



TEST REPORT

Certificate #4312.01

Product Name: Wi-Fi 6 Extender and Access Point
Trade Mark: GRANDSTREAM
Model No.: GWN7660EM
Report Number: 25081819514RFC-4
Test Standards: FCC 47 CFR Part 15 Subpart E
FCC ID: YZZGWN7660EM
Test Result: PASS
Date of Issue: November 14, 2025

Prepared for:

Grandstream Networks, Inc.
126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
16/F, Block A, Building 6th, Baoneng Science and Technology Park,
Longhua Street, Longhua District, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Prepared by:

David Chen

David Chen

Senior Project Engineer

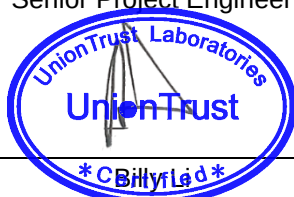
Reviewed by:

Kevin Liang

Kevin Liang

Assistant Manager

Approved by:



Technical Director

Date:

November 14, 2025

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, 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	November 14, 2025	Original



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, 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	4
1.4 OTHER INFORMATION.....	5
1.5 DESCRIPTION OF SUPPORT UNITS	5
1.6 TEST LOCATION.....	6
1.7 TEST FACILITY.....	6
1.8 DEVIATION FROM STANDARDS	6
1.9 ABNORMALITIES FROM STANDARD CONDITIONS.....	6
1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER	6
1.11 MEASUREMENT UNCERTAINTY	7
2. TEST SUMMARY	8
3. EQUIPMENT LIST	9
4. TEST CONFIGURATION	11
4.1 ENVIRONMENTAL CONDITIONS FOR TESTING.....	11
4.1.1 NORMAL OR EXTREME TEST CONDITIONS	11
4.1.2 RECORD OF NORMAL ENVIRONMENT AND TEST SAMPLE	11
4.2 TEST CHANNELS	11
4.3 EUT TEST STATUS	12
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	23
5.1 REFERENCE DOCUMENTS FOR TESTING	23
5.2 ANTENNA REQUIREMENT	23
5.3 6 dB BANDWIDTH & 99% OCCUPIED BANDWIDTH.....	24
5.4 MAXIMUM CONDUCTED OUTPUT POWER	25
5.5 PEAK POWER SPECTRAL DENSITY	27
5.6 RADIATED EMISSIONS AND BAND EDGE MEASUREMENT.....	28
5.7 AC POWER LINE CONDUCTED EMISSION	53
APPENDIX A RF TEST DATA.....	56
A.1 99% BANDWIDTH	56
A.2 PEAK POWER SPECTRAL DENSITY	69
A.3 6dB BANDWIDTH.....	81
APPENDIX 1 PHOTOS OF TEST SETUP.....	94
APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS.....	94

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Grandstream Networks, Inc.
Address of Applicant:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA
Manufacturer:	Grandstream Networks, Inc.
Address of Manufacturer:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Wi-Fi 6 Extender and Access Point		
Model No.:	GWN7660EM		
Trade Mark:	GRANDSTREAM		
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
		5 850 MHz to 5 895 MHz	IEEE 802.11a/n/ac/ax
Software Version:	1.0.24.4(Provided by the customer)		
Hardware Version:	V1.1(Provided by the customer)		
Sample Received Date:	August 16, 2025		
Sample Tested Date:	August 27, 2025 October 22, 2025		
Remark:	The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.		

1.2.2 Description of Accessories

None.

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Bands:	5850 MHz to 5895 MHz (U-NII-4)
Frequency Ranges:	5845 MHz to 5885 MHz
Support Standards:	IEEE 802.11a/n/ac/ax
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/OFDMA ^{Note1} (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
	IEEE 802.11ac-VHT160/ax-HE160: 160 MHz
Data Rate:	IEEE 802.11a: Up to 54 Mbps
	IEEE 802.11n: Up to MCS23
	IEEE 802.11ac-VHT20: Up to MCS8
	IEEE 802.11ac-VHT40/VHT80/VHT160: Up to MCS9
	IEEE 802.11ax-HE20/HE40/HE80/HE160: Up to MCS11

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

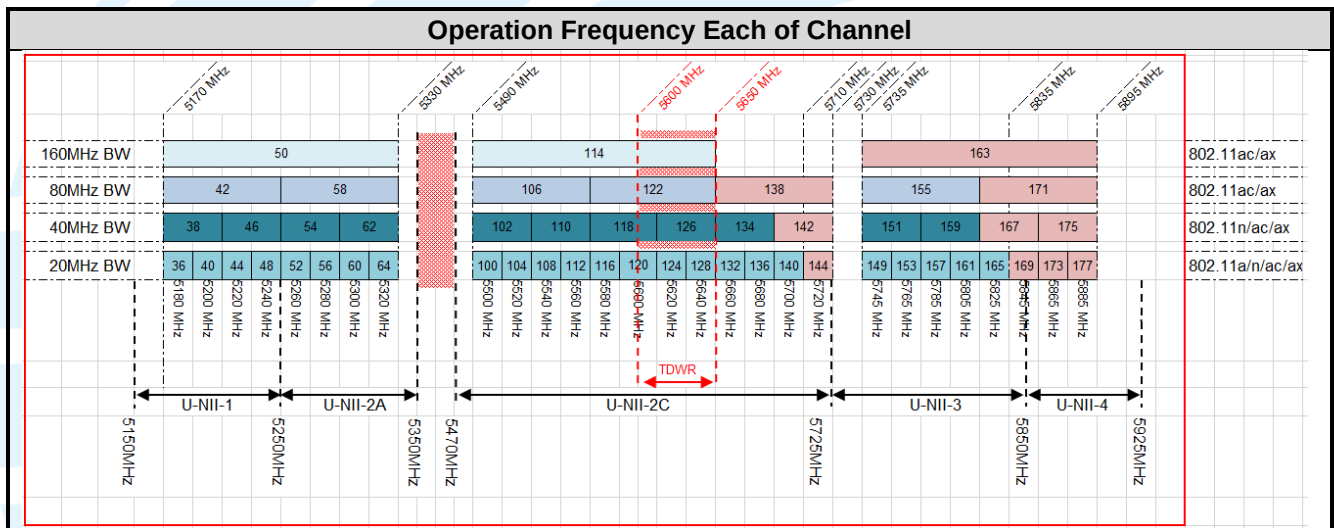
E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

Number of Channels:	5835 MHz to 5895 MHz: 3 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 1 for 802.11ac-VHT160/ax-HE160	
Antenna Type: (Provided by the customer)	Antenna 1:	PIFA Antenna
	Antenna 2:	PIFA Antenna
	Antenna 3:	PIFA Antenna
Antenna Gain (Provided by the customer)	Antenna	U-NII-4
	Antenna 1:	2.88
	Antenna 2:	2.88
	Antenna 3:	2.57
Normal Test Voltage:	120 Vac	
Note 1: For IEEE 802.11ax, the customer declaration the product supports only the Full RU mode.		

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	Supplied by
Notebook	Lenovo	B40-80	MP12NEQ6	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	UnionTrust
Router	H3C	H3C Magic NX30 Pro	2023AP4524	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length(Meter)	Supplied by
1	Ethernet Cable	RJ45	1.5 Unshielded without ferrite	UnionTrust
2	Antenna Cable*3	SMA	0.1	UnionTrust

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China 518109

Telephone: +86 (0) 755 2823 0888

Fax: +86 (0) 755 2823 0886

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

Dongguan DN Testing Co., Ltd.

A2LA-Lab Certificate No.: 7050.01

CAB identifier: CN0149

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, 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

1.11 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 %

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
6 dB bandwidth	FCC 47 CFR Part 15 Subpart E Section 15.407 (e)	KDB 789033 D02 v02r01 Section C.2	PASS
99% Occupied Bandwidth	N/A	KDB 789033 D02 v02r01 Section D	N/A Note 2
Maximum conducted output power	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(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)(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)(5) 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
AC Power Line Conducted Emission	FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(9) FCC 47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2020, Section 6.2.	PASS
Note: 1) N/A: In this whole report not applicable. 2) No test requirement, for reporting purposes only.			
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

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	3m SAC	ETS-LINDGREN	3m	Euroshiedpn-CT001270-1317	11-Nov-2023	10-Nov-2026
☒	Receiver	R&S	ESIB26	100114	25-Oct-2024	24-Oct-2025
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	28-Mar-2025	27-Mar-2026
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	28-Oct-2024	27-Oct-2025
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	29-Oct-2024	28-Oct-2025
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	29-Oct-2024	28-Oct-2025
☒	Preamplifier	HP	8447F	2805A02960	25-Oct-2024	24-Oct-2025
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	29-Mar-2025	28-Mar-2026
☒	Pre-amplifier	ETS-Lindgren	00118385	00201874	29-Mar-2025	28-Mar-2026
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	28-Oct-2024	27-Oct-2025
☒	Pre-amplifier	ETS-Lindgren	00118384	00202652	28-Oct-2024	27-Oct-2025
☒	Band Rejection Filter (5150MHz~5880MHz)	Micro-Tronics	BRM50716	G186	25-Oct-2024	24-Oct-2025
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	Receiver	R&S	ESC13	1166.5950.03	25-Oct-2024	24-Oct-2025
☒	LISN	ETS-Lindgren	3816/2SH	00201088	25-Oct-2024	24-Oct-2025
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	25-Oct-2024	24-Oct-2025
☒	Shielding room	ETS-Lindgren	843	Euroshiedpn-CT001270-1246	N/A	N/A
☒	Test Software	EZ-EMC	EZ-CON	Software Version: EMC-CON 3A1.1		

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, 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

Conducted RF test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	28-Mar-2025	27-Mar-2026
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	25-Oct-2024	24-Oct-2025
☒	EXG-B RF Analog Signal Generator	KEYSIGHT	N5171B	MY53051777	25-Oct-2024	24-Oct-2025
☒	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	25-Oct-2024	24-Oct-2025
☒	Spectrum Analyzer	R&S	FSV40-N	101653	28-Mar-2025	27-Mar-2026
☒	Band Rejection Filter (5150MHz~5880MHz)	Micro-Tronics	BRM50716	G186	25-Oct-2024	24-Oct-2025

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, 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 (V)	Relative Humidity (%)
NT/NV	+15 to +35	120	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	22.3	44.2	99.7	S202508166685-ZJA01/5	Fire Huo
Maximum conducted output power	22.4	42.6	100.5	S202508166685-ZJA04/5	David Du
Peak Power Spectral Density					
6 dB bandwidth					
Radiated Emissions and Band Edge Measurement	23.1	54.2	99.9	S202508166685-ZJA03/5	Leo Li

4.2 TEST CHANNELS

Mode	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
IEEE 802.11a	5835 - 5895 MHz	Channel 169	Channel 173	Channel 177
IEEE 802.11n-HT20		5845 MHz	5865MHz	5885MHz
IEEE 802.11ac-VHT20				
IEEE 802.11ax-HE20	5835 - 5895 MHz	Channel 167	--	Channel 175
IEEE 802.11n-HT40		5835 MHz	--	5875 MHz
IEEE 802.11ac-VHT40				
IEEE 802.11ax-HE40	5835 - 5895 MHz	--	Channel 171	--
IEEE 802.11ac-VHT80		--	5855 MHz	--
IEEE 802.11ax-HE80				
IEEE 802.11ac-VHT160	5835 - 5895 MHz	Channel 163		
IEEE 802.11ax-HE160		5815 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	3Tx/3Rx	
IEEE 802.11ac		
IEEE 802.11ax		

Test Software (Provided by the customer)

Test software name: MT7981 QA 0.0.2.78;

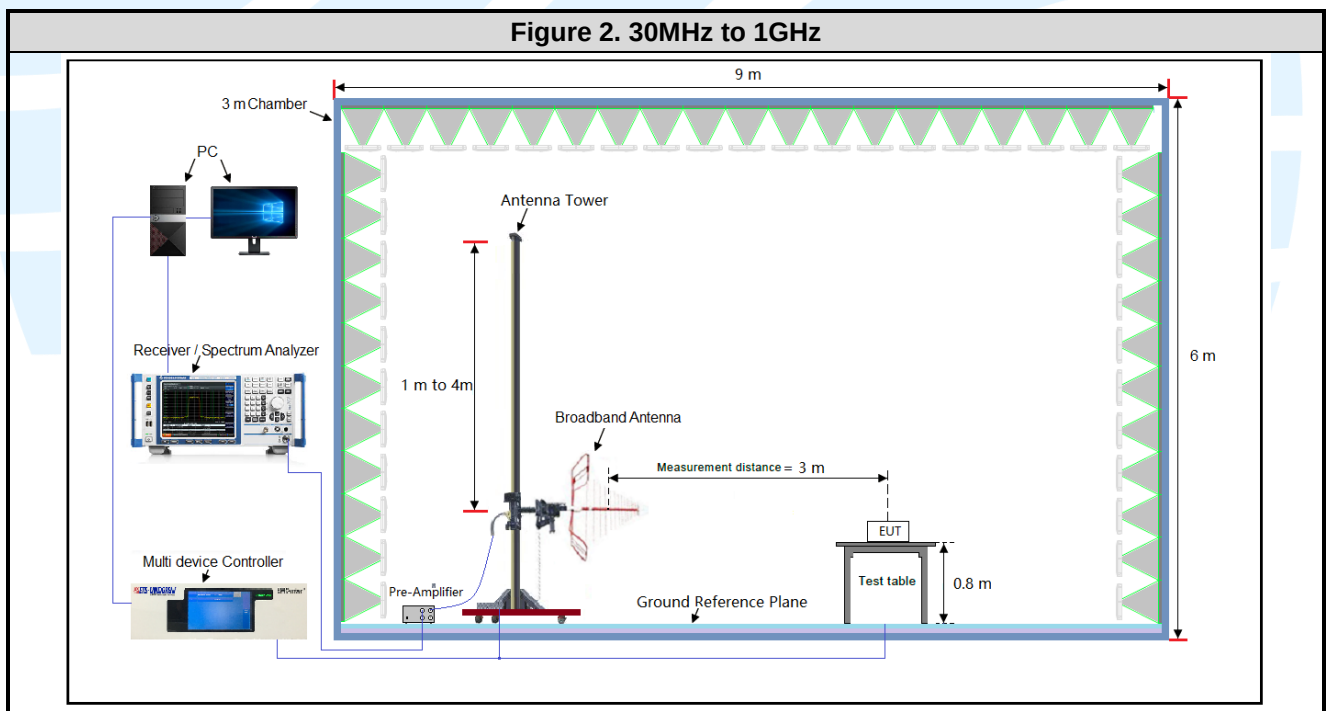
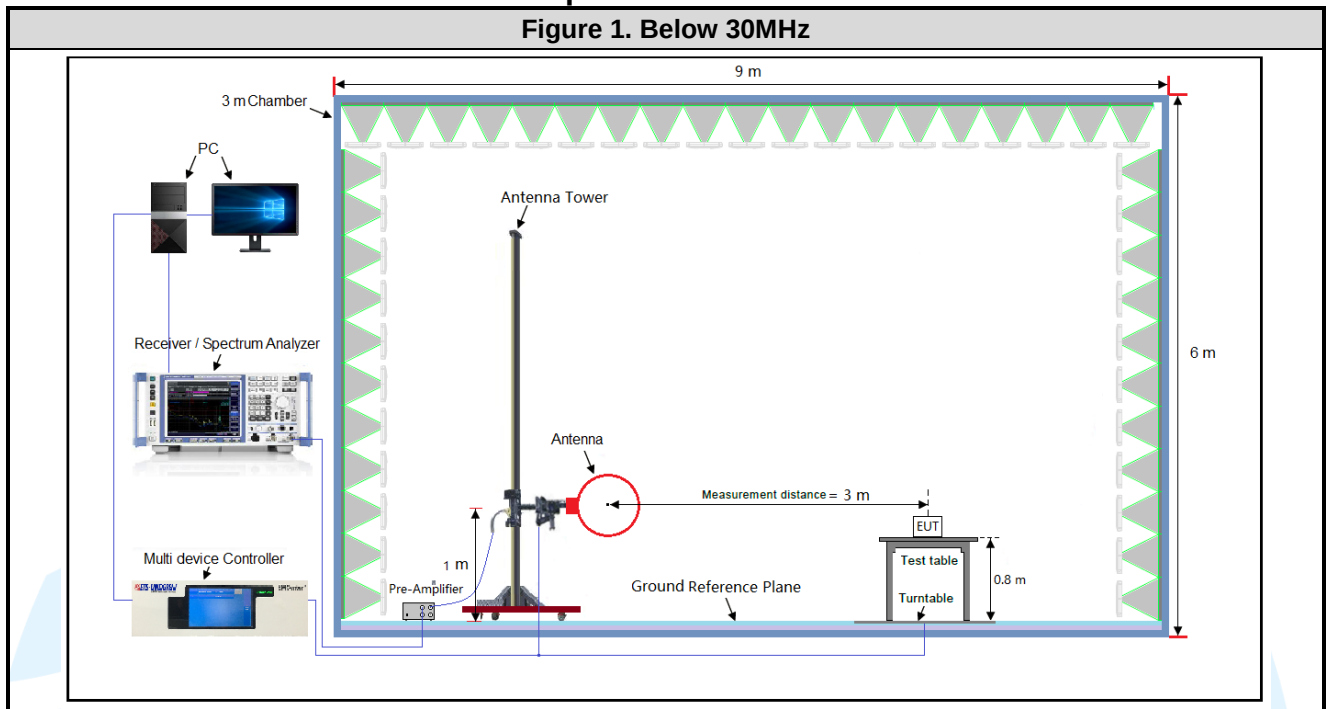
4.4 PRE-SCAN

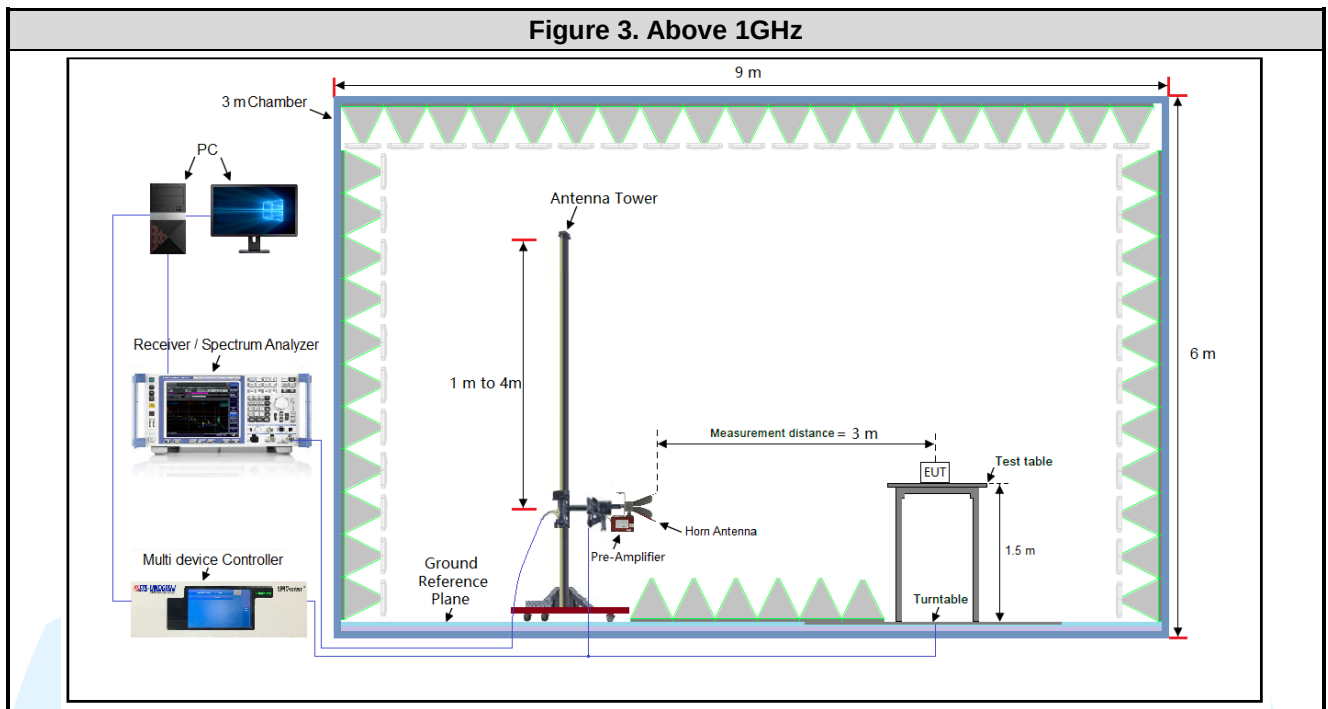
Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Following data rate was (were) selected for the final test as listed below

Mode	Worst-case data rates
IEEE 802.11a	6 Mbps
IEEE 802.11n-HT20	MCS16
IEEE 802.11n-HT40	MCS16
IEEE 802.11ac-VHT20	MCS0
IEEE 802.11ac-VHT40	MCS0
IEEE 802.11ac-VHT80	MCS0
IEEE 802.11ac-VHT160	MCS0
IEEE 802.11ax-HE20	MCS0
IEEE 802.11ax-HE40	MCS0
IEEE 802.11ax-HE80	MCS0
IEEE 802.11ax-HE160	MCS0

