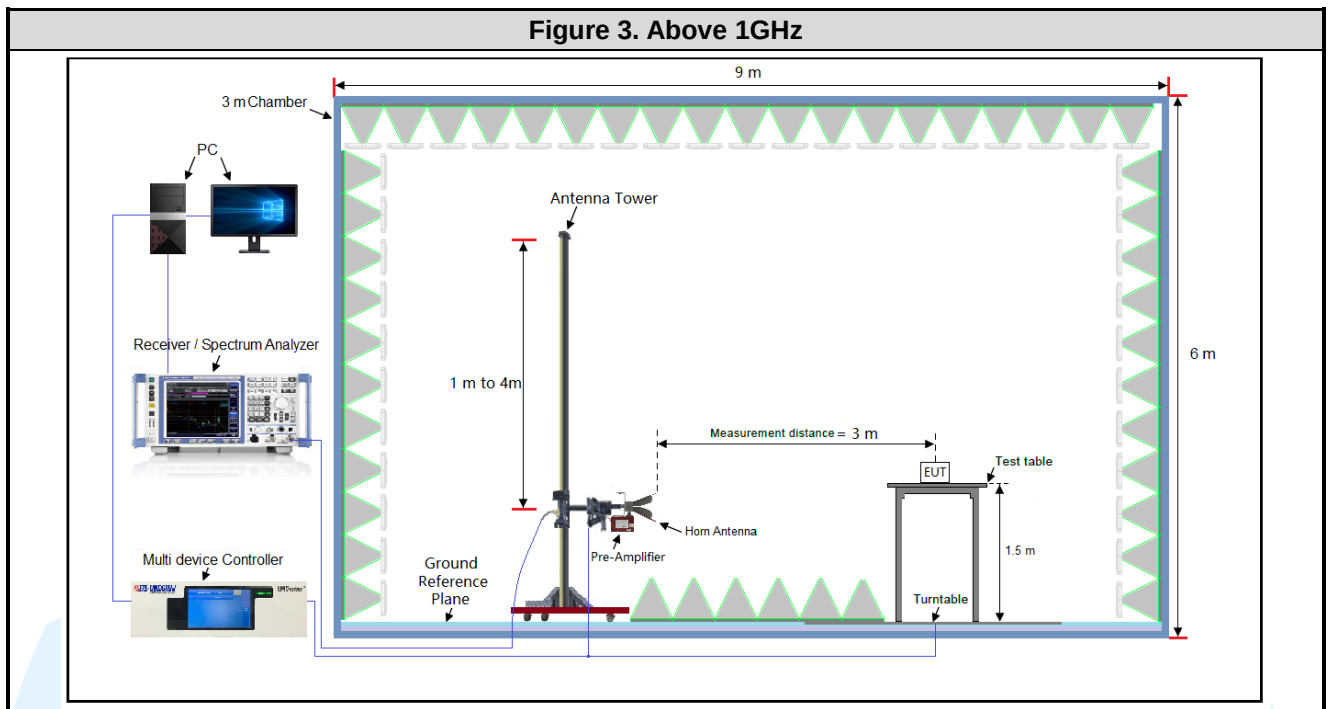
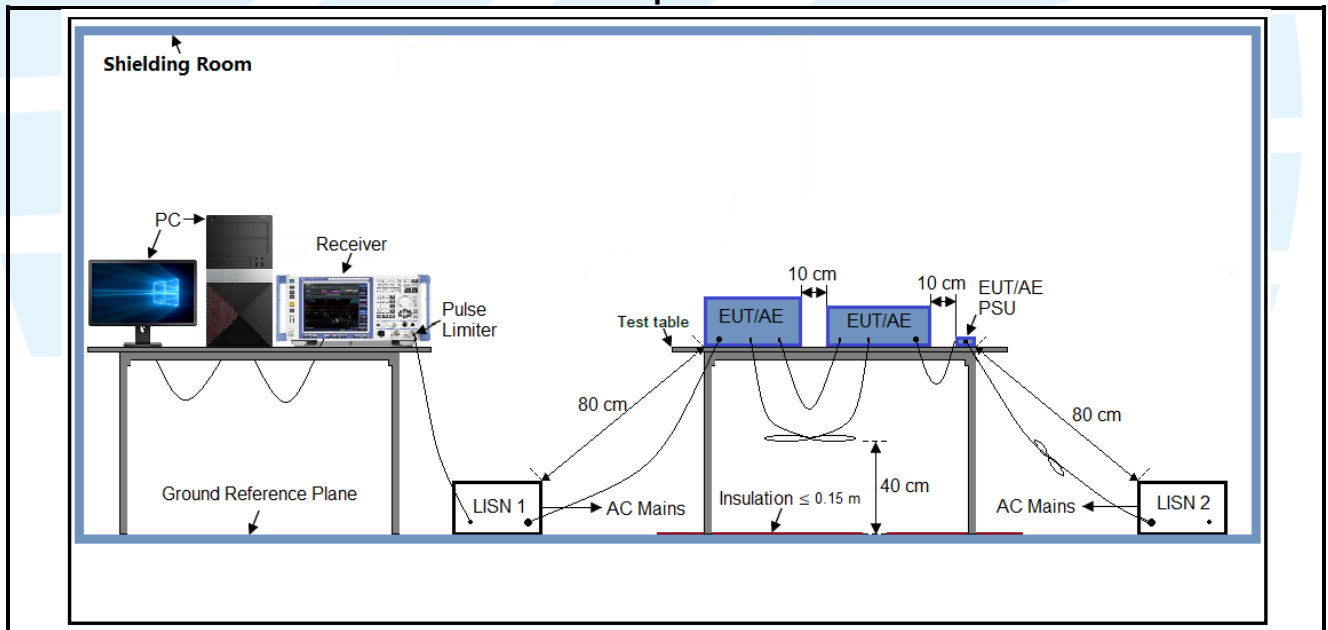


Figure 2. 30MHz to 1GHz

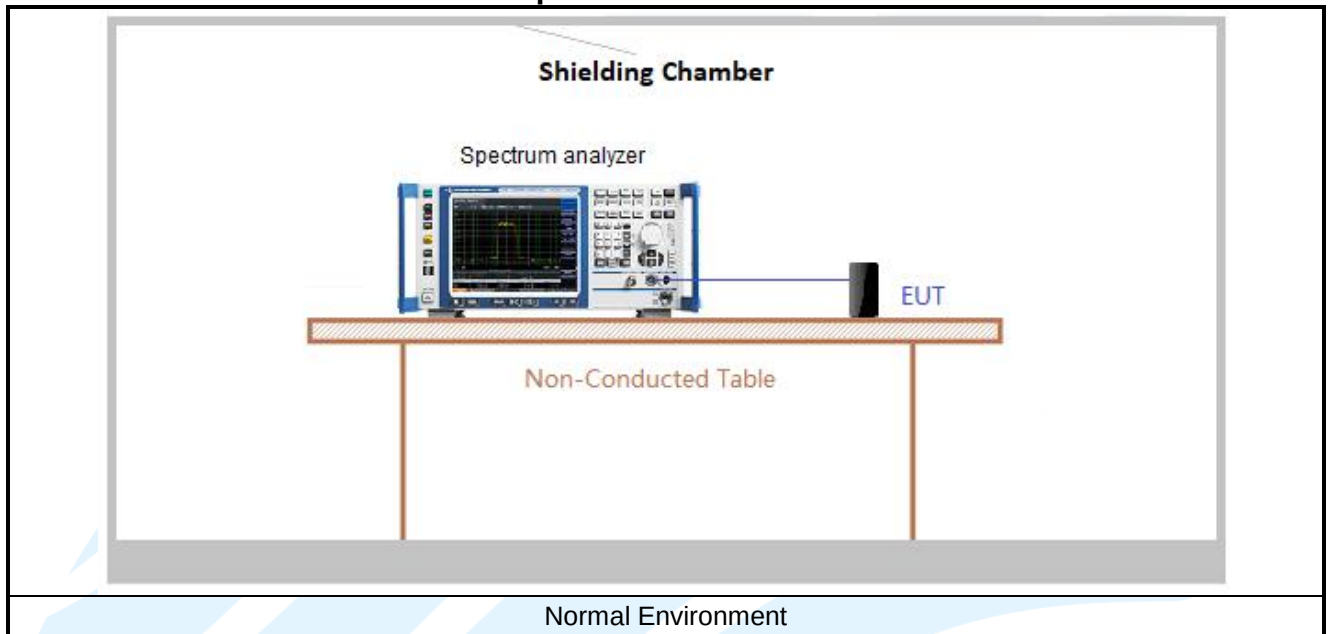




4.5.2 For Conducted Emissions test setup



4.5.3 For Conducted RF test setup



4.6 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 3.85V battery. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Therefore, all final radiated testing was performed with the EUT in orientation.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.7 DUTY CYCLE

Test Procedure: ANSI C63.10-2013 Clause 12.2.