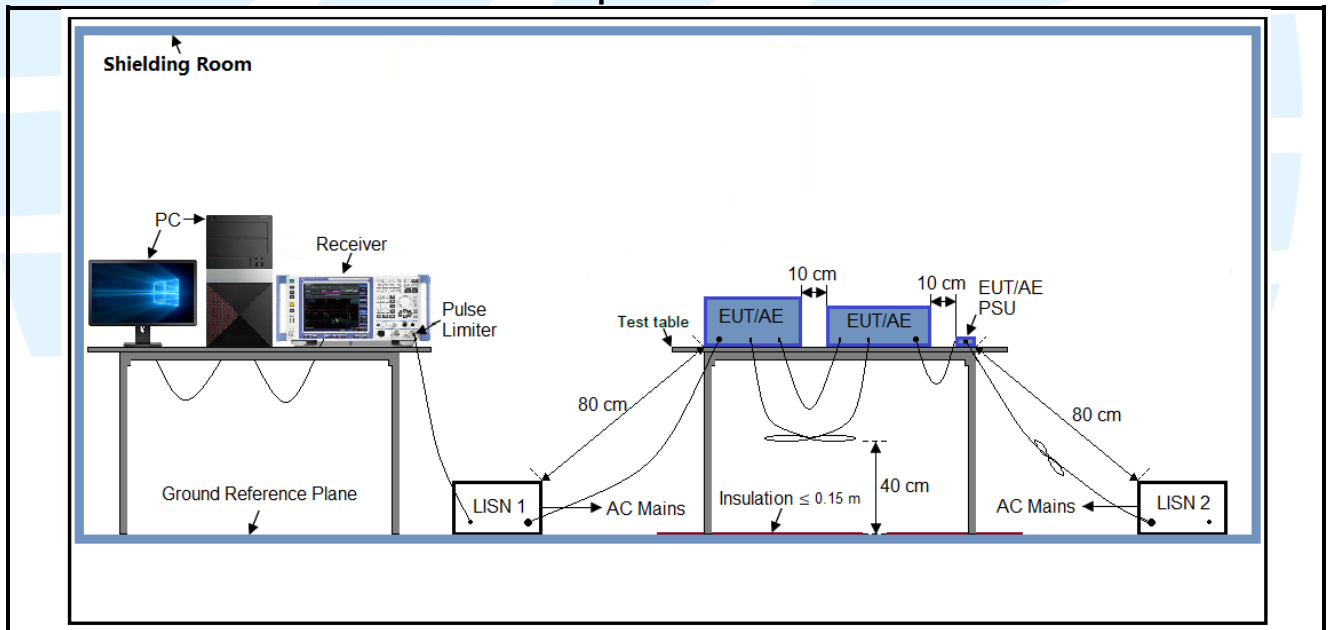
4.5 TEST SETUP

4.5.1 For Radiated Emissions test setup

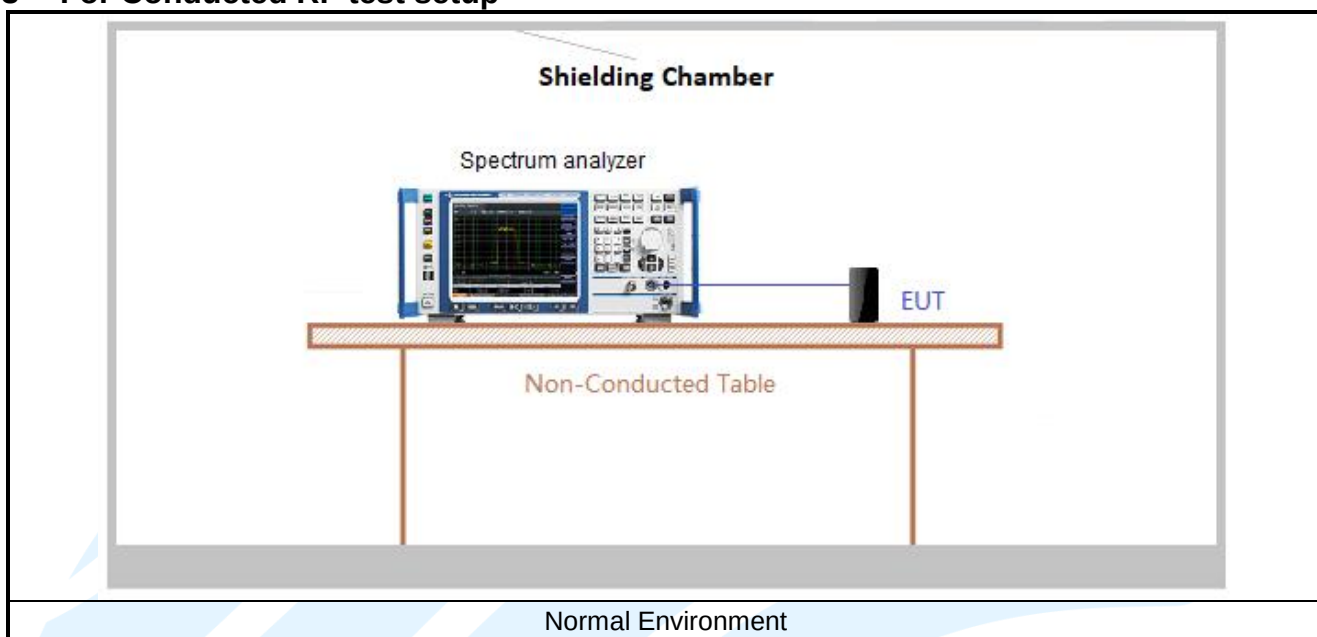




4.5.2 For Conducted Emissions test setup



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. 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 C63.10-2020 Clause 12.2.

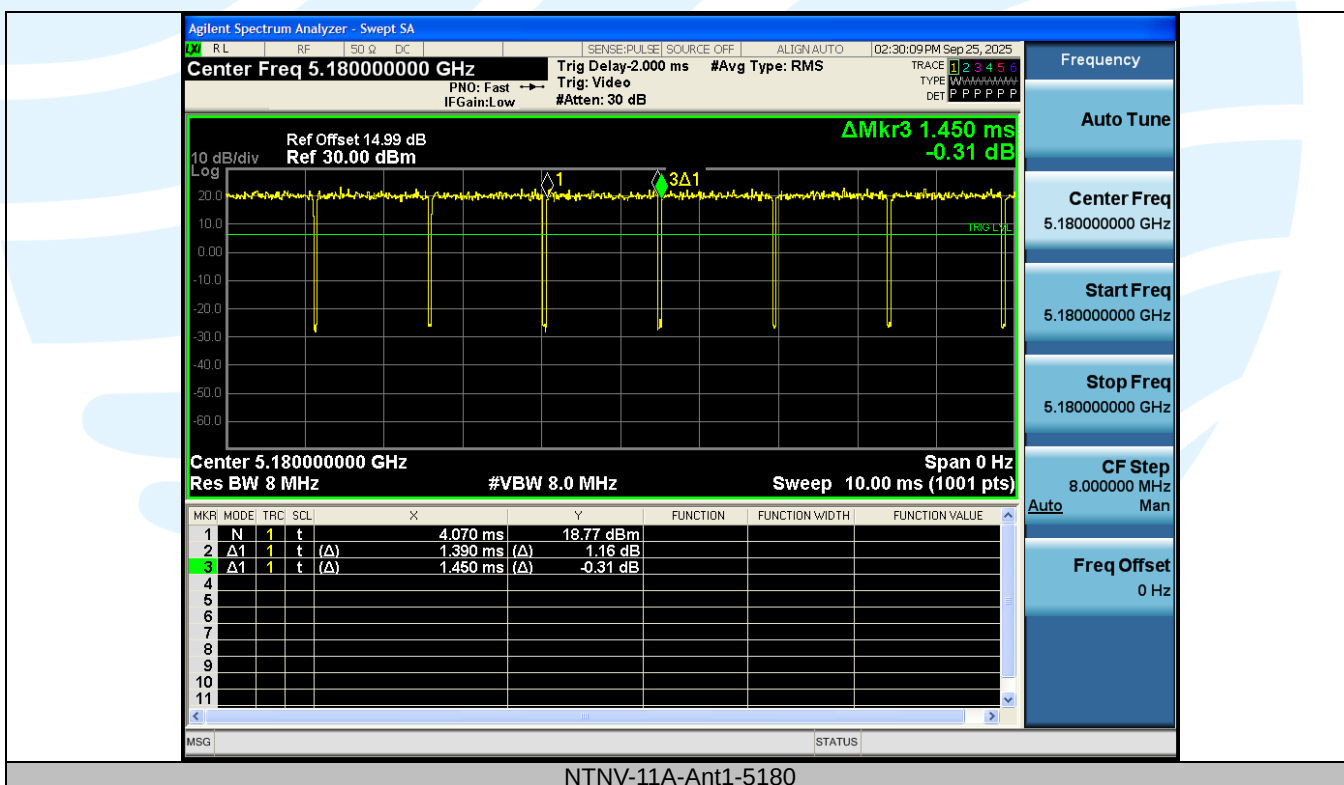
Test Results

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	1.39	1.45	0.96	95.86	0.18	0.72
IEEE 802.11n-HT20	N/A	MCS 16	0.67	0.73	0.92	91.78	0.37	1.49
IEEE 802.11n-HT40	N/A	MCS 16	0.34	0.4	0.85	85.00	0.71	2.94
IEEE 802.11ac-VHT20	N/A	MCS 0	0.48	0.54	0.89	88.89	0.51	2.08
IEEE 802.11ac-VHT40	N/A	MCS 0	0.26	0.32	0.81	81.25	0.90	3.85
IEEE 802.11ac-VHT80	N/A	MCS 0	0.14	0.2	0.70	70.00	1.55	7.14
IEEE 802.11ac-VHT160	N/A	MCS 0	0.1	0.16	0.63	62.50	2.04	10.00
IEEE 802.11ax-HE20	SU	MCS 0	0.42	0.48	0.88	87.50	0.58	2.38
IEEE 802.11ax-HE40	SU	MCS 0	0.26	0.32	0.81	81.25	0.90	3.85
IEEE 802.11ax-HE80	SU	MCS 0	0.18	0.24	0.75	75.00	1.25	5.56
IEEE 802.11ax-HE160	SU	MCS 0	0.14	0.2	0.70	70.00	1.55	7.14

Remark:

- 1) Duty cycle= On Time/ Period;
- 2) Duty Cycle factor = $10 * \log(1/ \text{Duty cycle})$

The test plots as follows



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

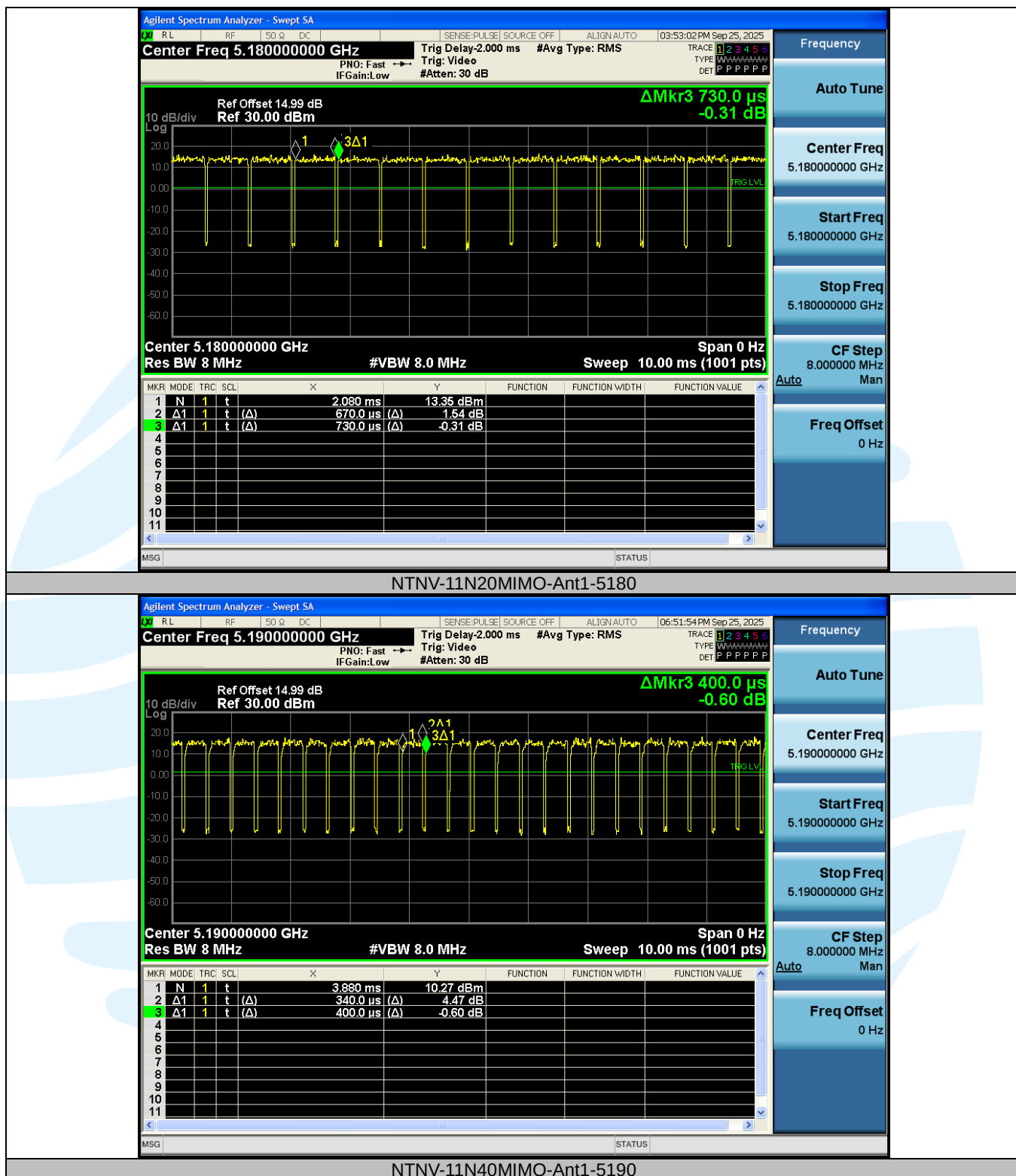
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

**Shenzhen UnionTrust Quality and Technology Co., Ltd.**

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

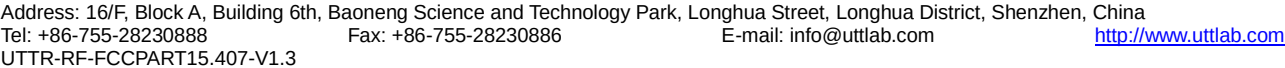
Tel: +86-755-28230888

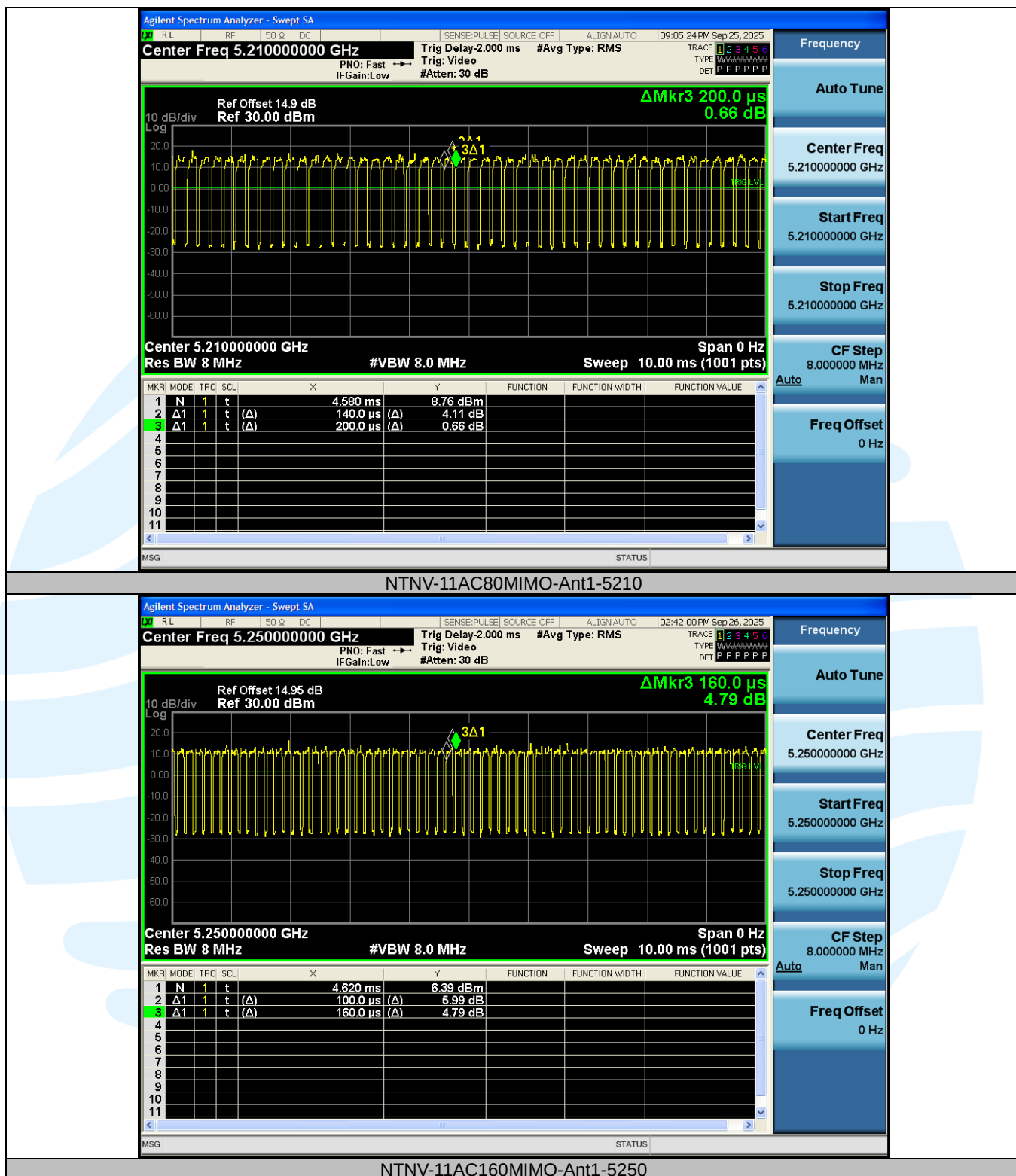
Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3





Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

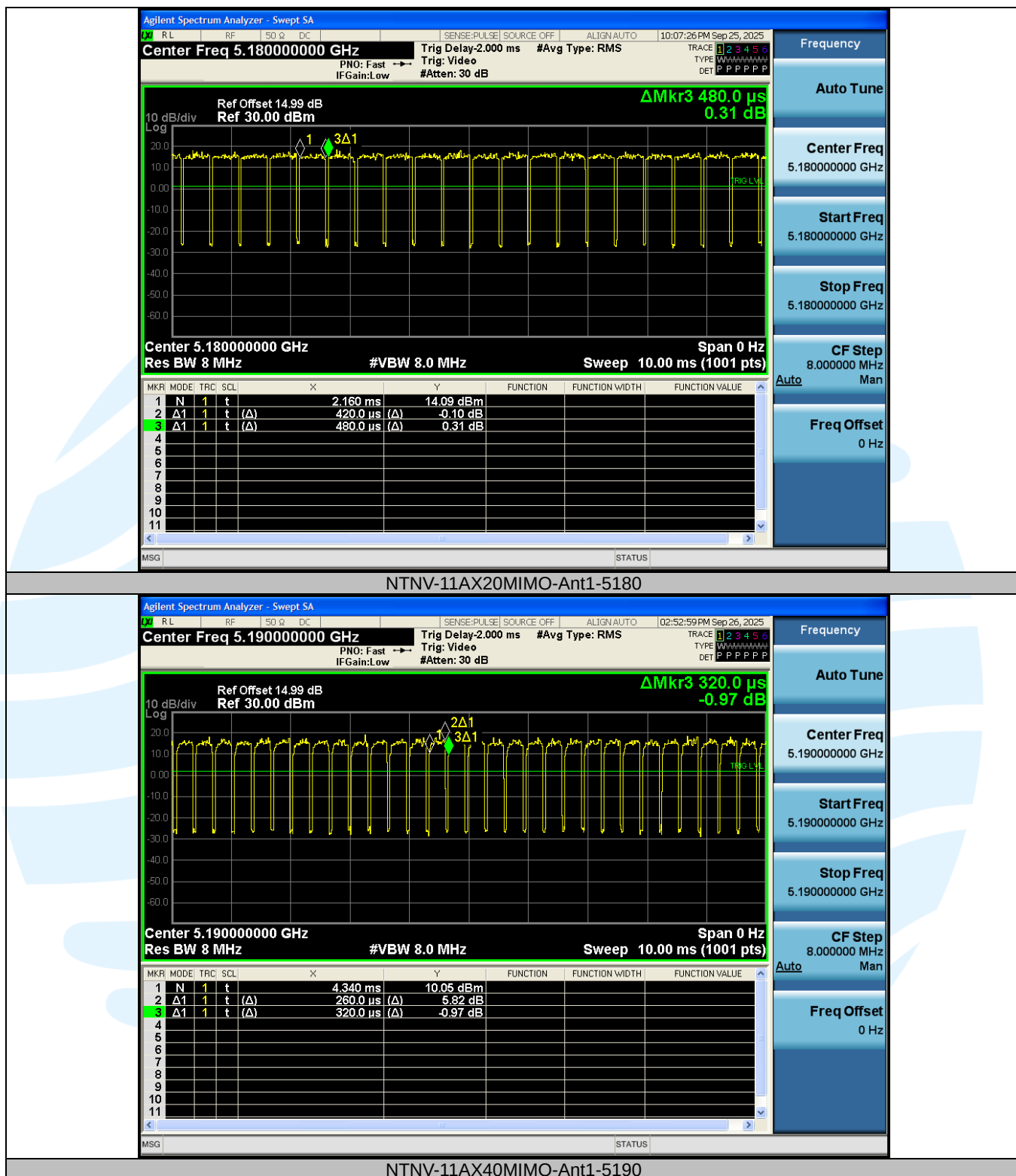
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

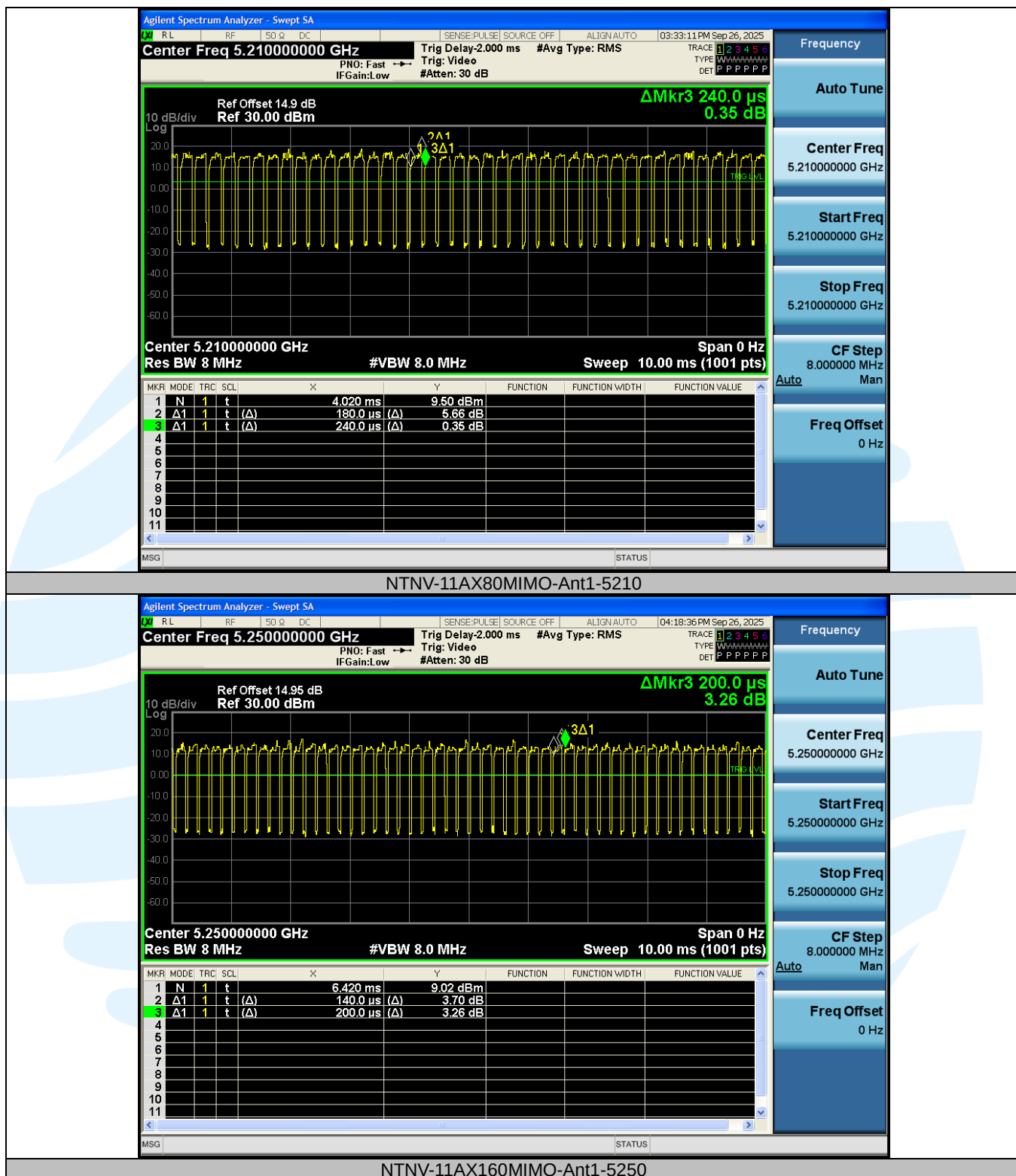
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, 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

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 C63.10-2020	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 662911 D01 Multiple Transmitter Output v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

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: All antennas (3 Antennas) in the interior of the equipment and no consideration of replacement. The transmit signals are correlated with each other, the best case directional gain of the antenna is 7.55 dBi. (See section 5.5).

5.36 DB BANDWIDTH & 99% OCCUPIED BANDWIDTH

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.407 (e)

Test Method: KDB 789033 D02 v02r01Section C.2

Limit: Within the 5.725-5.850 GHz and 5.850-5.895 GHz bands, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

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 = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 * \text{RBW}$.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

- a) Set center frequency to the nominal EUT channel center frequency.
- b) Set span = 1.5 times to 5.0 times the OBW.
- c) Set RBW = 1% to 5% of the OBW
- d) Set VBW $\geq 3 \times \text{RBW}$
- e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- f) Use the 99% power bandwidth function of the instrument (if available).
- g) If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

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 Mode: Transmitter mode

Test Results: Pass

Test Results: Please refer to Appendix A

5.4 MAXIMUM CONDUCTED OUTPUT POWER

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (a) (3)

Test Method: KDB 789033 D02 v02r01 Section E.3.a(Method PM)

Limits:

- For an indoor access point operating in the 5.850-5.895 GHz band, the maximum power spectral density must not exceed 20 dBm e.i.r.p. in any 1-megahertz band. In addition, the maximum e.i.r.p. over the frequency band of operation must not exceed 36 dBm. Indoor access points operating on a channel that spans the 5.725-5.850 GHz and 5.850-5.895 GHz bands must not exceed an e.i.r.p. of 36 dBm.

Test Procedure:

- Connected the EUT's antenna port to measure device by 10dB attenuator.
- Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of Tx on burst.

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 Mode: Transmitter mode

Test Results: Pass

Test Data:

Directional gain and the maximum output power limit.

Frequency (MHz)	Antenna Gain (dBi)			Directional gain (dBi)		Limit	
	Ant .0	Ant .1	Ant .2	Power	PSD	Power (dBm)	PSD (dBm/MHz or dBm/500kHz)
U-NII-4	2.88	2.88	2.57	7.55	7.55	36 (EIRP)	20 (EIRP)
Unequal antenna gains, with equal transmit powers. Directional gain is to be computed as follows: If transmit signals are correlated, then $\text{Directional gain} = 10 \log[(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10})^2 / N] \text{ dBi}$ [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]							

Mode	Freq. (MHz)	Set Power (Provided by the customer)	Result [dBm]				EIRP[dBm]				EIRP Limit (dBm)	Result
			Ant1	Ant2	Ant3	Total	Ant1	Ant2	Ant3	Total		
IEEE 802.11a	5845	20.5	20.89	20.50	22.64	N/A	23.77	23.38	25.21	N/A	36	Pass
	5865	20.5	20.80	20.46	22.67	N/A	23.68	23.34	25.24	N/A	36	Pass
	5885	20.5	20.76	20.53	22.63	N/A	23.64	23.41	25.20	N/A	36	Pass
IEEE 802.11n-HT20	5845	20.5	19.85	19.45	21.78	25.26	22.73	22.33	24.35	32.81	36	Pass
	5865	20.5	19.72	19.52	21.81	25.25	22.60	22.40	24.38	32.80	36	Pass
	5885	20.5	19.68	19.60	21.75	25.23	22.56	22.48	24.32	32.78	36	Pass
IEEE 802.11n-HT40	5835	20.5	19.95	19.62	21.90	25.38	22.83	22.50	24.47	32.93	36	Pass
	5875	20.5	19.74	19.57	21.76	25.25	22.62	22.45	24.33	32.80	36	Pass
	5845	20.5	19.68	19.38	21.68	25.14	22.56	22.26	24.25	32.69	36	Pass
IEEE 802.11ac-VHT20	5865	20.5	19.65	19.34	21.63	25.10	22.53	22.22	24.20	32.65	36	Pass
	5885	20.5	19.56	19.29	21.61	25.05	22.44	22.17	24.18	32.60	36	Pass
	5835	20.5	19.58	19.28	22.13	25.30	22.46	22.16	24.70	32.85	36	Pass
IEEE 802.11ac-VHT40	5875	20.5	19.41	19.17	22.08	25.20	22.29	22.05	24.65	32.75	36	Pass
IEEE 802.11ac-VHT80	5855	20.5	19.10	18.68	20.86	24.42	21.98	21.56	23.43	31.97	36	Pass
IEEE 802.11ac-VHT160	5815	20.5	17.57	17.20	19.19	22.85	20.45	20.08	21.76	30.40	36	Pass
IEEE 802.11ax-HE20	5845	20.5	19.84	19.53	21.82	25.29	22.72	22.41	24.39	32.84	36	Pass
	5865	20.5	19.82	19.51	21.80	25.27	22.70	22.39	24.37	32.82	36	Pass
	5885	18.0	17.40	17.16	18.16	22.37	20.28	20.04	20.73	29.92	36	Pass
IEEE 802.11ax-HE40	5835	20.5	19.93	19.89	21.71	25.37	22.81	22.77	24.28	32.92	36	Pass
	5875	20.5	19.77	19.74	21.73	25.29	22.65	22.62	24.30	32.84	36	Pass
IEEE 802.11ax-HE80	5855	20.5	19.82	19.61	21.04	24.97	22.70	22.49	23.61	32.52	36	Pass
IEEE 802.11ax-HE160	5815	20.5	18.77	18.42	19.64	22.24	21.65	21.30	22.21	29.79	36	Pass

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, 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

5.5 PEAK POWER SPECTRAL DENSITY

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(3)

Test Method: KDB 789033 D02 v02r01 Section F

Limits:

1. For an indoor access point operating in the 5.850-5.895 GHz band, the maximum power spectral density must not exceed 20 dBm e.i.r.p. in any 1-megahertz band. In addition, the maximum e.i.r.p. over the frequency band of operation must not exceed 36 dBm. Indoor access points operating on a channel that spans the 5.725-5.850 GHz and 5.850-5.895 GHz bands must not exceed an e.i.r.p. of 36 dBm.

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:

1. For U-NII-4 band:

- a) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- b) Set RBW = 500 kHz, Set VBW ≥ 3 RBW, Detector = RMS
- c) Use the peak marker function to determine the maximum power level in any 500 kHz band segment within the fundamental EBW.
- d) Sweep time = auto, trigger set to “free run”.
- e) Trace average at least 100 traces in power averaging mode.
- f) Record the max value and add 10 log (1/duty cycle)

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 Mode: Transmitter mode

Test Results: Please refer to Appendix A

Directional gain and the maximum power spectral density limit.

Frequency (MHz)	Antenna Gain (dBi)			Directional gain (dBi)		Limit	
	Ant .0	Ant .1	Ant .2	Power	PSD	Power (dBm)	PSD (dBm/MHz or dBm/500kHz)
U-NII-4	2.88	2.88	2.57	7.55	7.55	36 (EIRP)	20 (EIRP)

Unequal antenna gains, with equal transmit powers. Directional gain is to be computed as follows:
 If transmit signals are correlated, then
 Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / NANT]$ dBi [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

5.6 RADIATED EMISSIONS AND BAND EDGE MEASUREMENT

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(5)
FCC 47 CFR Part 15 Subpart C Section 15.209/205

Test Method: KDB 789033 D02 v02r01 Section G.3, G.4, G.5, and G.6

Receiver Setup:

Frequency	RBW
0.009 MHz-0.150 MHz	200/300 kHz
0.150 MHz -30 MHz	9/10 kHz
30 MHz-1 GHz	100/120 kHz
Above 1 GHz	1 MHz

Limits:

1. Limits of Radiated Emission and Band edge Measurement

Radiated emissions that fall in the restricted bands must comply with the general emissions limits in 15.209(a) as below table. Other emissions shall be at least 20 dB below the highest level of the desired power.

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Remark:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBμV/m) = 20 log Emission level (uV/m).
- For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

2. Limits of Unwanted Emission Out of the Restricted Bands

For transmitters operating solely in the 5.850-5.895 GHz band or operating on a channel that spans across 5.725-5.895 GHz:

For an indoor access point or subordinate device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of 15 dBm/MHz and shall decrease linearly to an e.i.r.p. of -7 dBm/MHz at or above 5.925 GHz.

For a client device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of -5 dBm/MHz and shall decrease linearly to an e.i.r.p. of -27 dBm/MHz at or above 5.925 GHz.

For a client device or indoor access point or subordinate device, all emissions below 5.725 GHz shall not exceed an e.i.r.p. of -27 dBm/MHz at 5.65 GHz increasing linearly to 10 dBm/MHz at 5.7 GHz, and from 5.7 GHz increasing linearly to a level of 15.6 dBm/MHz at 5.72 GHz, and from 5.72 GHz increasing linearly to a level of 27 dBm/MHz at 5.725 GHz.

Test Setup: Refer to section 4.5.1 for details.

Test Procedures:

- The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, 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

make the measurement.

4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
6. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Remark:

- a) The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
- b) The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
- c) The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for RMS Average (Duty cycle < 98 %) for Average detection (AV) at frequency above 1 GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
- d) The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle $\geq 98 \%$) or $\geq 1/T$ (duty cycle is < 98%) for Average detection (AV) at frequency above 1 GHz.
- e) All modes of operation were investigated and the worst-case emissions are reported.

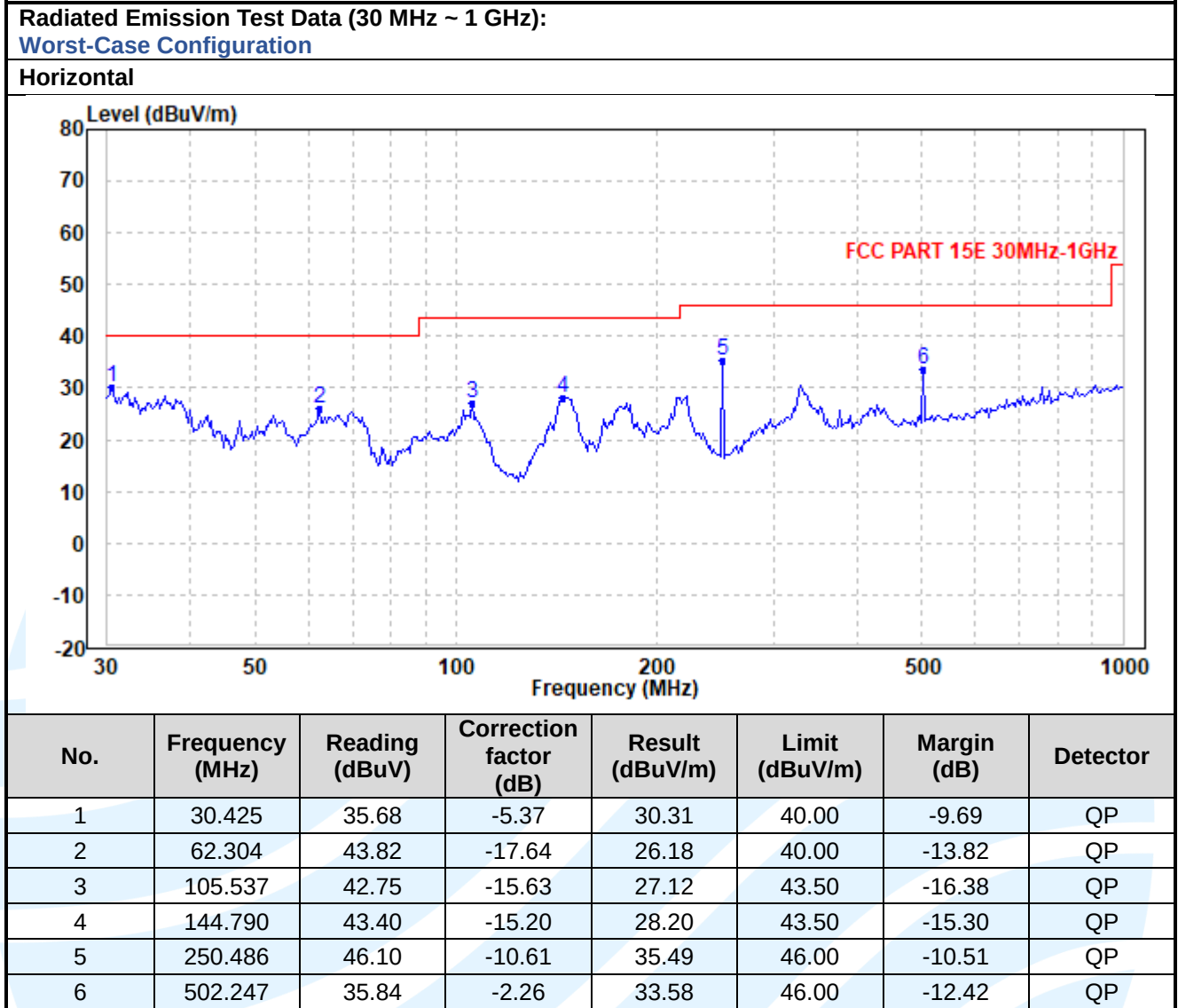
Equipment Used: Refer to section 3 for details.

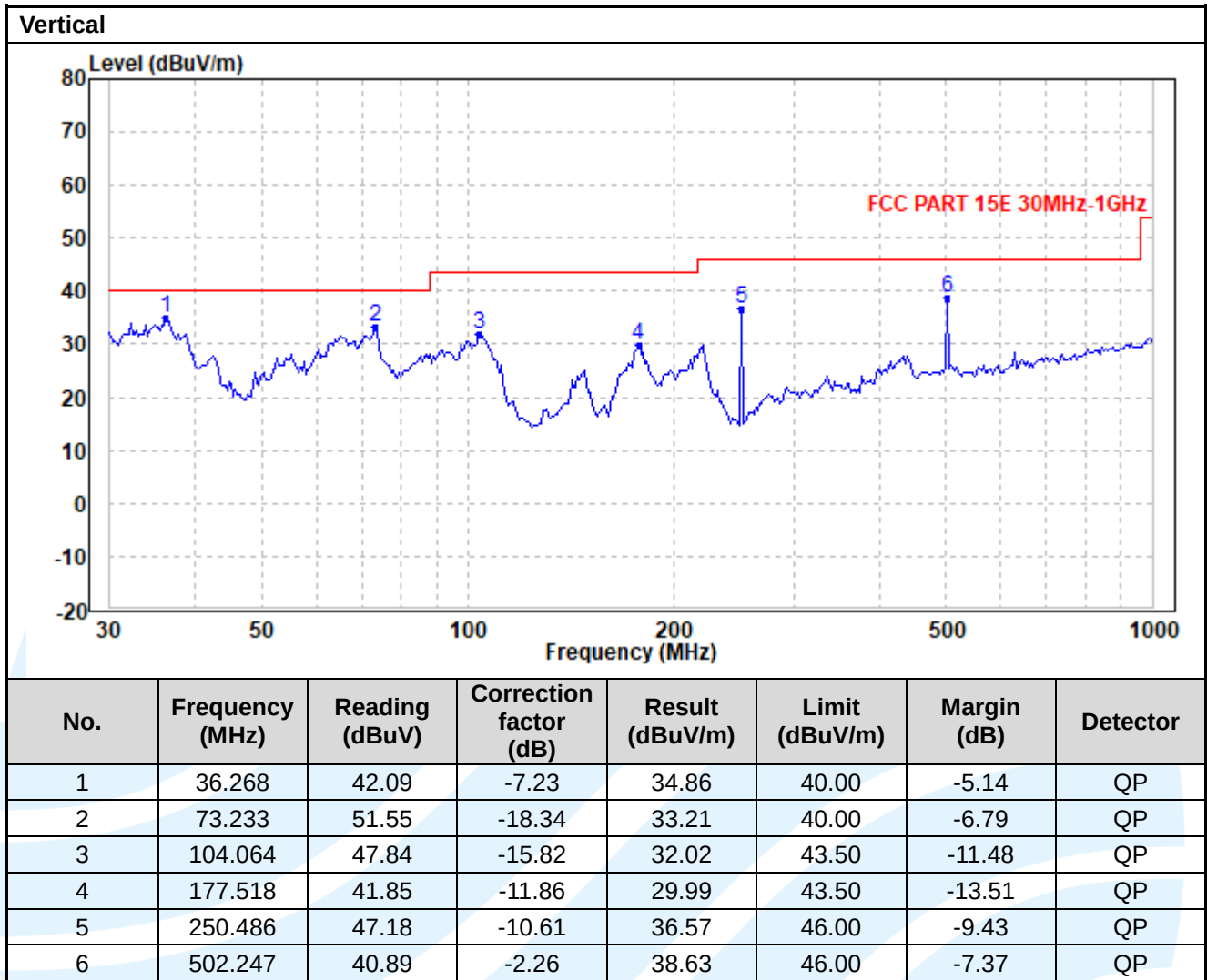
Test Result: Pass

The measurement data as follows:

Radiated Emission Test Data (9 KHz ~ 30 MHz):
--

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.
--





Radiated Emission Test Data (Above 1GHz):

TX1_5G_A_5845 MHz 11690 MHz 17535 MHz								
1	11690	35.33	2.77	38.10	54.00	-15.90	Average	Horizontal
2	11690	49.29	2.77	52.06	74.00	-21.94	Peak	Horizontal
3	17535	50.94	10.82	61.76	68.20	-6.44	Peak	Horizontal
4	11690	37.67	2.77	40.44	54.00	-13.56	Average	Vertical
5	11690	56.34	2.77	59.11	74.00	-14.89	Peak	Vertical
6	17535	53.43	10.82	64.25	68.20	-3.95	Peak	Vertical
TX1_5G_A_5865 MHz 11730 MHz 17595 MHz								
1	11730	33.19	2.76	35.95	54.00	-18.05	Average	Horizontal
2	11730	46.84	2.76	49.60	74.00	-24.40	Peak	Horizontal
3	17595	41.24	10.92	52.16	68.20	-16.04	Peak	Horizontal
4	11730	34.00	2.76	36.76	54.00	-17.24	Average	Vertical
5	11730	48.72	2.76	51.48	74.00	-22.52	Peak	Vertical
6	17595	41.88	10.92	52.80	68.20	-15.40	Peak	Vertical
TX1_5G_A_5885 MHz 11770 MHz 17655 MHz								
1	11770	33.37	2.73	36.10	54.00	-17.90	Average	Horizontal
2	11770	45.08	2.73	47.81	74.00	-26.19	Peak	Horizontal
3	17655	41.02	11.03	52.05	68.20	-16.15	Peak	Horizontal
4	11770	33.71	2.73	36.44	54.00	-17.56	Average	Vertical
5	11770	47.84	2.73	50.57	74.00	-23.43	Peak	Vertical
6	17655	42.06	11.03	53.09	68.20	-15.11	Peak	Vertical
TX2_5G_A_5845 MHz 11690 MHz 17535 MHz								
1	11690	34.30	2.77	37.07	54.00	-16.93	Average	Horizontal
2	11690	48.39	2.77	51.16	74.00	-22.84	Peak	Horizontal
3	17535	42.12	10.82	52.94	68.20	-15.26	Peak	Horizontal
4	11690	33.33	2.77	36.10	54.00	-17.90	Average	Vertical
5	11690	43.94	2.77	46.71	74.00	-27.29	Peak	Vertical
6	17535	41.68	10.82	52.50	68.20	-15.70	Peak	Vertical
TX2_5G_A_5865 MHz 11730 MHz 17595 MHz								
1	11730	33.22	2.76	35.98	54.00	-18.02	Average	Horizontal
2	11730	45.93	2.76	48.69	74.00	-25.31	Peak	Horizontal
3	17595	42.10	10.92	53.02	68.20	-15.18	Peak	Horizontal
4	11730	33.62	2.76	36.38	54.00	-17.62	Average	Vertical
5	11730	47.71	2.76	50.47	74.00	-23.53	Peak	Vertical
6	17595	41.17	10.92	52.09	68.20	-16.11	Peak	Vertical
TX2_5G_A_5885 MHz 11770 MHz 17655 MHz								
1	11770	33.34	2.73	36.07	54.00	-17.93	Average	Horizontal
2	11770	46.04	2.73	48.77	74.00	-25.23	Peak	Horizontal
3	17655	41.23	11.03	52.26	68.20	-15.94	Peak	Horizontal
4	11770	33.65	2.73	36.38	54.00	-17.62	Average	Vertical
5	11770	47.43	2.73	50.16	74.00	-23.84	Peak	Vertical
6	17655	41.33	11.03	52.36	68.20	-15.84	Peak	Vertical
TX3_5G_A_5845 MHz 11690 MHz 17535 MHz								
1	11690	33.24	2.77	36.01	54.00	-17.99	Average	Horizontal
2	11690	44.70	2.77	47.47	74.00	-26.53	Peak	Horizontal
3	17535	42.21	10.82	53.03	68.20	-15.17	Peak	Horizontal
4	11690	33.27	2.77	36.04	54.00	-17.96	Average	Vertical
5	11690	46.32	2.77	49.09	74.00	-24.91	Peak	Vertical
6	17535	41.56	10.82	52.38	68.20	-15.82	Peak	Vertical
TX3_5G_A_5865 MHz 11730 MHz 17595 MHz								
1	11730	33.09	2.76	35.85	54.00	-18.15	Average	Horizontal
2	11730	45.53	2.76	48.29	74.00	-25.71	Peak	Horizontal
3	17595	42.25	10.92	53.17	68.20	-15.03	Peak	Horizontal
4	11730	33.40	2.76	36.16	54.00	-17.84	Average	Vertical
5	11730	46.86	2.76	49.62	74.00	-24.38	Peak	Vertical