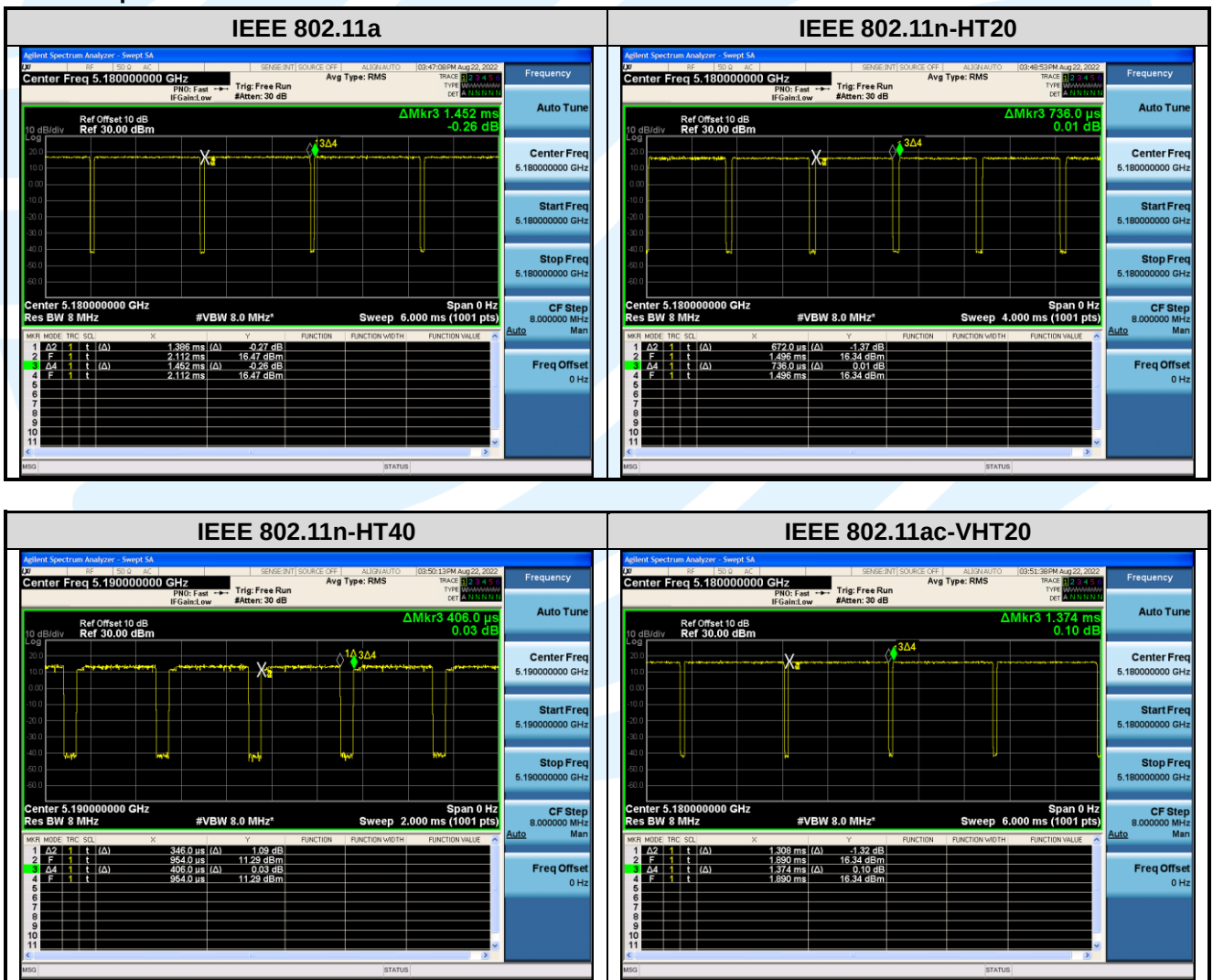
Test Results

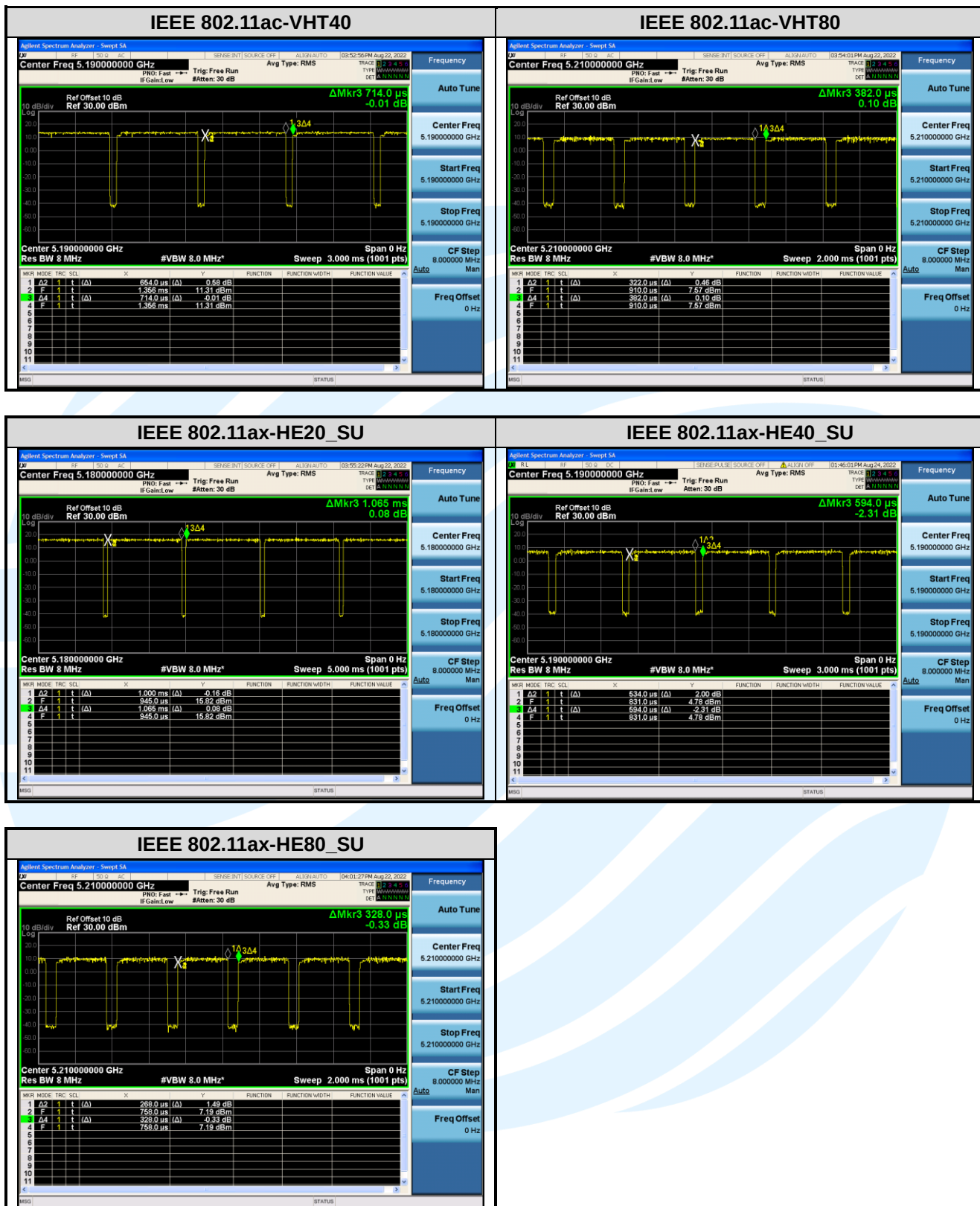
Mode	RU	Data Rates	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/T Minimum VBW (kHz)
IEEE 802.11a	N/A	6 Mbps	1.386	1.452	0.95	95.45	0.20	0.72
IEEE 802.11n-HT20	N/A	MCS 0	0.672	0.736	0.91	91.30	0.40	1.49
IEEE 802.11n-HT40	N/A	MCS 0	0.346	0.406	0.85	85.22	0.69	2.89
IEEE 802.11ac-VHT20	N/A	MCS 0	1.308	1.374	0.95	95.20	0.21	0.76
IEEE 802.11ac-VHT40	N/A	MCS 0	0.654	0.714	0.92	91.60	0.38	1.53
IEEE 802.11ac-VHT80	N/A	MCS 0	0.322	0.382	0.84	84.29	0.74	3.11
IEEE 802.11ax-HE20	SU	MCS 0	1.000	1.065	0.94	93.90	0.27	1.00
IEEE 802.11ax-HE40	SU	MCS 0	0.534	0.594	0.90	89.90	0.46	1.87
IEEE 802.11ax-HE80	SU	MCS 0	0.268	0.328	0.82	81.71	0.88	3.73