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, 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

6	17595	42.02	10.92	52.94	68.20	-15.26	Peak	Vertical
TX3_5G_A_5885 MHz 11770 MHz 17655 MHz								
1	11770	33.19	2.73	35.92	54.00	-18.08	Average	Horizontal
2	11770	45.88	2.73	48.61	74.00	-25.39	Peak	Horizontal
3	17655	41.75	11.03	52.78	68.20	-15.42	Peak	Horizontal
4	11770	33.65	2.73	36.38	54.00	-17.62	Average	Vertical
5	11770	47.04	2.73	49.77	74.00	-24.23	Peak	Vertical
6	17655	40.92	11.03	51.95	68.20	-16.25	Peak	Vertical

TX1TX2TX3_5G_N20_5845 MHz 11690 MHz 17535 MHz								
1	11690	33.67	2.77	36.44	54.00	-17.56	Average	Horizontal
2	11690	46.14	2.77	48.91	74.00	-25.09	Peak	Horizontal
3	17535	42.42	10.82	53.24	68.20	-14.96	Peak	Horizontal
4	11690	34.16	2.77	36.93	54.00	-17.07	Average	Vertical
5	11690	45.65	2.77	48.42	74.00	-25.58	Peak	Vertical
6	17535	41.81	10.82	52.63	68.20	-15.57	Peak	Vertical

TX1TX2TX3_5G_N20_5865 MHz 11730 MHz 17595 MHz								
1	11730	34.77	2.76	37.53	54.00	-16.47	Average	Horizontal
2	11730	45.70	2.76	48.46	74.00	-25.54	Peak	Horizontal
3	17595	41.28	10.92	52.20	68.20	-16.00	Peak	Horizontal
4	11730	35.84	2.76	38.60	54.00	-15.40	Average	Vertical
5	11730	48.65	2.76	51.41	74.00	-22.59	Peak	Vertical
6	17595	41.79	10.92	52.71	68.20	-15.49	Peak	Vertical

TX1TX2TX3_5G_N20_5885 MHz 11770 MHz 17655 MHz								
1	11770	34.51	2.73	37.24	54.00	-16.76	Average	Horizontal
2	11770	46.19	2.73	48.92	74.00	-25.08	Peak	Horizontal
3	17655	41.06	11.03	52.09	68.20	-16.11	Peak	Horizontal
4	11770	34.20	2.73	36.93	54.00	-17.07	Average	Vertical
5	11770	45.31	2.73	48.04	74.00	-25.96	Peak	Vertical
6	17655	40.89	11.03	51.92	68.20	-16.28	Peak	Vertical

TX1TX2TX3_5G_N40_5835 MHz 11670 MHz 17505 MHz								
1	11670	35.60	2.77	38.37	54.00	-15.63	Average	Vertical
2	11670	46.44	2.77	49.21	74.00	-24.79	Peak	Horizontal
3	17505	41.24	10.78	52.02	68.20	-16.18	Peak	Horizontal
4	11670	35.60	2.77	38.37	54.00	-15.63	Average	Vertical
5	11670	45.22	2.77	47.99	74.00	-26.01	Peak	Vertical
6	17505	42.60	10.78	53.38	68.20	-14.82	Peak	Vertical

TX1TX2TX3_5G_N40_5875 MHz 11750 MHz 17625 MHz								
1	11750	33.78	2.75	36.53	54.00	-17.47	Average	Horizontal
2	11750	44.71	2.75	47.46	74.00	-26.54	Peak	Horizontal
3	17625	41.51	10.97	52.48	68.20	-15.72	Peak	Horizontal
4	11750	33.78	2.75	36.53	54.00	-17.47	Average	Vertical
5	11750	45.21	2.75	47.96	74.00	-26.04	Peak	Vertical
6	17625	41.96	10.97	52.93	68.20	-15.27	Peak	Vertical

TX1TX2TX3_5G_AC80_5855 MHz 11710 MHz 17565 MHz								
1	11710	34.61	2.76	37.37	54.00	-16.63	Average	Horizontal
2	11710	45.96	2.76	48.72	74.00	-25.28	Peak	Horizontal
3	17565	41.86	10.88	52.74	68.20	-15.46	Peak	Horizontal
4	11710	35.21	2.76	37.97	54.00	-16.03	Average	Vertical
5	11710	48.00	2.76	50.76	74.00	-23.24	Peak	Vertical
6	17565	42.23	10.88	53.11	68.20	-15.09	Peak	Vertical

TX1TX2TX3_5G_AC160_5815 MHz 11630 MHz 17445 MHz								
1	11630	33.52	2.80	36.32	54.00	-17.68	Average	Horizontal
2	11630	44.53	2.80	47.33	74.00	-26.67	Peak	Horizontal
3	17445	41.94	10.61	52.55	68.20	-15.65	Peak	Horizontal
4	11630	34.05	2.80	36.85	54.00	-17.15	Average	Vertical
5	11630	47.71	2.80	50.51	74.00	-23.49	Peak	Vertical

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, 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

6	17445	41.79	10.61	52.40	68.20	-15.80	Peak	Vertical
TX1TX2TX3_5G_AX20_5845 MHz 11690 MHz 17535 MHz								
1	11690	35.63	2.77	38.40	54.00	-15.60	Average	Horizontal
2	11690	49.72	2.77	52.49	74.00	-21.51	Peak	Horizontal
3	17535	43.03	10.82	53.85	68.20	-14.35	Peak	Horizontal
4	11690	36.45	2.77	39.22	54.00	-14.78	Average	Vertical
5	11690	51.85	2.77	54.62	74.00	-19.38	Peak	Vertical
6	17535	46.08	10.82	56.90	68.20	-11.30	Peak	Vertical
TX1TX2TX3_5G_AX20_5865 MHz 11730 MHz 17595 MHz								
1	11730	34.64	2.76	37.40	54.00	-16.60	Average	Horizontal
2	11730	46.14	2.76	48.90	74.00	-25.10	Peak	Horizontal
3	17595	40.87	10.92	51.79	68.20	-16.41	Peak	Horizontal
4	11730	37.24	2.76	40.00	54.00	-14.00	Average	Vertical
5	11730	50.38	2.76	53.14	74.00	-20.86	Peak	Vertical
6	17595	44.44	10.92	55.36	68.20	-12.84	Peak	Vertical
TX1TX2TX3_5G_AX20_5885 MHz 11770 MHz 17655 MHz								
1	11770	35.21	2.73	37.94	54.00	-16.06	Average	Horizontal
2	11770	47.98	2.73	50.71	74.00	-23.29	Peak	Horizontal
3	17655	42.33	11.03	53.36	68.20	-14.84	Peak	Horizontal
4	11770	36.60	2.73	39.33	54.00	-14.67	Average	Vertical
5	11770	51.68	2.73	54.41	74.00	-19.59	Peak	Vertical
6	17655	43.92	11.03	54.95	68.20	-13.25	Peak	Vertical
TX1TX2TX3_5G_AX40_5835 MHz 11670 MHz 17505 MHz								
1	11670	36.70	2.77	39.47	54.00	-14.53	Average	Horizontal
2	11670	50.63	2.77	53.40	74.00	-20.60	Peak	Horizontal
3	17505	44.04	10.78	54.82	68.20	-13.38	Peak	Horizontal
4	11670	36.70	2.77	39.47	54.00	-14.53	Average	Vertical
5	11670	50.63	2.77	53.40	74.00	-20.60	Peak	Vertical
6	17505	44.04	10.78	54.82	68.20	-13.38	Peak	Vertical
TX1TX2TX3_5G_AX40_5875 MHz 11750 MHz 17625 MHz								
1	11750	33.84	2.75	36.59	54.00	-17.41	Average	Horizontal
2	11750	44.32	2.75	47.07	74.00	-26.93	Peak	Horizontal
3	17625	41.31	10.97	52.28	68.20	-15.92	Peak	Horizontal
4	11750	33.84	2.75	36.59	54.00	-17.41	Average	Horizontal
5	11750	47.72	2.75	50.47	74.00	-23.53	Peak	Vertical
6	17625	42.98	10.97	53.95	68.20	-14.25	Peak	Vertical
TX1TX2TX3_5G_AX80_5855 MHz 11710 MHz 17565 MHz								
1	11710	34.03	2.76	36.79	54.00	-17.21	Average	Horizontal
2	11710	45.55	2.76	48.31	74.00	-25.69	Peak	Horizontal
3	17565	42.24	10.88	53.12	68.20	-15.08	Peak	Horizontal
4	11710	35.96	2.76	38.72	54.00	-15.28	Average	Vertical
5	11710	47.63	2.76	50.39	74.00	-23.61	Peak	Vertical
6	17565	42.30	10.88	53.18	68.20	-15.02	Peak	Vertical
TX1TX2TX3_5G_AX160_5815 MHz 11630 MHz 17445 MHz								
1	11630	33.99	2.80	36.79	54.00	-17.21	Average	Horizontal
2	11630	45.66	2.80	48.46	74.00	-25.54	Peak	Horizontal
3	17445	42.14	10.61	52.75	68.20	-15.45	Peak	Horizontal
4	11630	34.82	2.80	37.62	54.00	-16.38	Average	Vertical
5	11630	47.56	2.80	50.36	74.00	-23.64	Peak	Vertical
6	17445	42.07	10.61	52.68	68.20	-15.52	Peak	Vertical

Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Limit - Result
4. For Radiated Emission 18GHz to 40GHz, there was not any unwanted emission detected.

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

Tel: +86-755-28230888

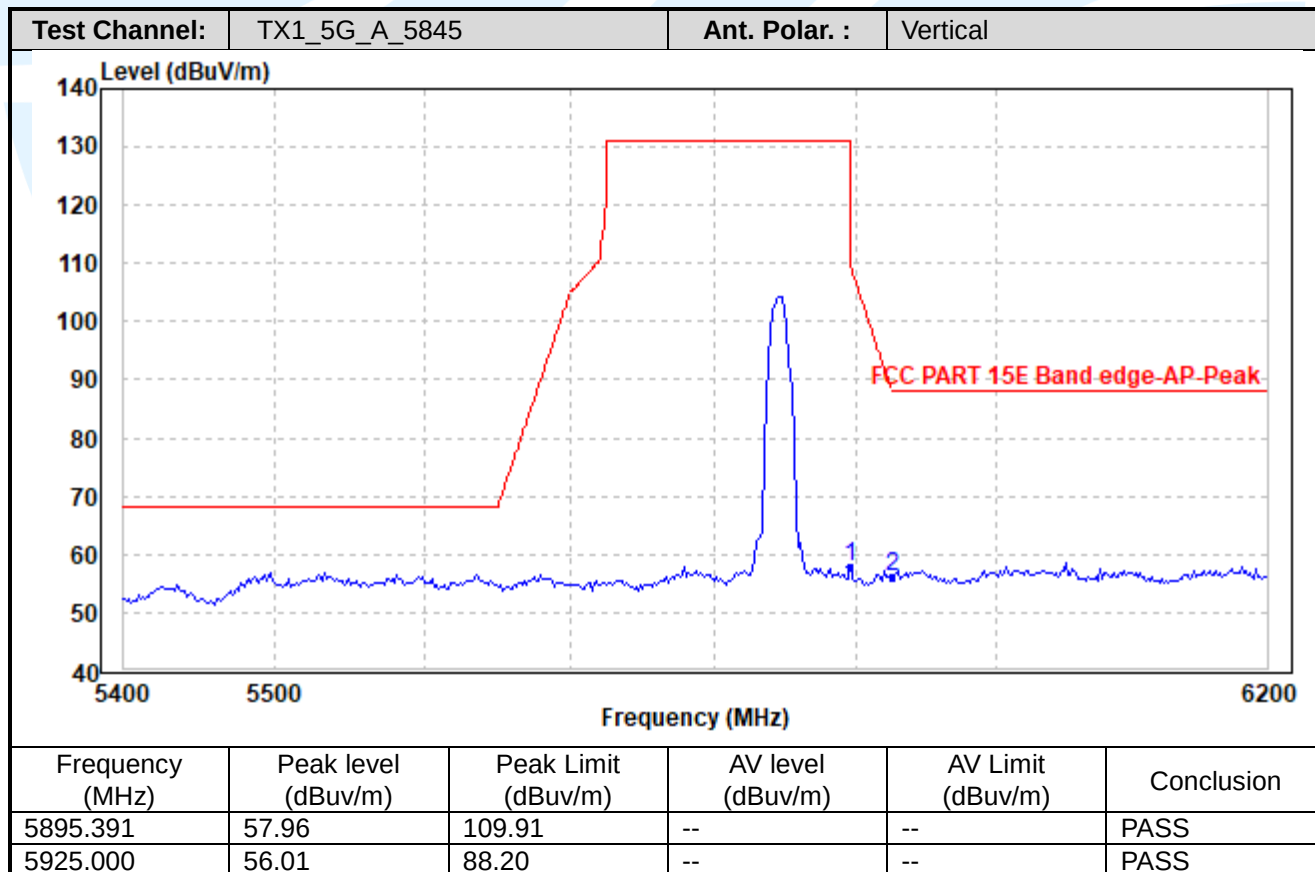
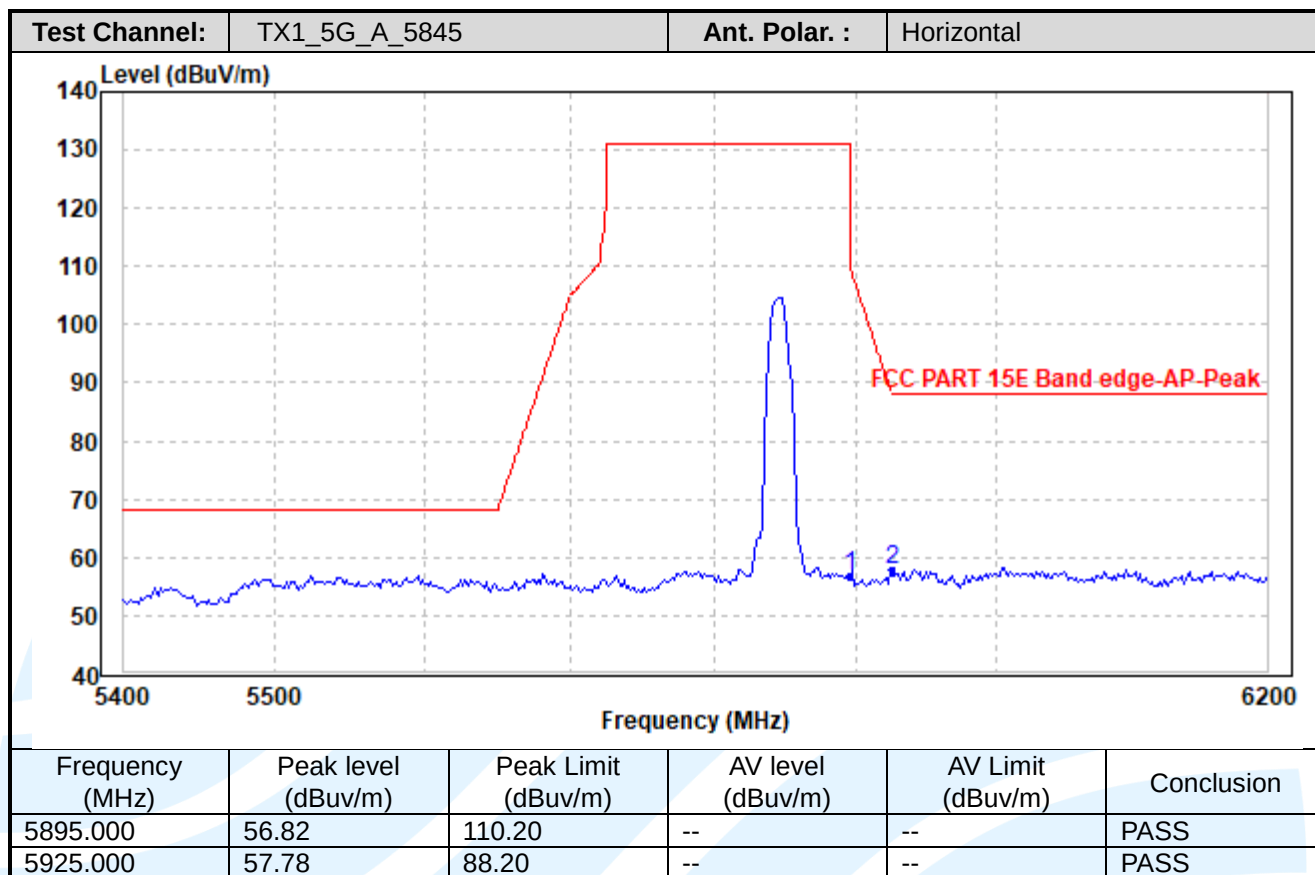
Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

Band Edge Measurements (Radiated)



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

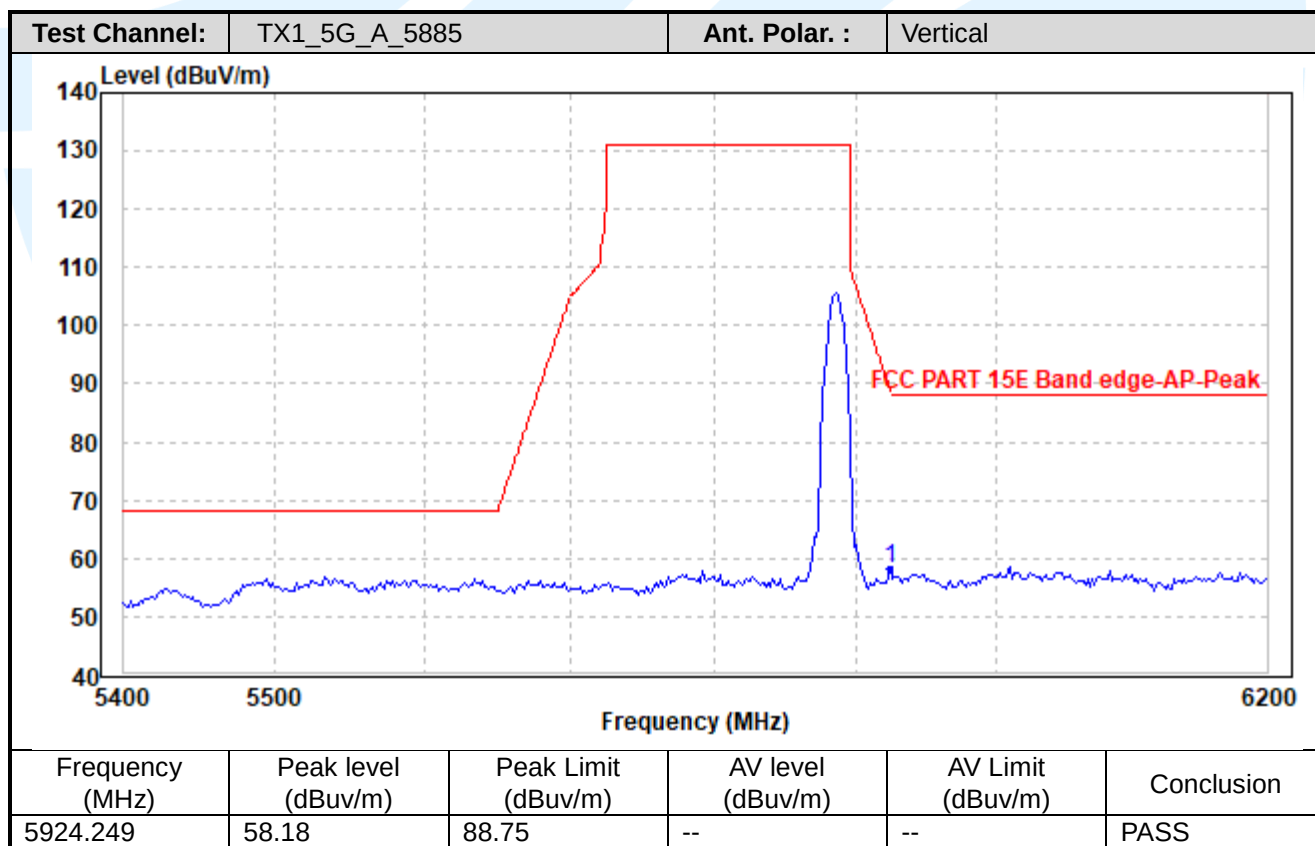
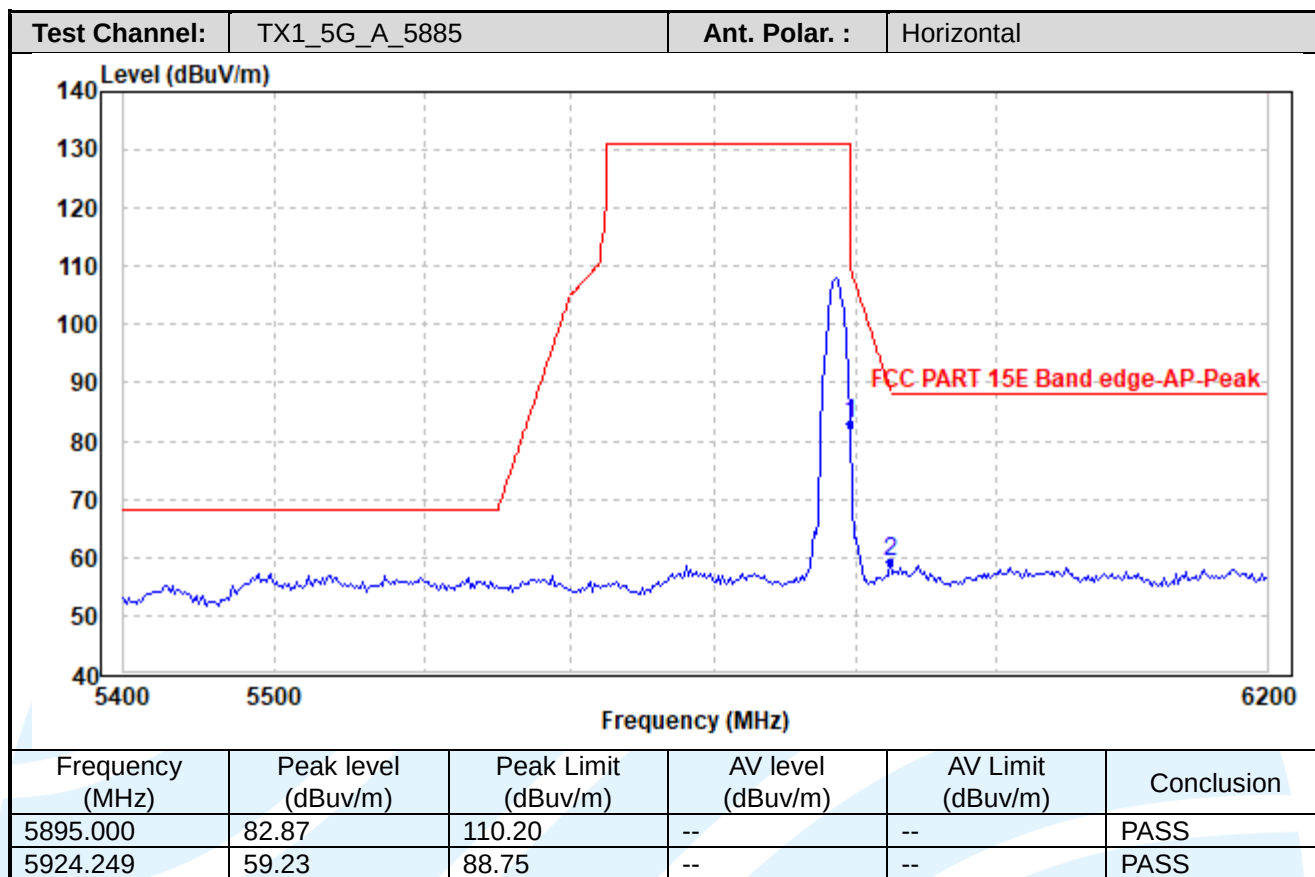
Tel: +86-755-28230888

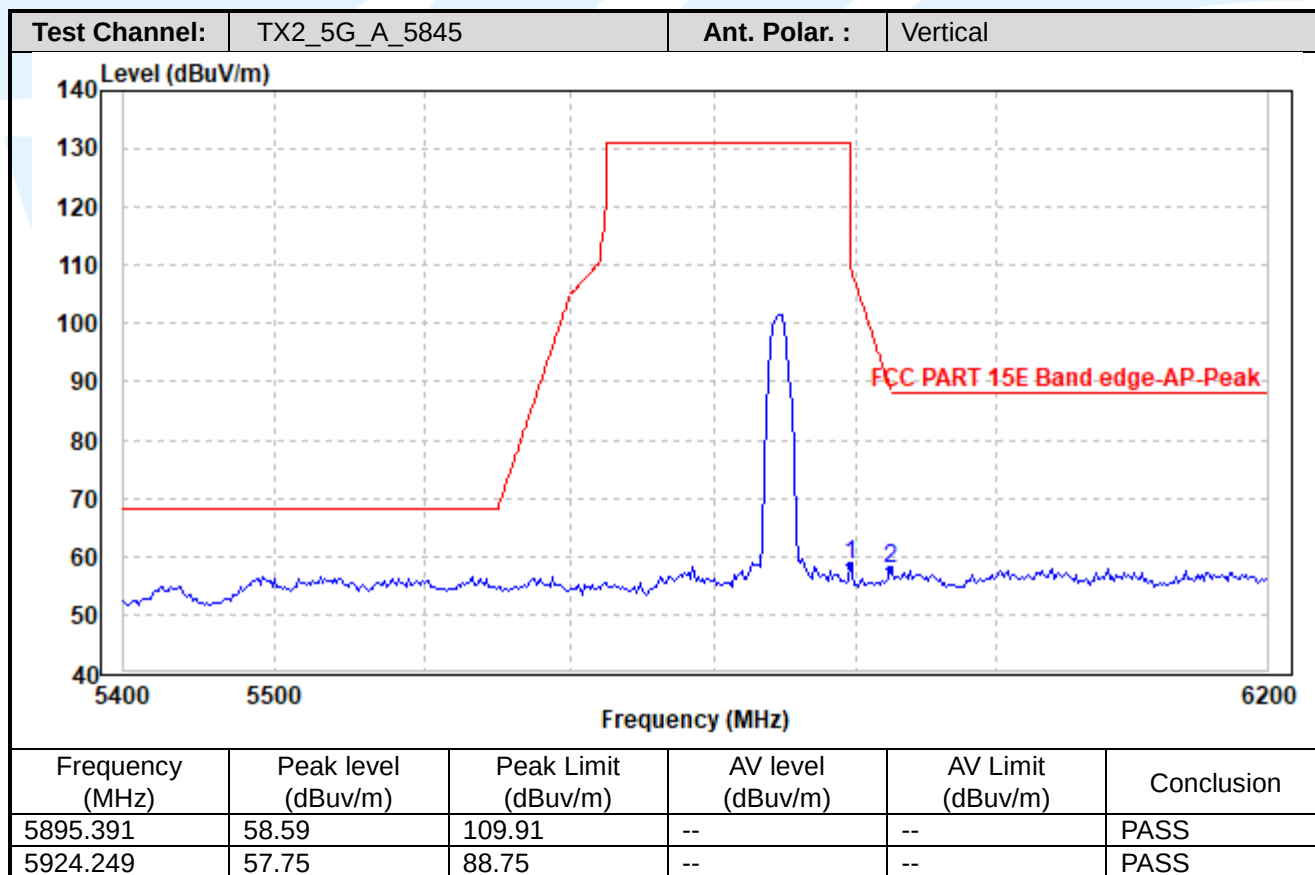
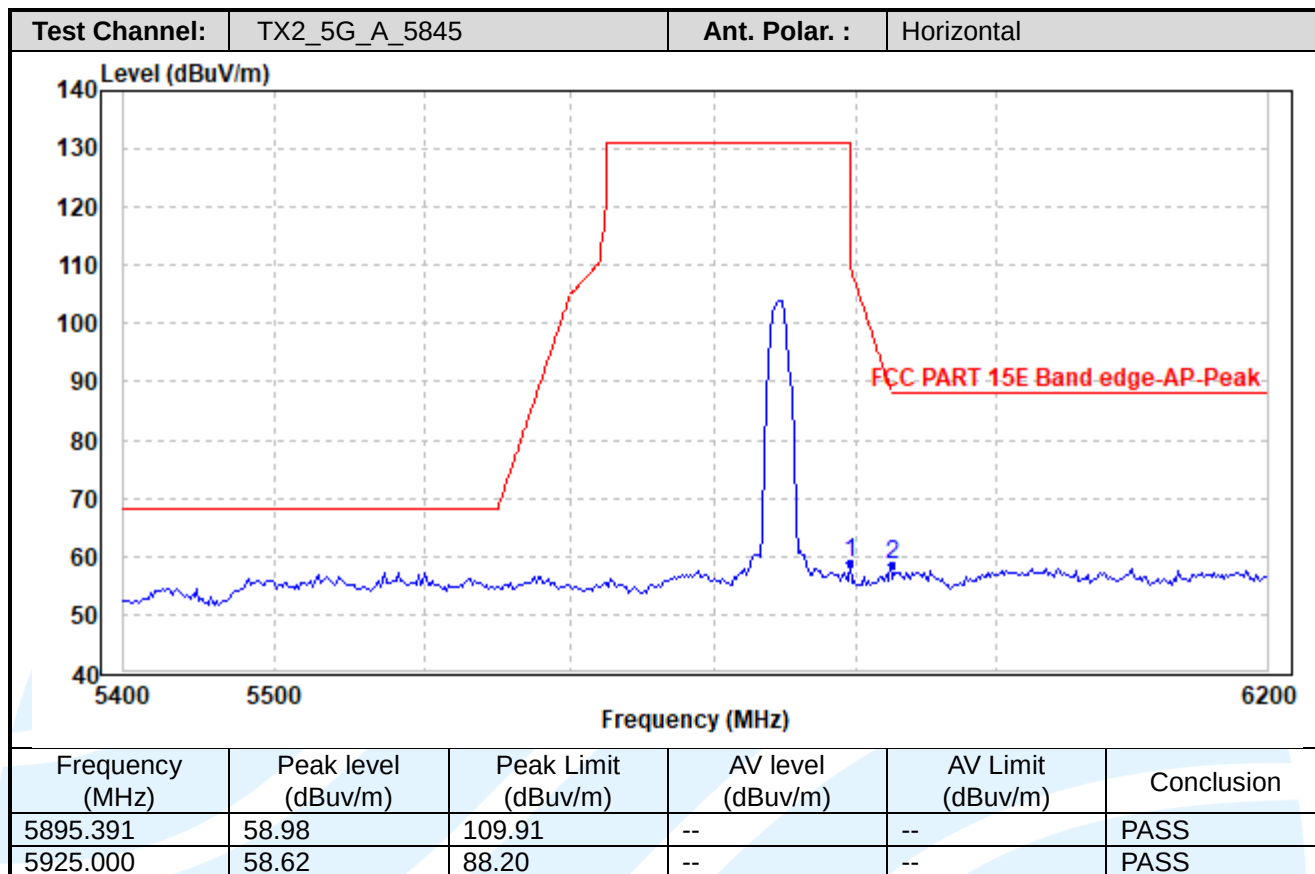
Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3





Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

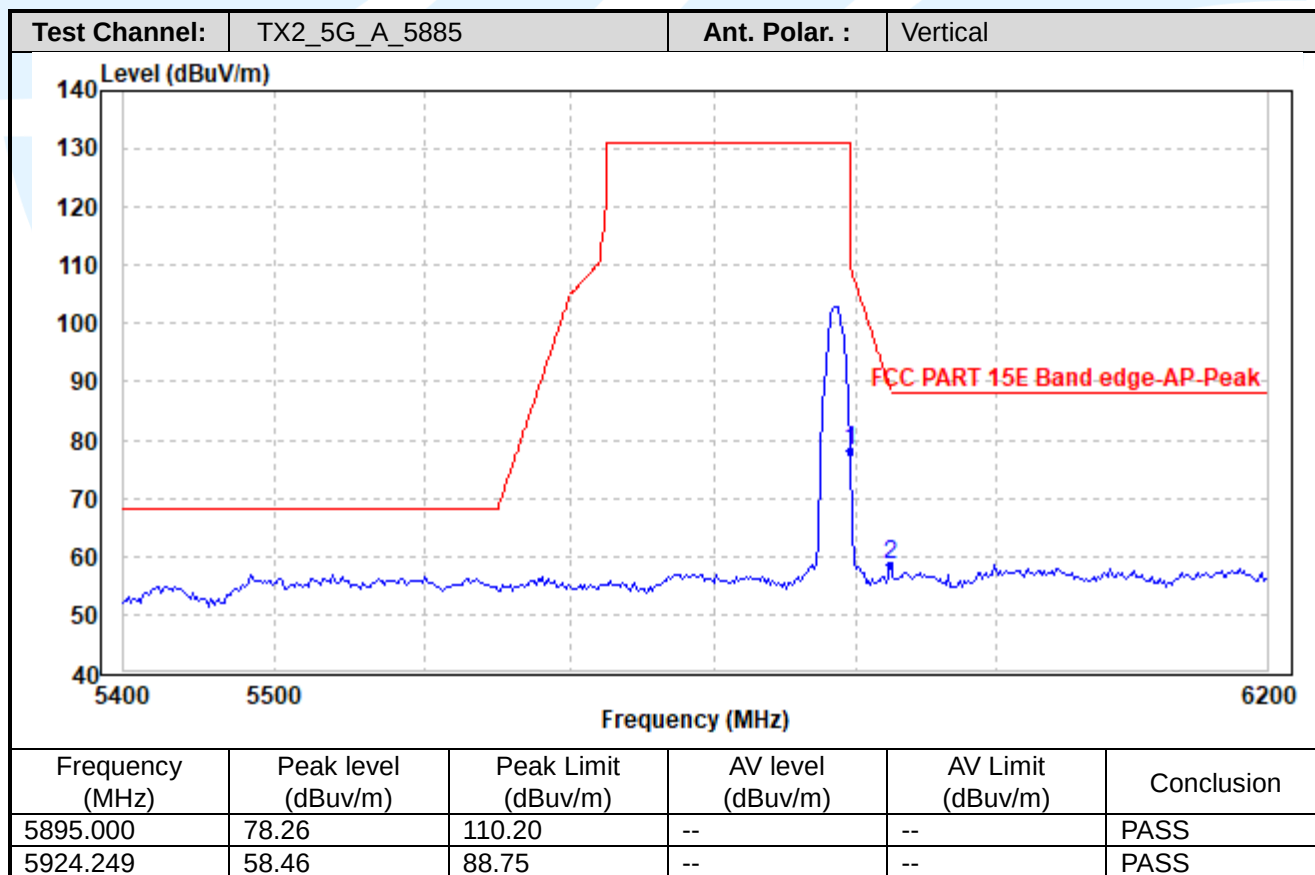
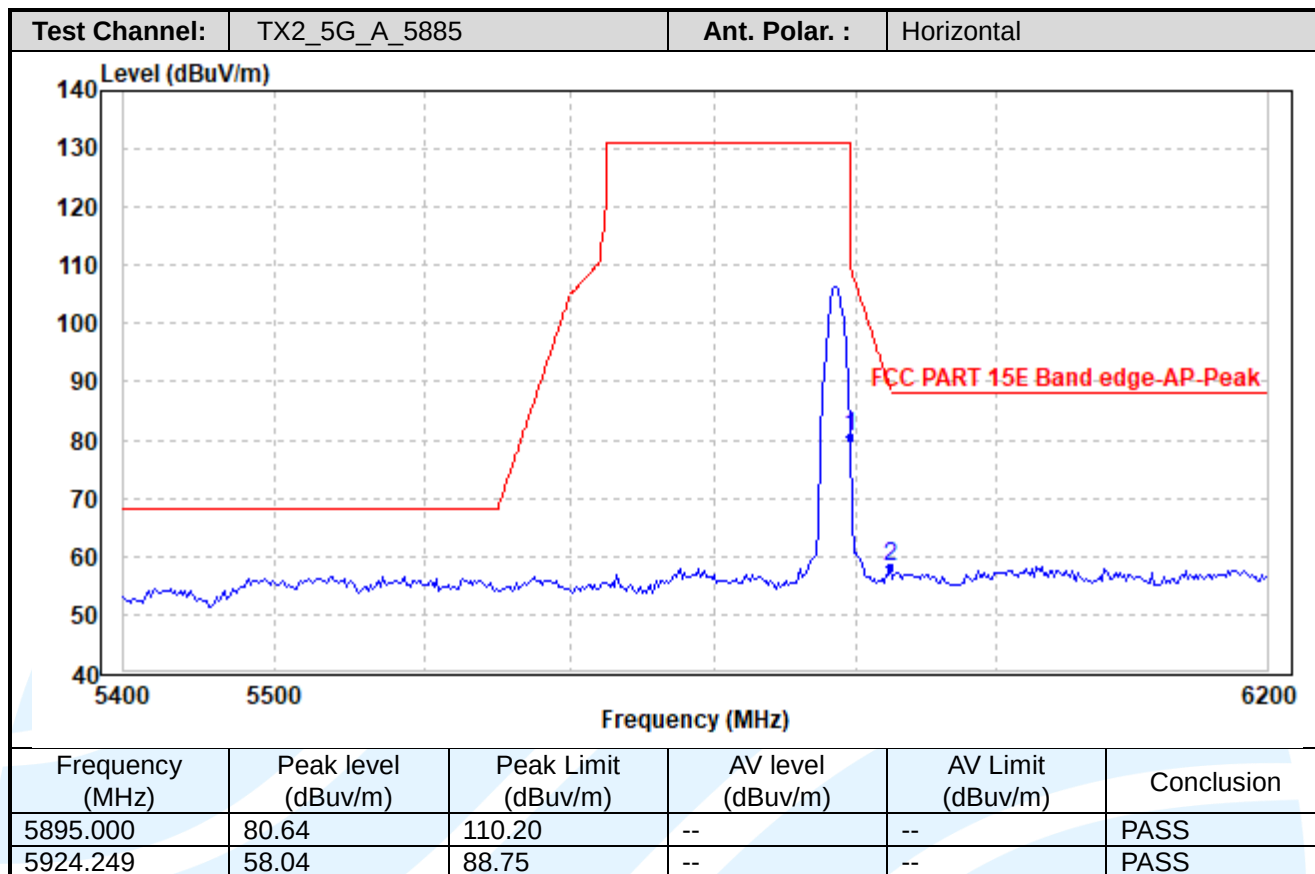
Tel: +86-755-28230888

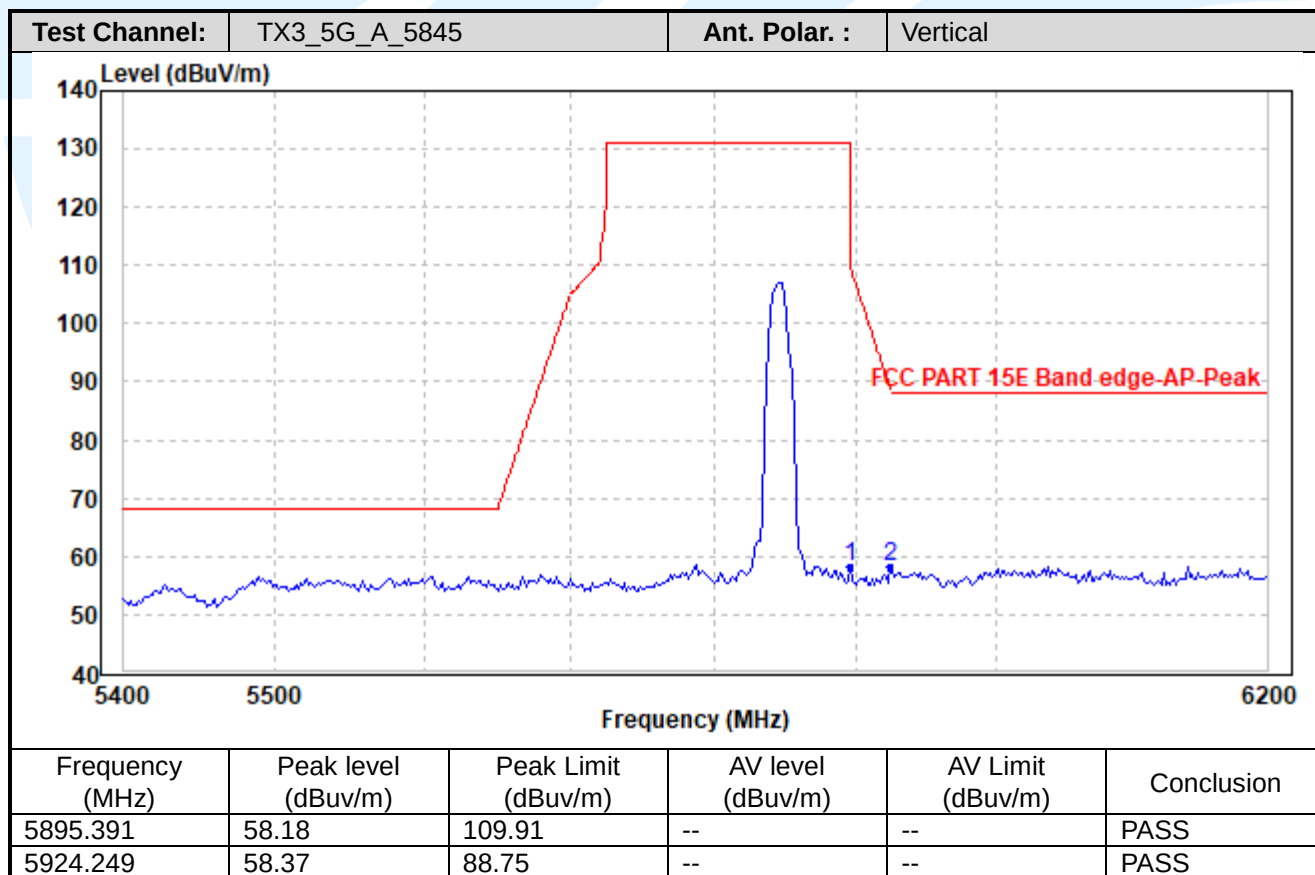
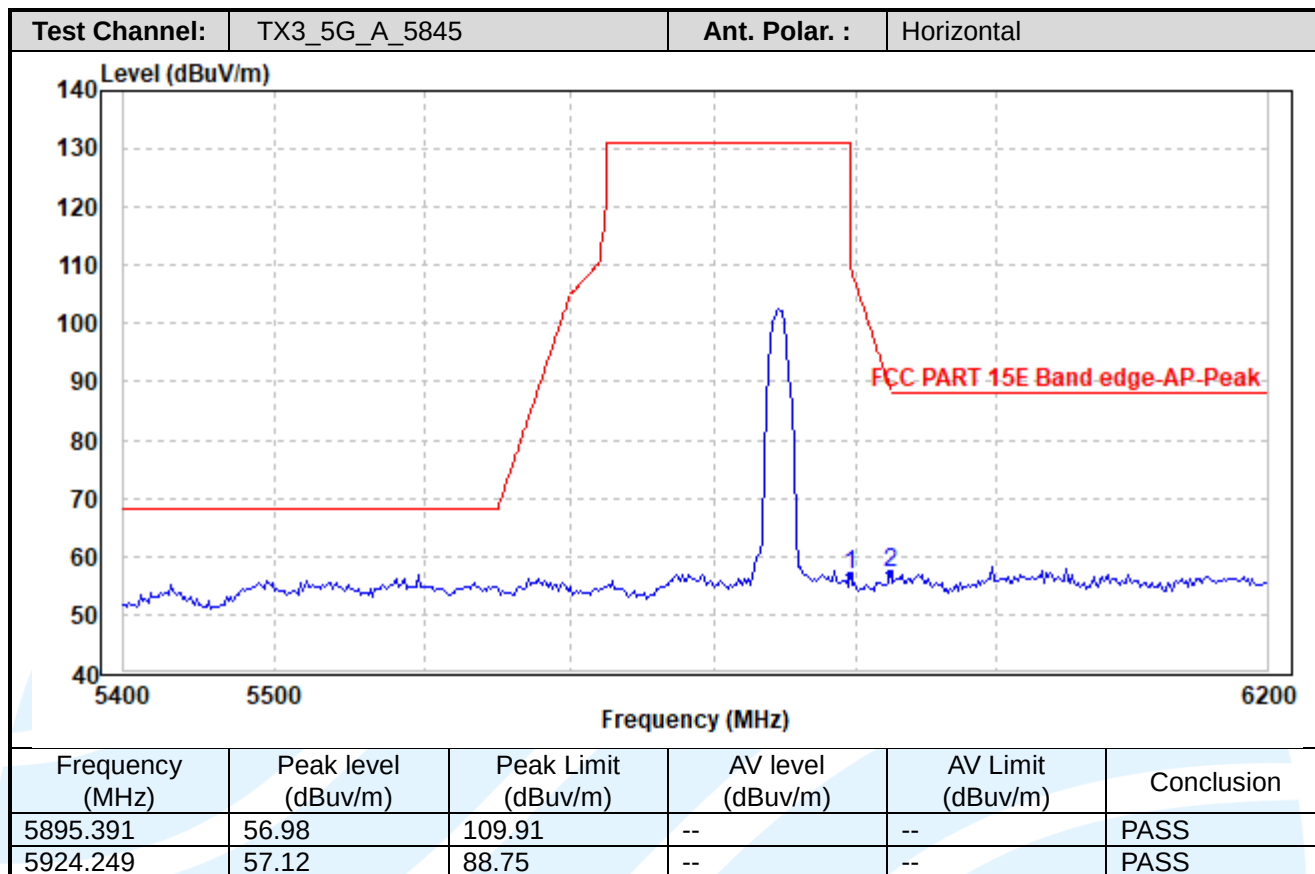
Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3





Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

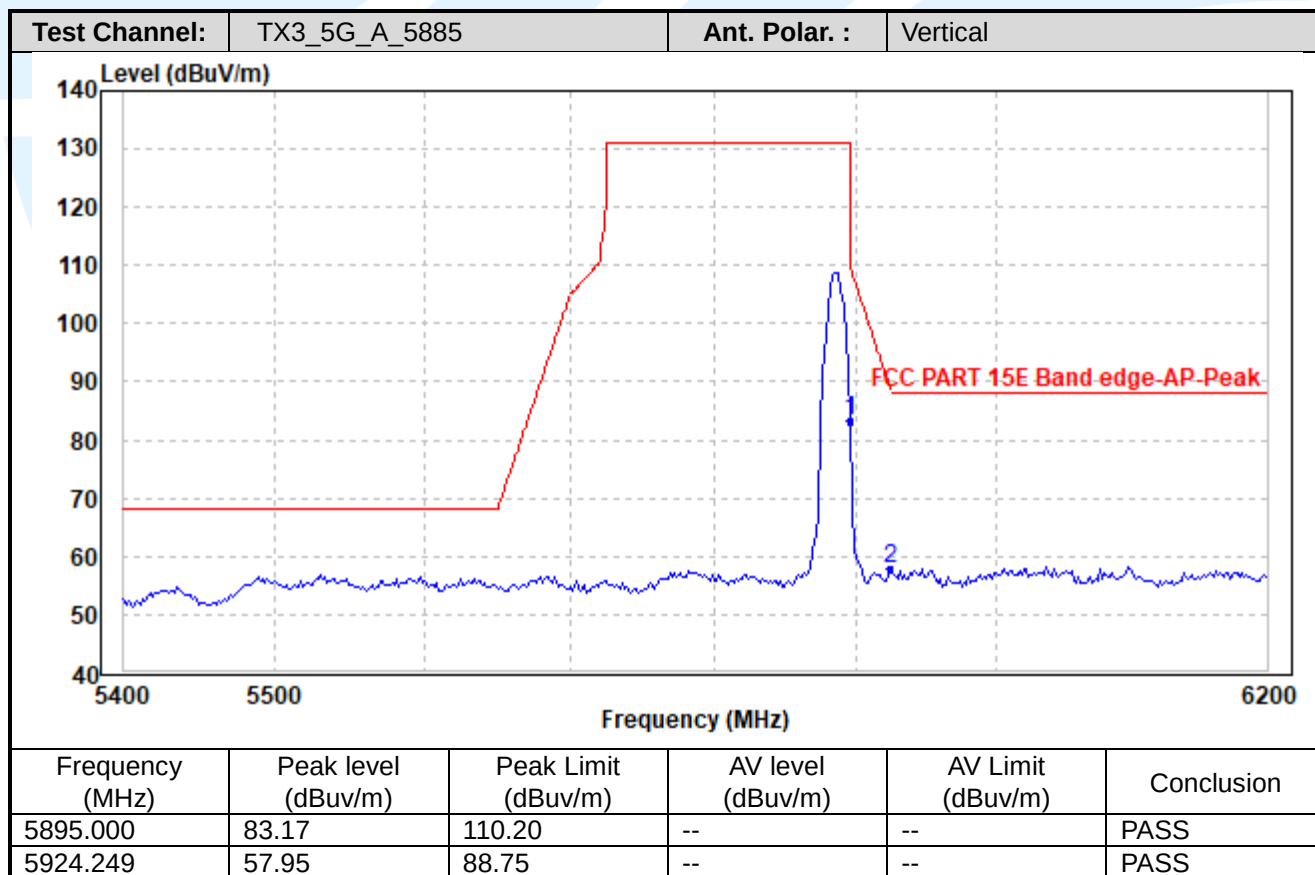
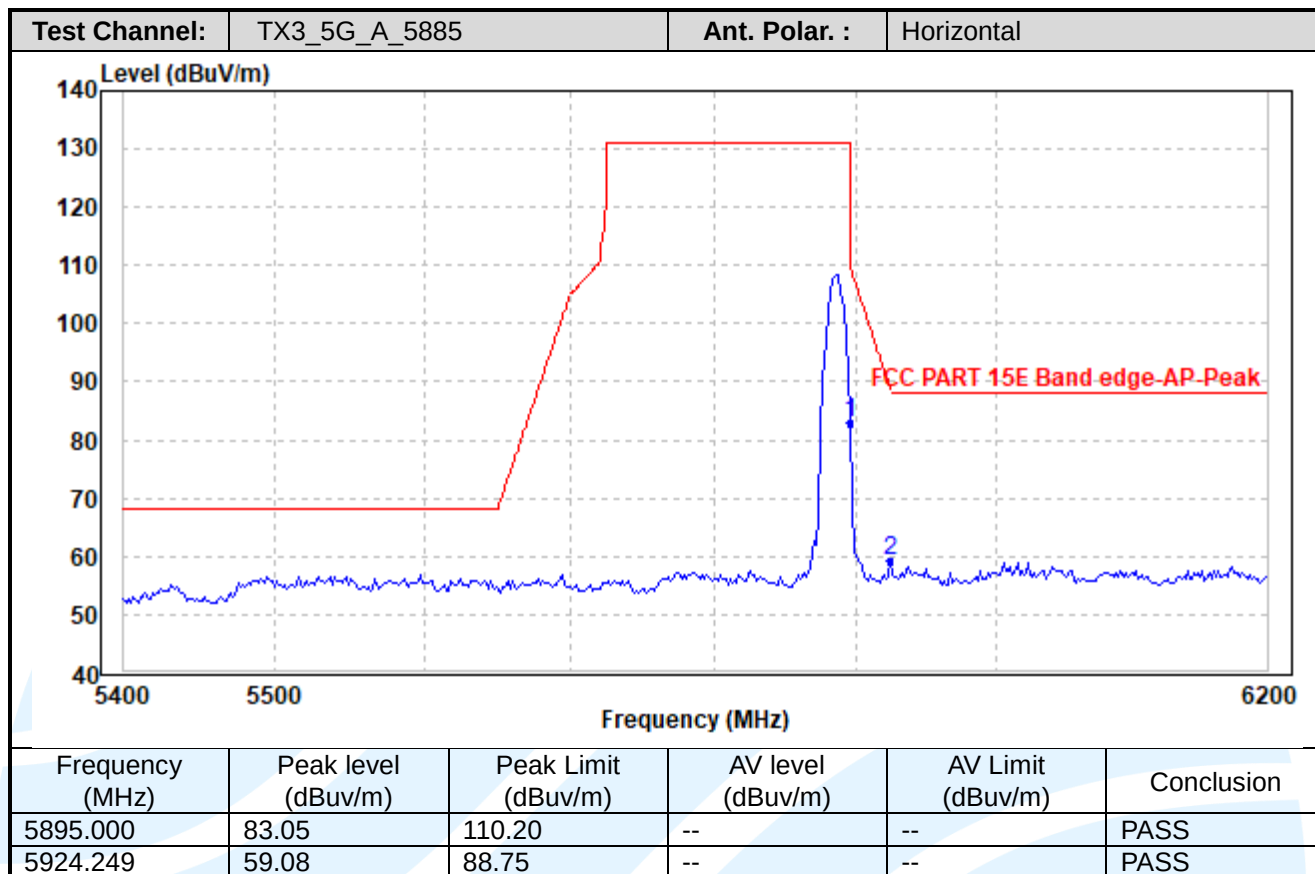
Tel: +86-755-28230888

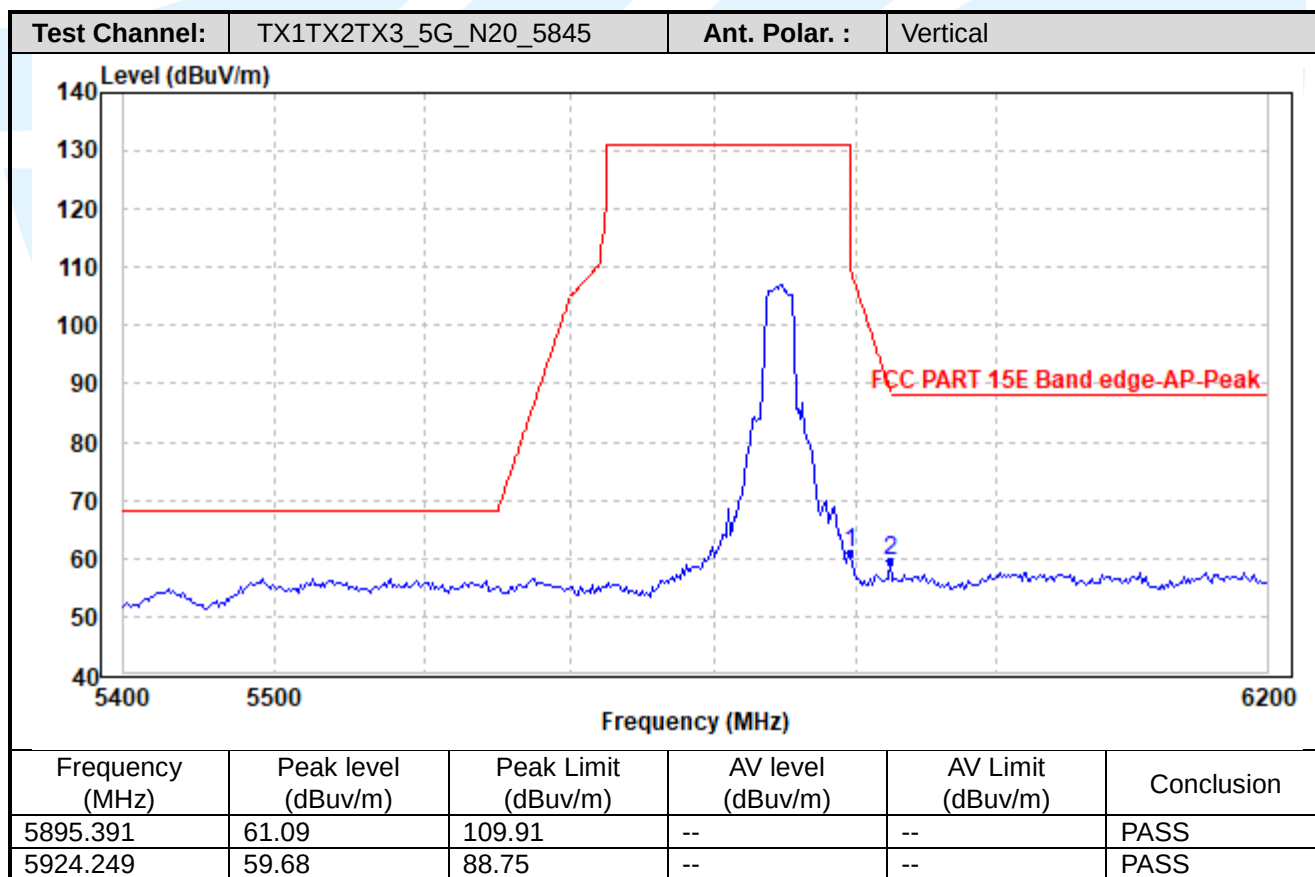
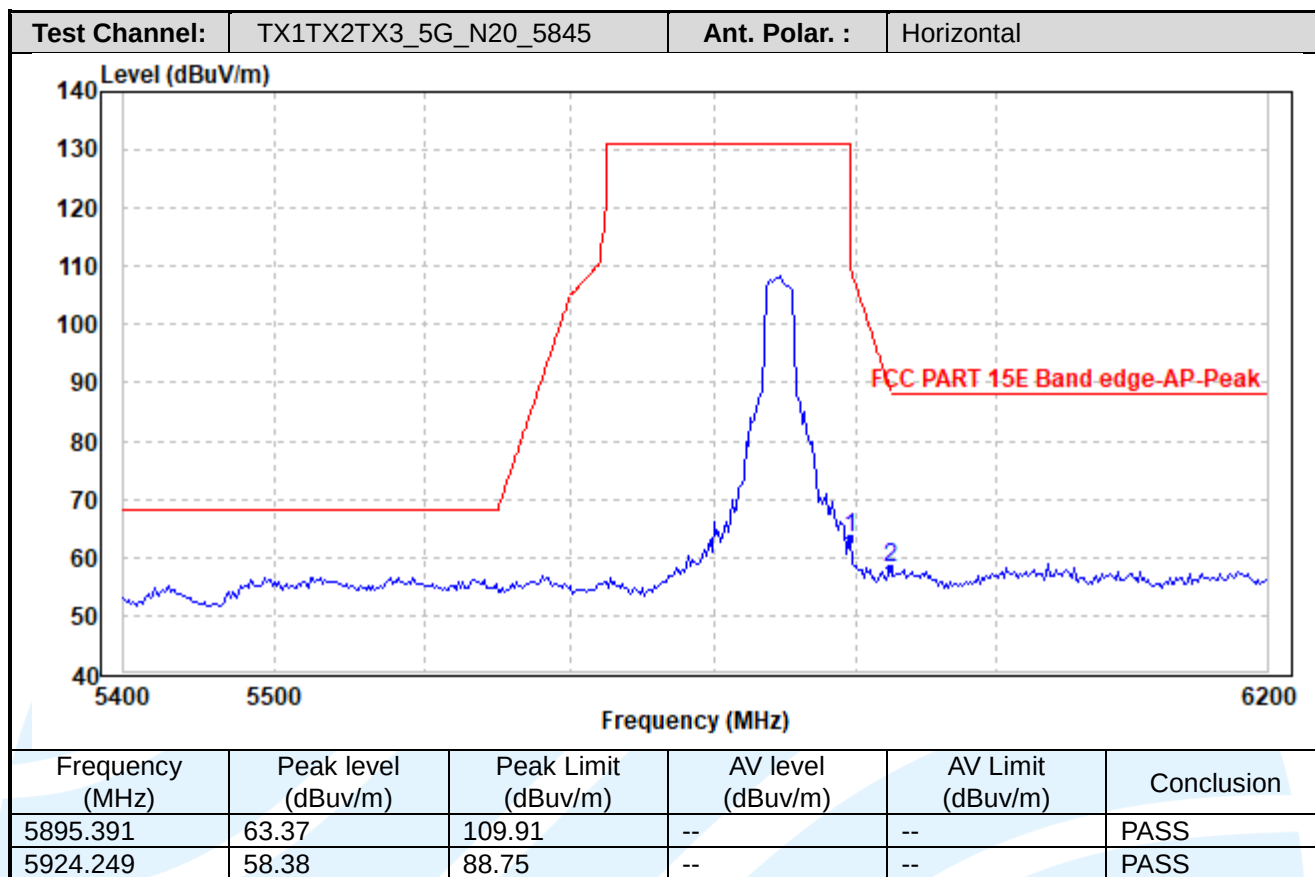
Fax: +86-755-28230886

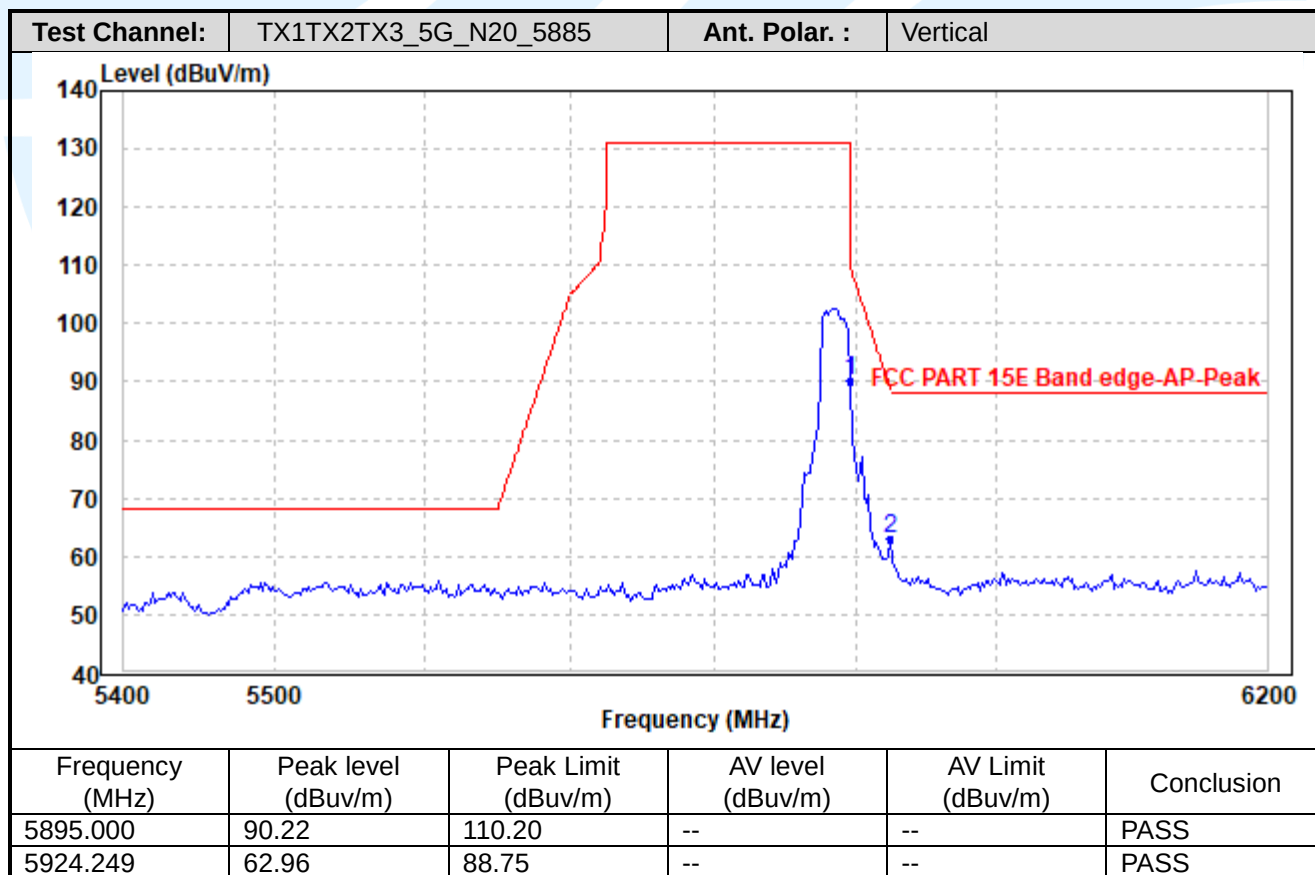
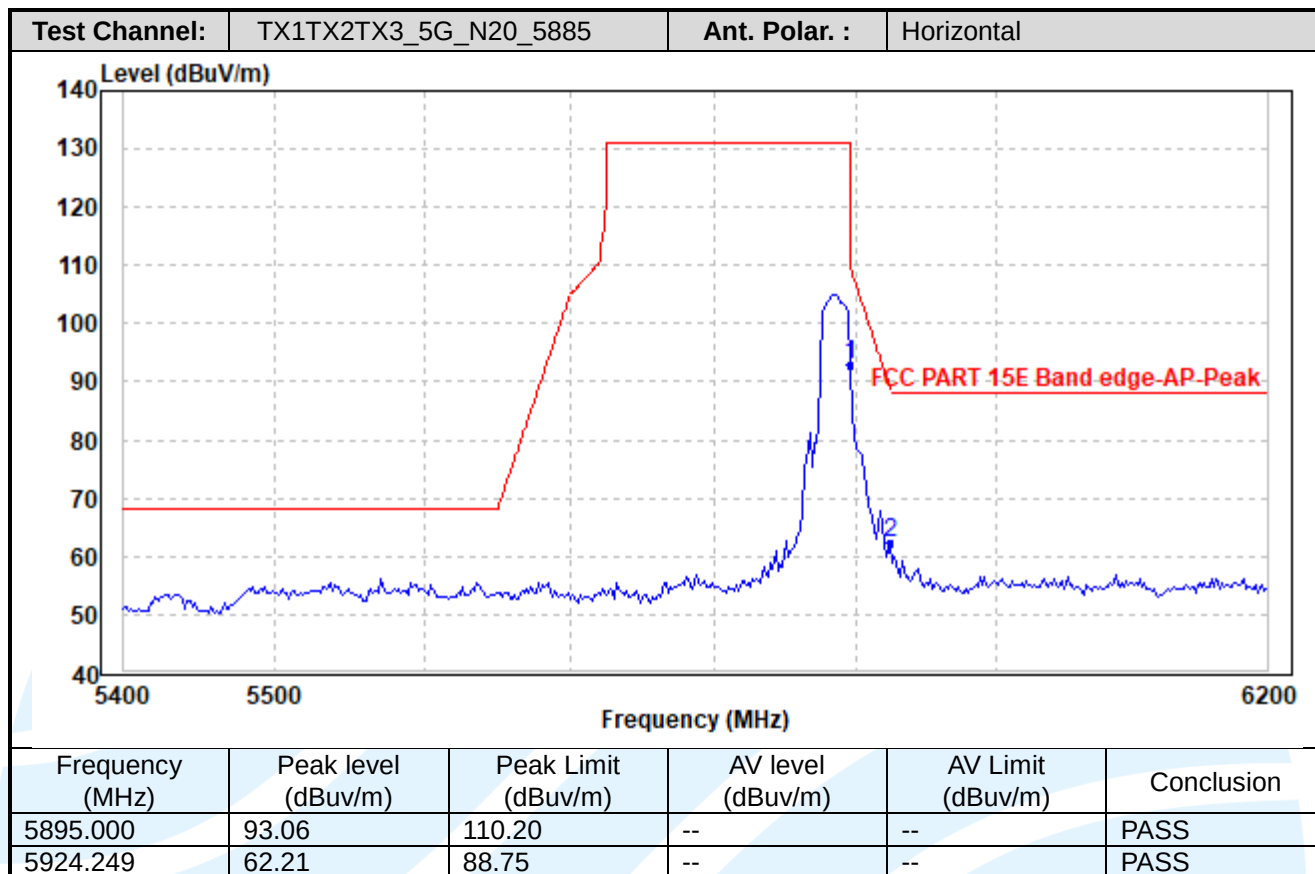
E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3







Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

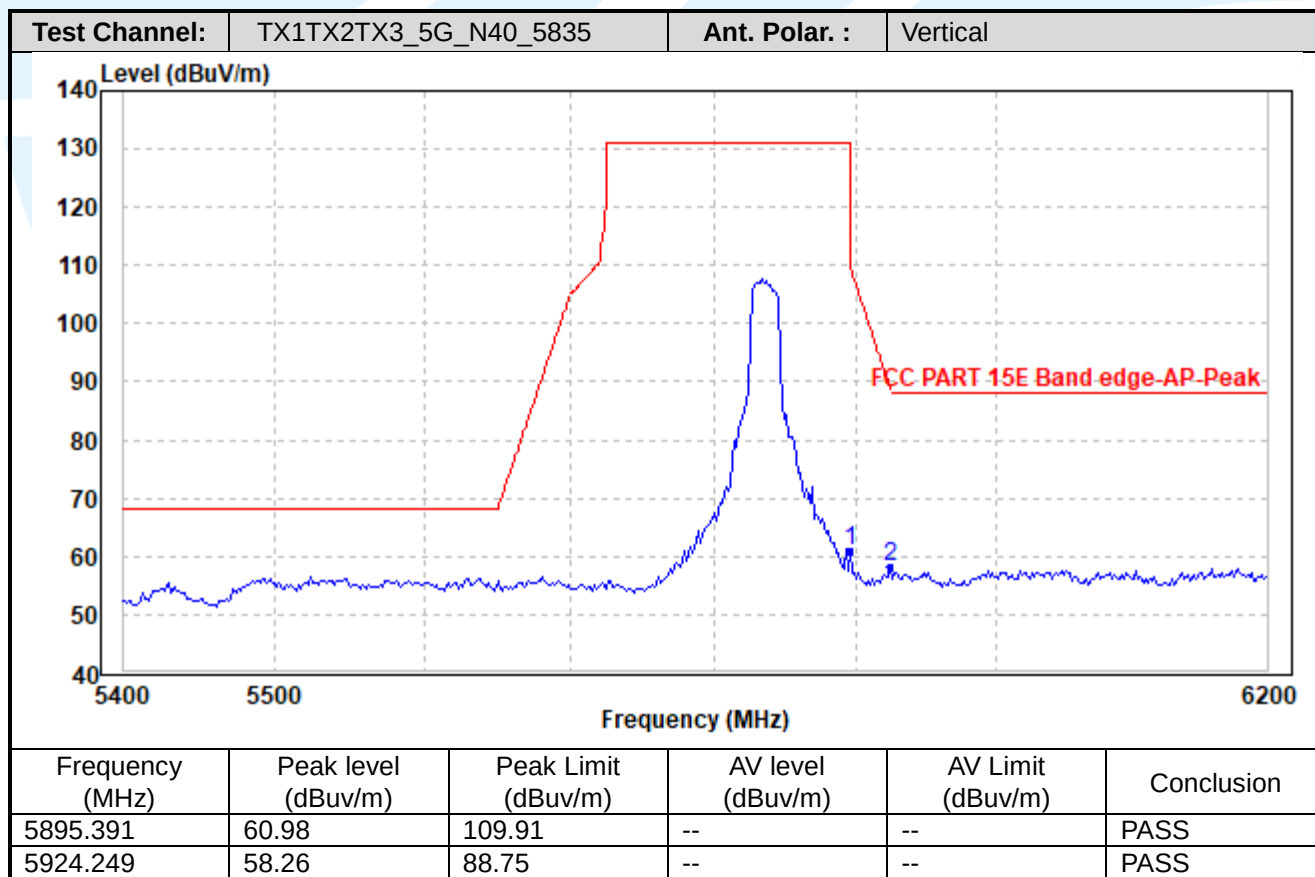
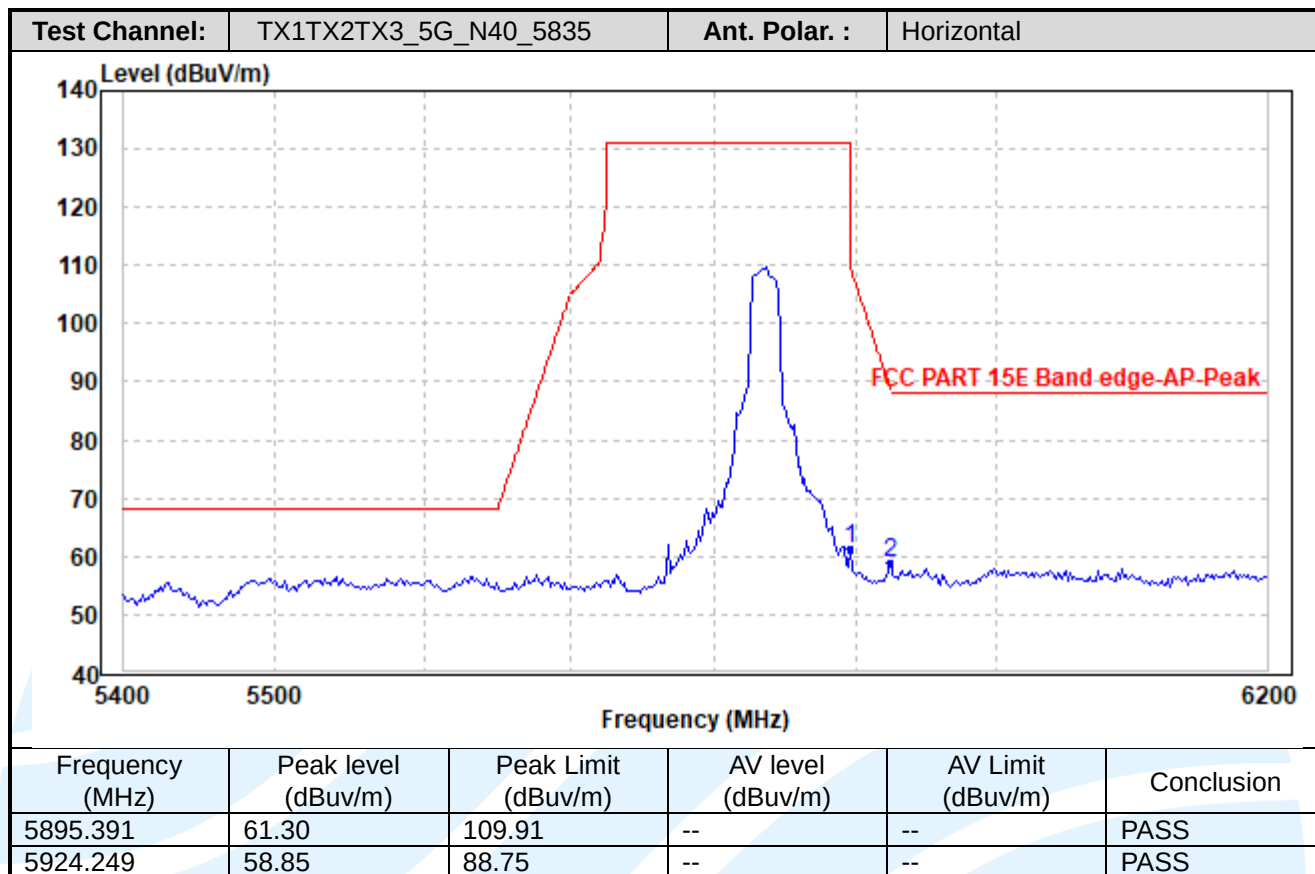
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

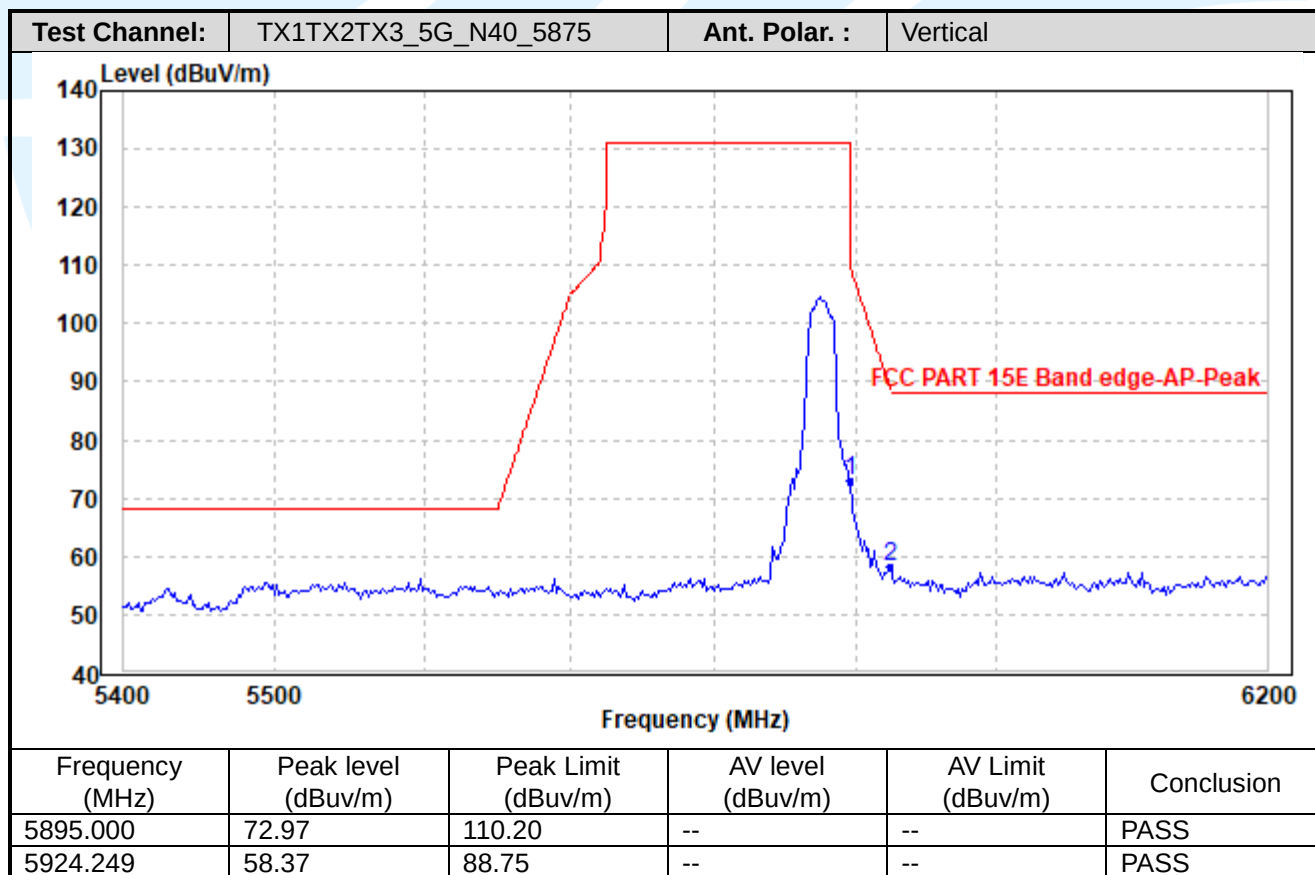
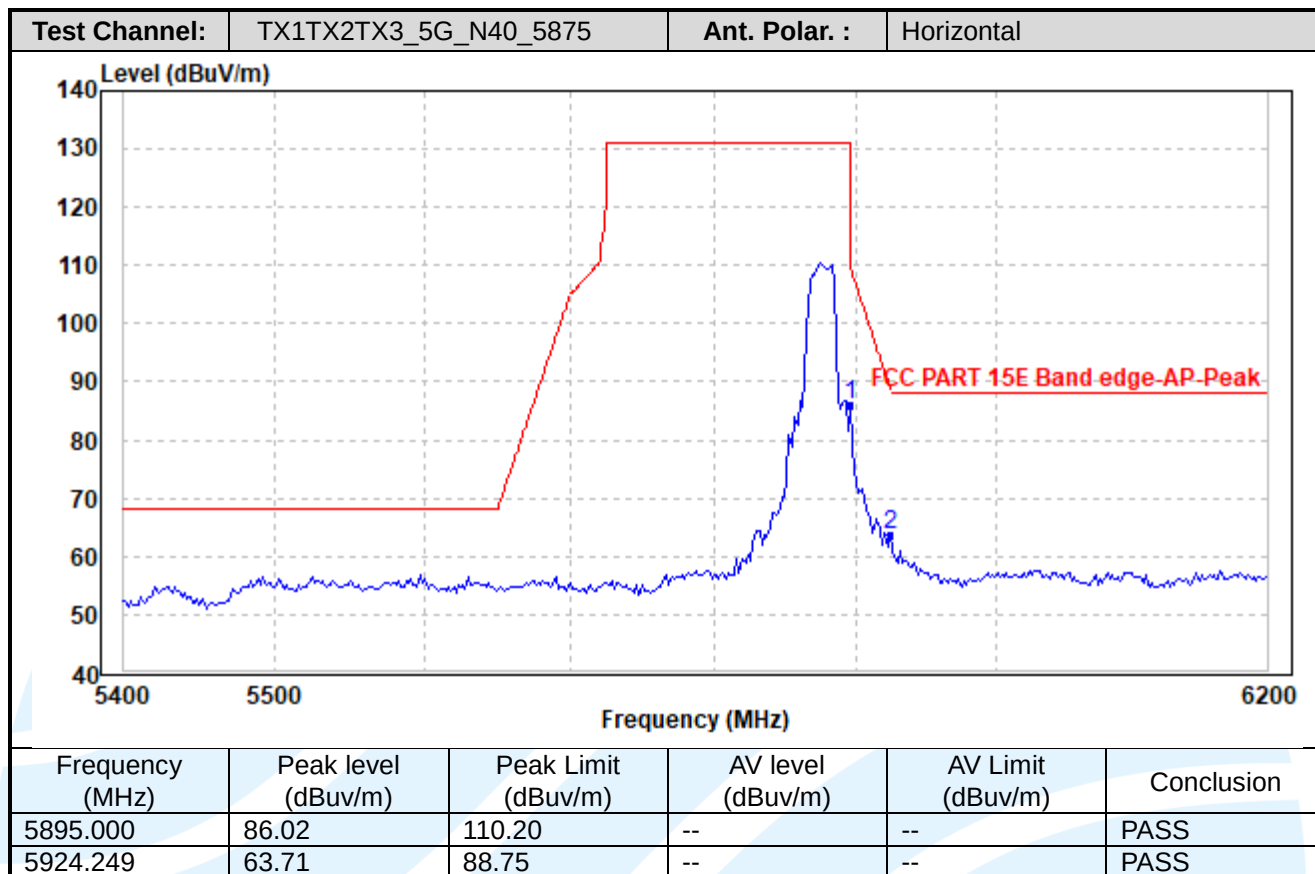
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

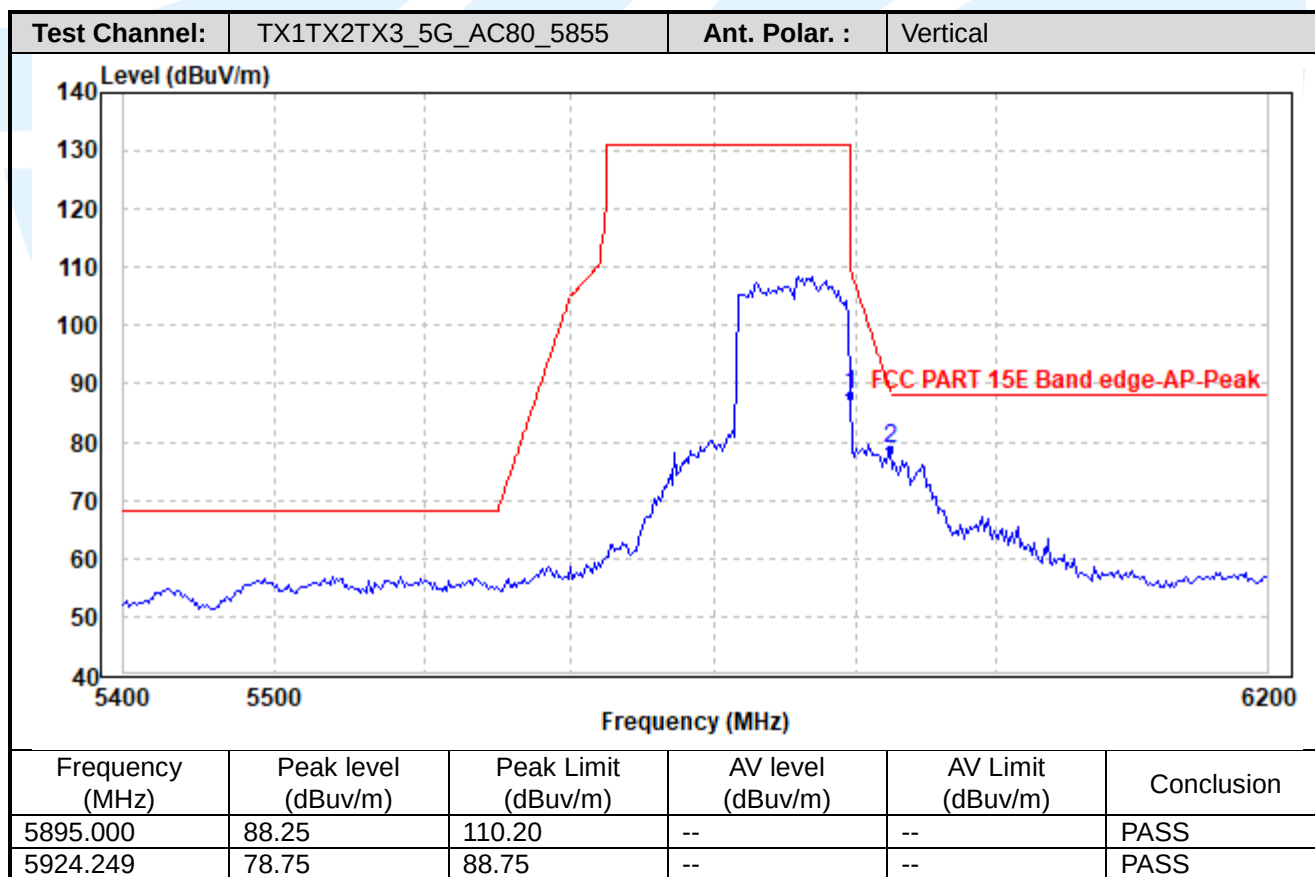
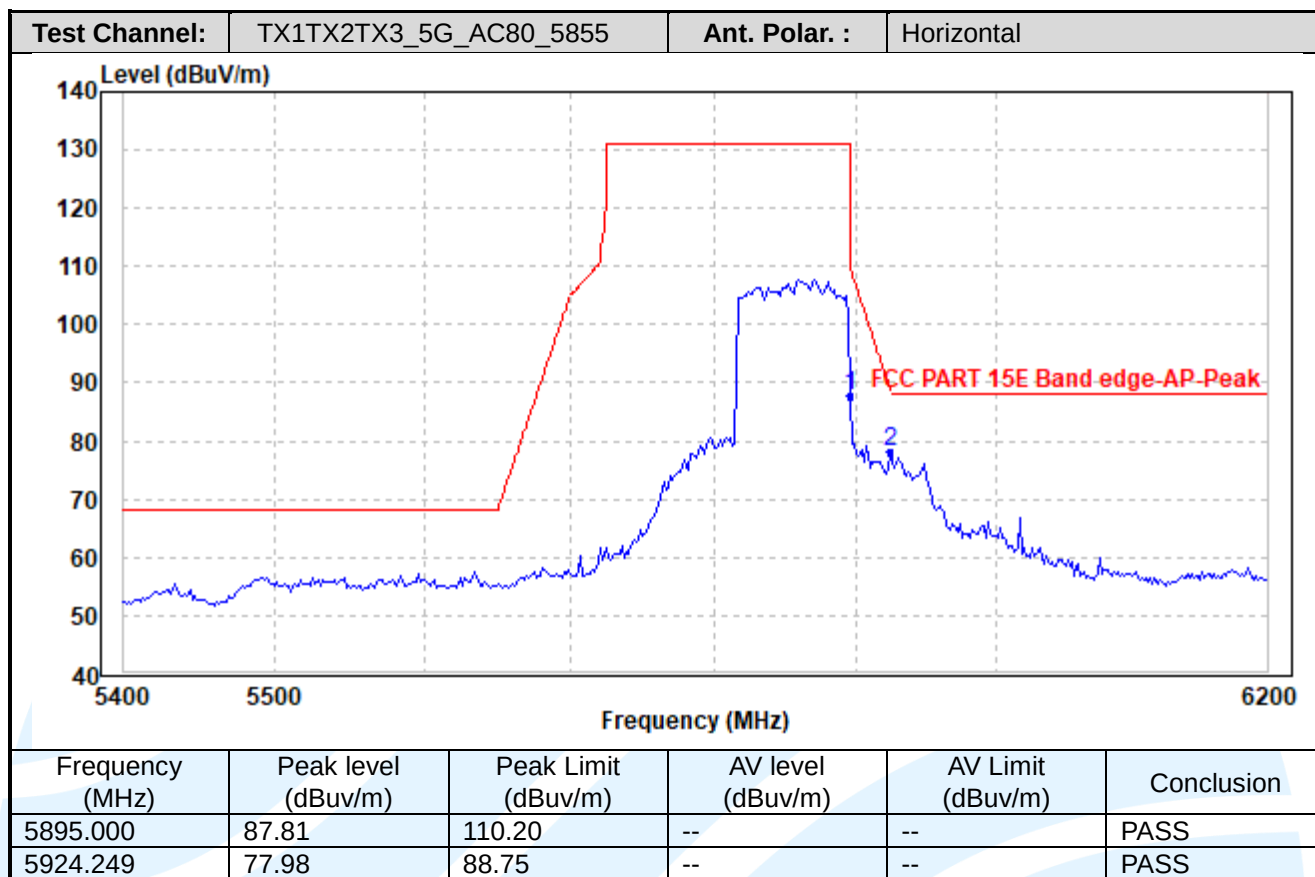
Tel: +86-755-28230888