Remark:

- 1) Duty cycle= On Time/ Period;
- 2) Duty Cycle factor = 10 * log(1/ Duty cycle)

The test plots as follows





5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 15	Radio Frequency Devices
3	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
4	KDB 789033 D02 General UNII Test Procedures New Rules v02r01	Guidelines for compliance testing of unlicensed national information infrastructure (U-NII) device part 15, subpart E
5	KDB 905462 D06 802.11 Channel Plans New Rules v02	Operation in U-NII bands -802.11 channel PLAN(\$15.407)
6	KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02	Compliance measurement procedures for Unlicensed –National Information Infrastructure devices operates in the frequency bands 5250 MHz to 5350 MHz and 5470 MHz to 5725 MHz bands incorporating dynamic frequency selection

5.2 ANTENNA REQUIREMENT

Standard Requirement
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.407(a)(1) (2) requirement: The conducted output power limit specified in paragraph (a) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (a) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
EUT Antenna: Both antenna in the interior of the equipment and no consideration of replacement. The transmit signals are correlated with each other and the antenna gain of both chains is completely consistent, the best-case directional gain of the antenna is 5 dBi.

5.326 DB BANDWIDTH

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (a) (2)(5)

Test Method: KDB 789033 D02 v02r01 Section C.1

Limit: None; for reporting purposes only.

Test Procedure:

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum analyzer.

Spectrum analyzer according to the following Settings:

a) Set RBW = approximately 1 % of the emission bandwidth.

b) Set the VBW > RBW.

c) Detector = Peak.

d) Trace mode = max hold.

e) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.5.3 for details.

Instruments Used: Refer to section 3 for details

Test Results: Pass

Mode	Ch.	Freq. (MHz)	RU	26 dB Bandwidth (MHz)		99% Bandwidth (MHz)	
				Ant. 0	Ant. 1	Ant. 0	Ant. 1
IEEE 802.11a	36	5180	N/A	20.09	20.22	16.733	16.745
	44	5220		20.11	20.05	16.648	16.696
	48	5240		20.15	20.26	16.630	16.684
	52	5260		20.12	20.25	16.754	16.709
	60	5300		20.16	20.14	16.726	16.622
	64	5320		20.14	20.03	16.690	16.736
	100	5500		20.04	20.21	16.654	16.668
	120	5600		20.03	20.19	16.664	16.704
	140	5700		20.18	20.22	16.725	16.664
IEEE 802.11n -HT20	36	5180	N/A	20.60	20.41	17.769	17.664
	44	5220		20.59	20.14	17.739	17.660
	48	5240		20.56	20.39	17.815	17.668
	52	5260		20.44	20.29	17.731	17.648
	60	5300		20.52	20.44	17.770	17.680
	64	5320		20.52	20.51	17.698	17.670
	100	5500		20.41	20.19	17.716	17.624
	120	5600		20.61	20.26	17.761	17.665
	140	5700		20.49	20.25	17.785	17.626
IEEE 802.11n -HT40	38	5190	N/A	40.84	39.72	35.955	35.886
	46	5230		40.45	39.80	35.877	35.836
	54	5270		40.52	40.37	35.884	35.922
	62	5310		40.43	39.96	35.885	35.871
	102	5510		40.36	39.61	35.894	35.850
	110	5550		40.20	39.80	35.969	35.816
	134	5670		40.20	39.94	35.893	35.752
IEEE 802.11ac -VHT20	36	5180	N/A	20.27	20.08	17.726	17.632
	44	5220		20.58	20.14	17.700	17.663
	48	5240		20.21	20.26	17.728	17.663
	52	5260		20.52	20.11	17.735	17.688
	60	5300		20.55	20.23	17.797	17.644
	64	5320		20.45	20.15	17.762	17.661

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

	100	5500		20.47	20.26	17.702	17.654
	120	5600		20.41	20.31	17.716	17.631
	140	5700		20.39	20.18	17.713	17.647
IEEE 802.11ac -VHT40	38	5190	N/A	40.28	39.80	35.900	35.805
	46	5230		40.35	39.29	35.956	35.801
	54	5270		39.98	39.76	35.881	35.837
	62	5310		40.33	39.99	35.947	35.866
	102	5510		40.71	39.90	35.949	35.754
	110	5550		40.20	39.80	35.969	35.816
	134	5670		40.60	39.99	35.972	35.803
IEEE 802.11ac -VHT80	42	5210	N/A	79.94	79.82	75.086	75.040
	58	5290		80.06	79.85	75.045	75.020
	106	5530		79.92	79.82	75.131	74.996
	122	5610		79.95	79.90	74.818	74.894

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

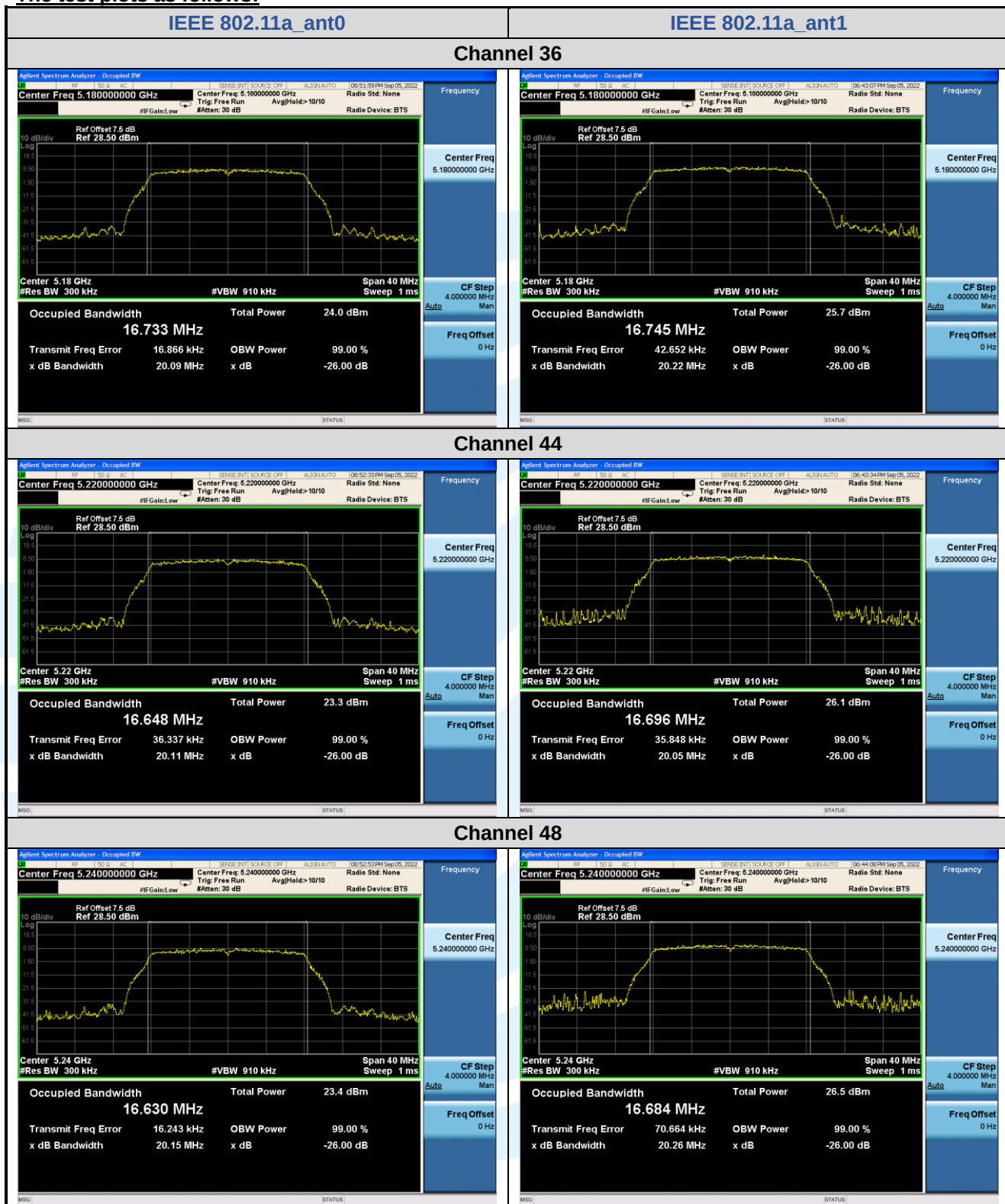
E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

Mode	Ch.	Freq. (MHz)	RU	26 dB Bandwidth (MHz)		99% Bandwidth (MHz)	
				Ant. 0	Ant. 1	Ant. 0	Ant. 1
IEEE 802.11ax-HE20	36	5180	26RU0	21.59	20.64	18.913	18.597
			52RU37	21.06	21.60	18.377	18.279
			106RU53	21.91	21.33	18.350	18.253
			SU	22.81	26.33	19.086	19.121
	44	5220	26RU4	18.56	18.41	17.067	17.064
			52RU39	18.84	18.66	17.106	17.083
			106RU53	21.73	20.96	18.370	18.318
			SU	27.30	23.79	19.067	19.061
	48	5240	26RU8	20.64	21.34	18.651	18.602
			52RU40	22.20	21.12	18.495	18.406
			106RU54	21.24	22.41	18.355	18.295
			SU	22.67	23.28	19.056	19.059
	52	5260	26RU0	20.75	20.67	18.674	18.614
			52RU37	21.27	20.91	18.457	18.228
			106RU53	20.73	20.74	18.336	18.273
			SU	22.80	25.00	19.104	19.070
	60	5300	26RU4	18.60	18.39	17.125	17.072
			52RU39	18.72	18.53	17.113	17.116
			106RU53	21.37	21.62	18.384	18.288
			SU	26.43	25.35	19.092	19.060
	64	5320	26RU8	21.91	20.22	18.645	18.600
			52RU40	21.76	21.38	18.503	18.394
			106RU54	22.70	21.87	18.350	18.281
			SU	23.24	23.52	19.079	19.032
	100	5500	26RU0	21.32	21.00	18.723	18.633
			52RU37	21.13	21.46	18.367	18.319
			106RU53	21.79	22.08	18.391	18.285
			SU	25.19	26.98	19.039	19.087
	120	5600	26RU4	18.62	18.41	17.102	17.052
			52RU39	18.80	18.41	17.126	17.052
			106RU53	21.00	21.72	18.428	18.277
			SU	23.56	25.96	19.065	19.158
	140	5700	26RU8	20.54	20.38	18.655	18.707
			52RU40	21.79	20.45	18.487	18.426
			106RU54	22.73	22.94	18.374	18.290
			SU	27.26	25.15	19.123	19.114
IEEE 802.11ax-HE40	38	5190	SU	39.49	39.64	37.469	37.442
	46	5230	SU	39.62	39.51	37.565	37.528
	54	5270	SU	39.61	39.43	37.486	37.465
	62	5310	SU	39.48	39.52	37.419	37.491
	102	5510	SU	39.67	39.60	37.427	37.475
	110	5550	SU	39.59	39.53	37.459	37.451
	134	5670	SU	39.54	39.44	37.465	37.491
IEEE 802.11ax-HE80	42	5210	SU	80.74	80.51	76.737	76.363
	58	5290	SU	80.56	80.59	76.565	76.701
	106	5530	SU	80.74	80.50	76.611	76.594
	122	5610	SU	80.72	80.79	76.537	76.698

The test plots as follows:



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