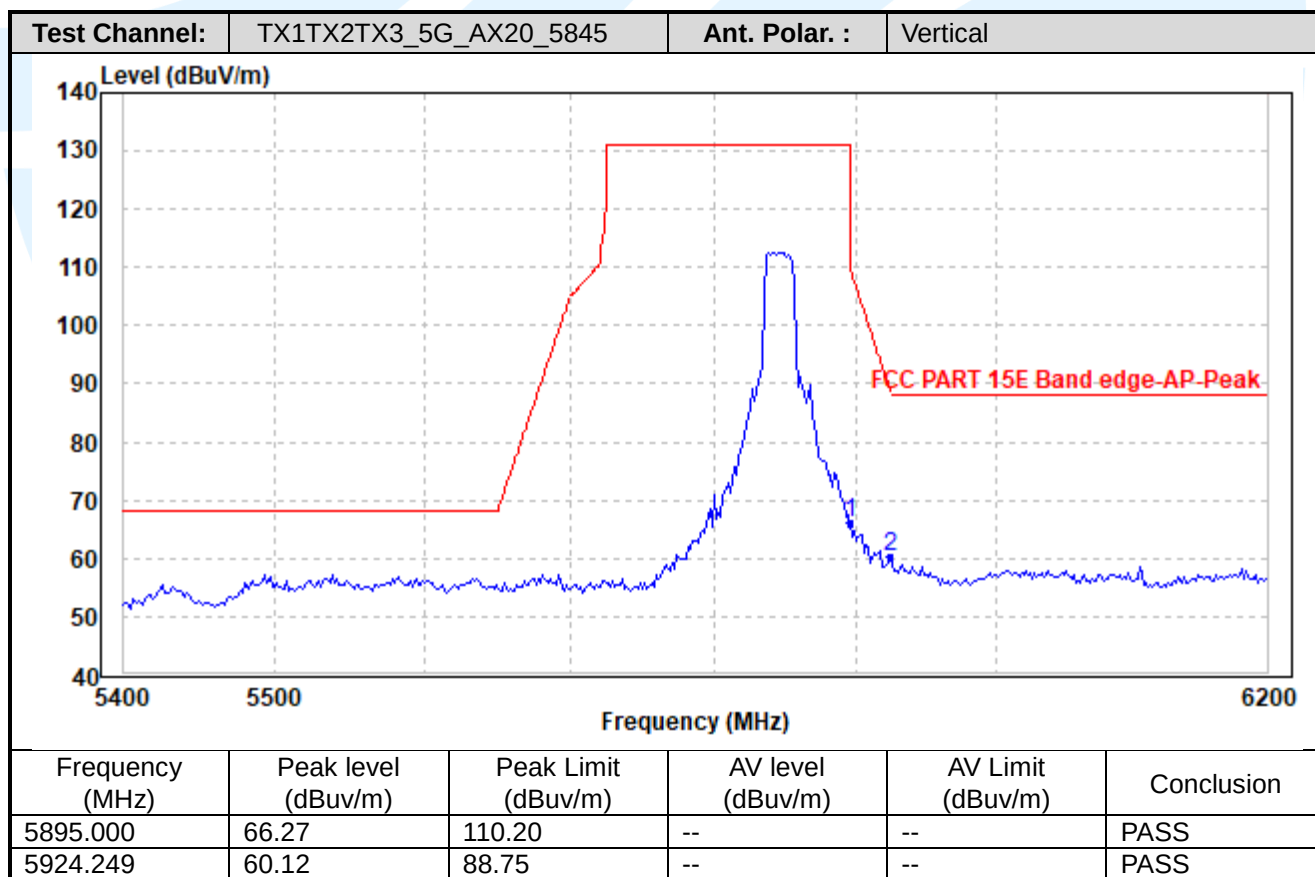
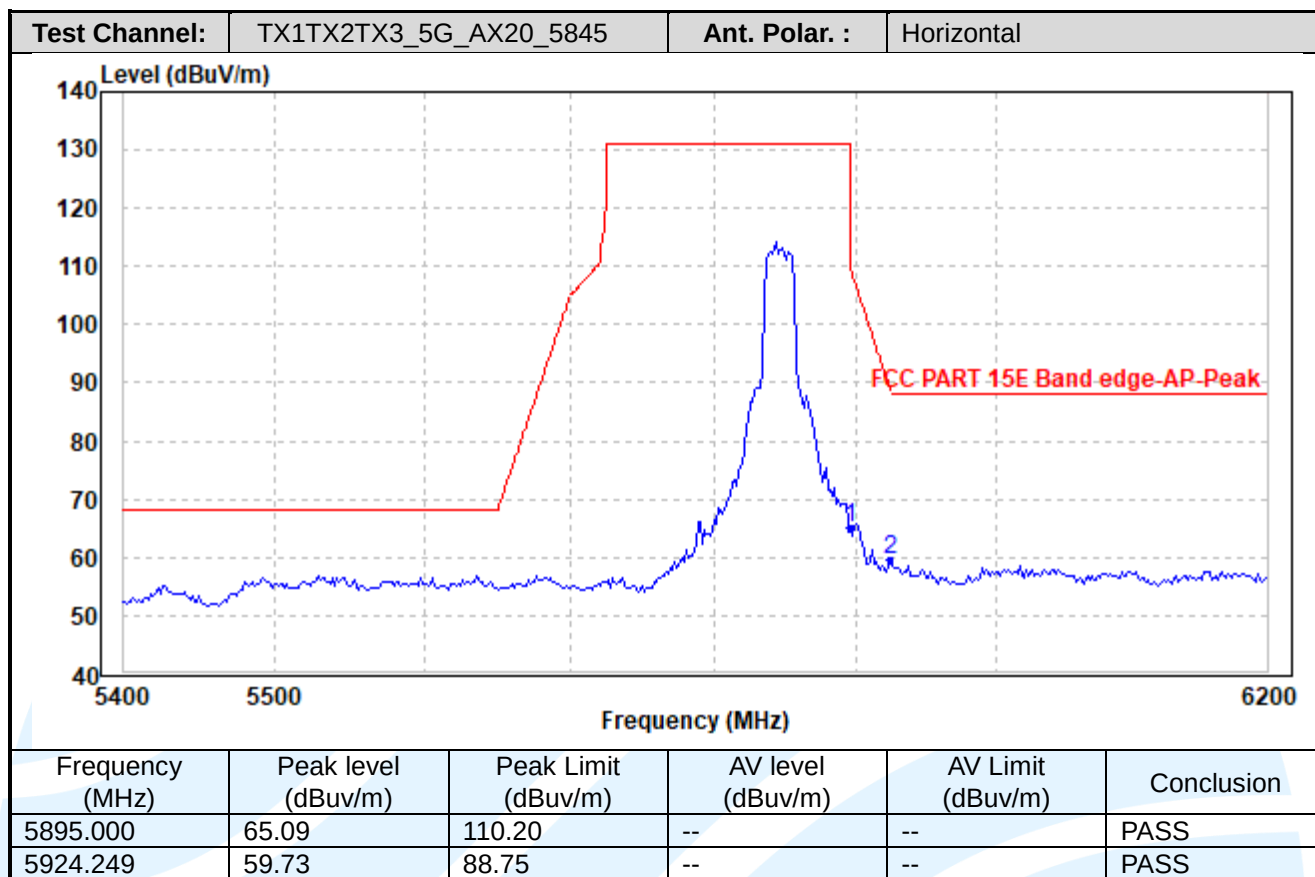
Fax: +86-755-28230886

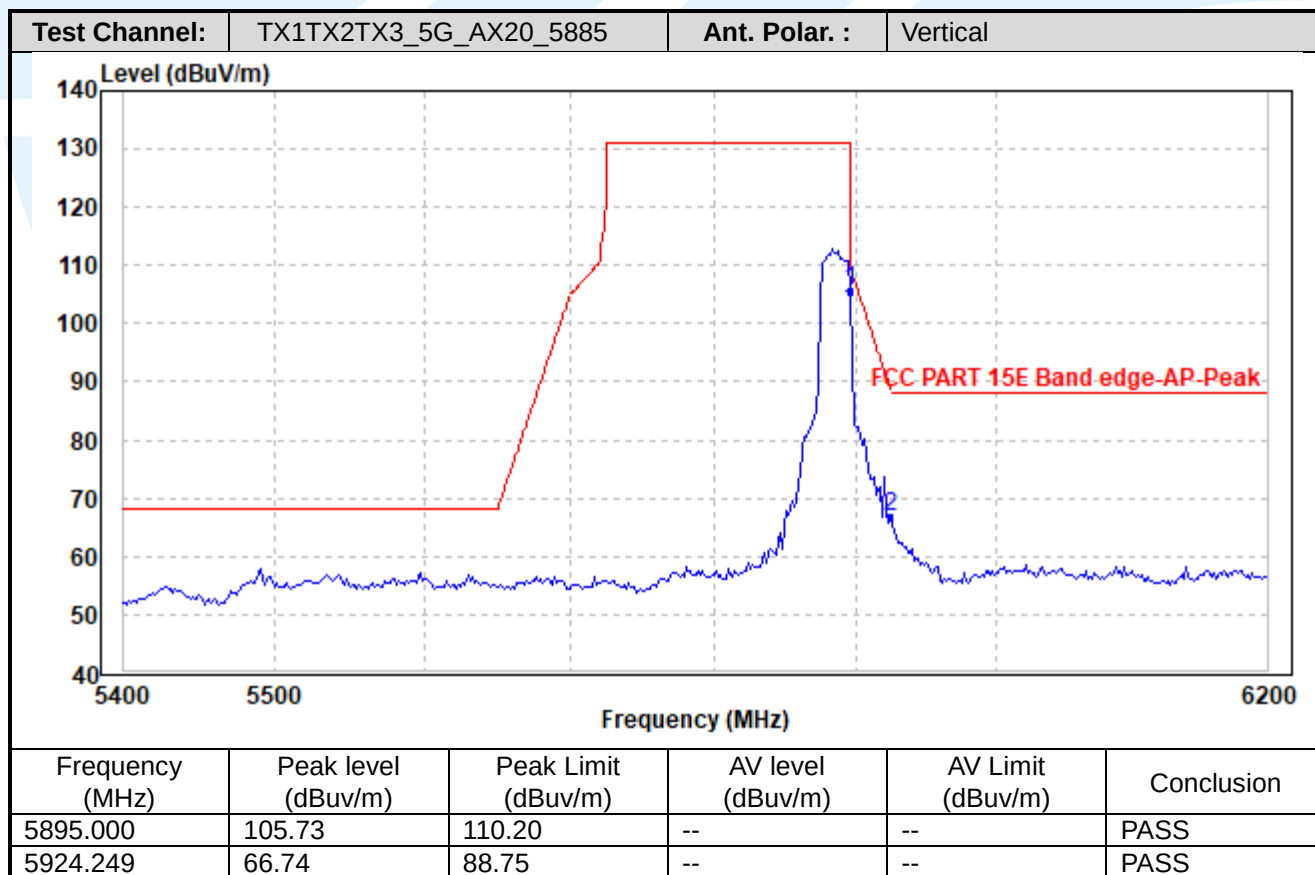
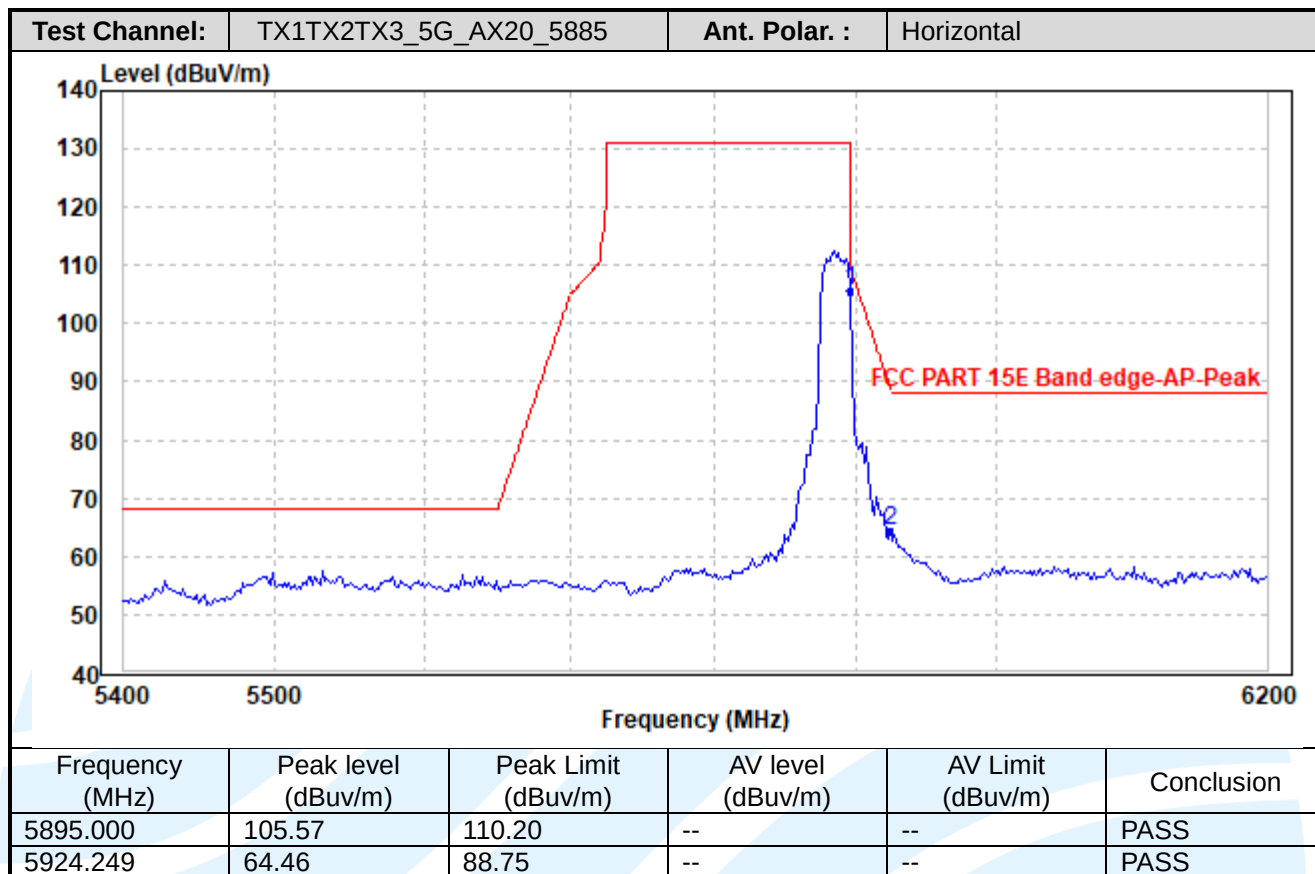
E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3







Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

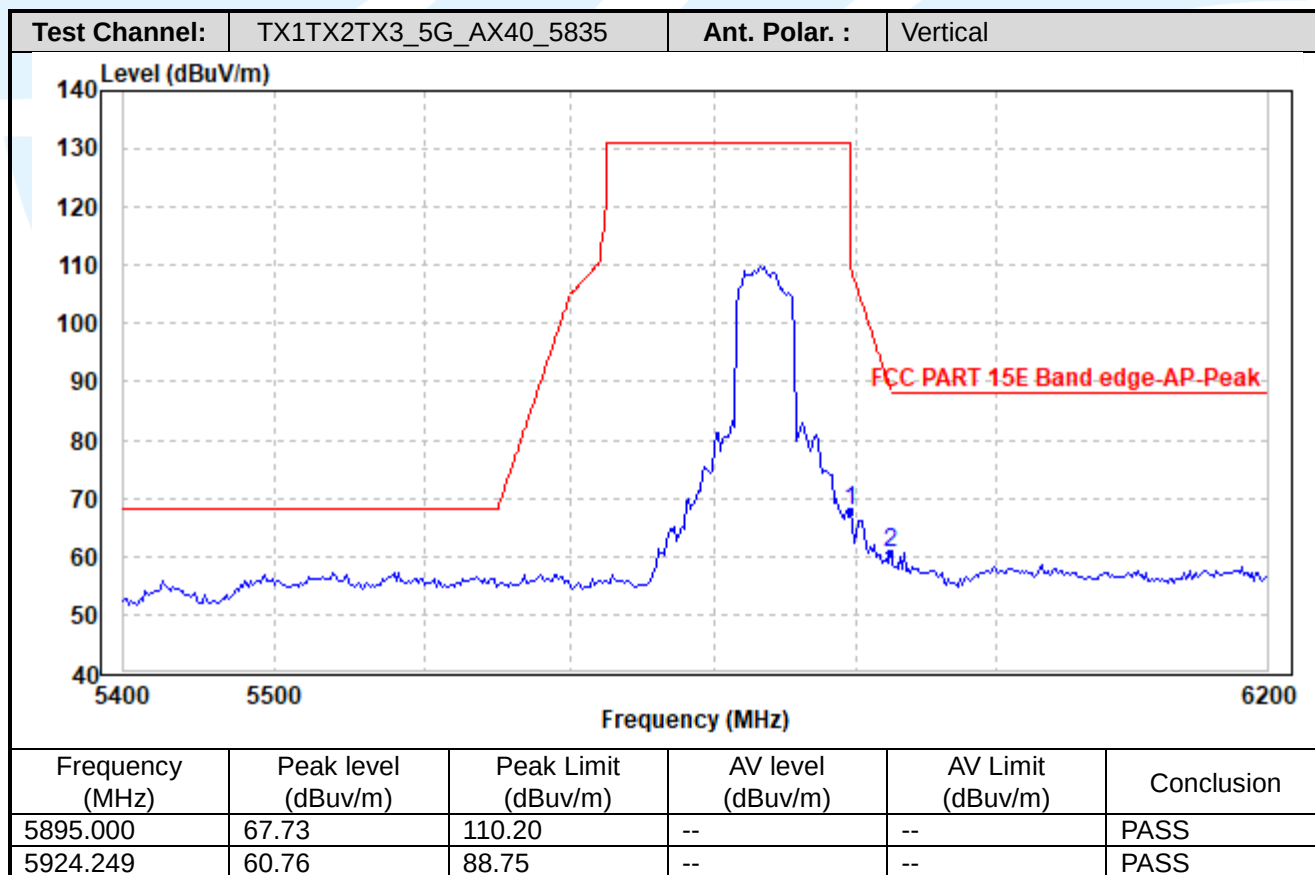
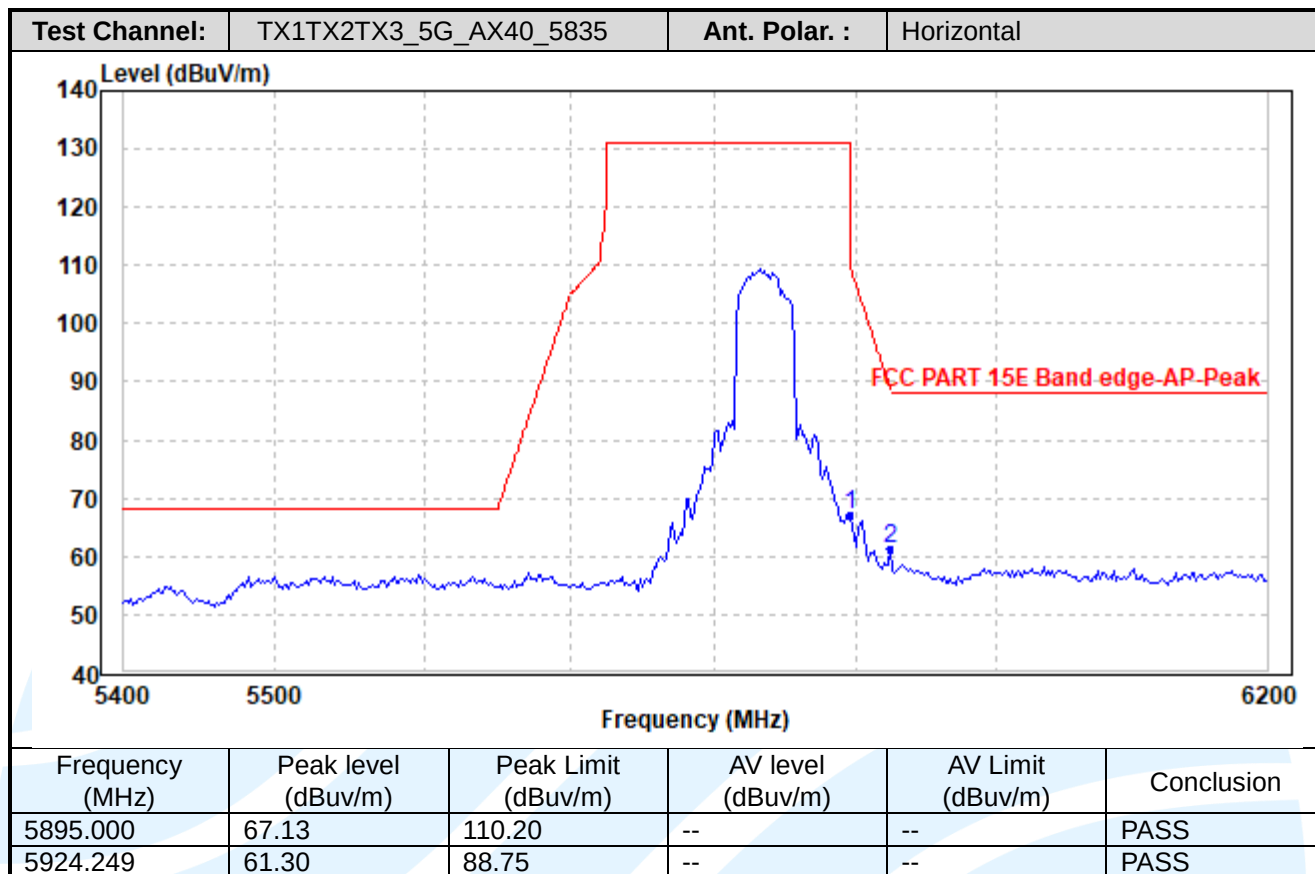
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

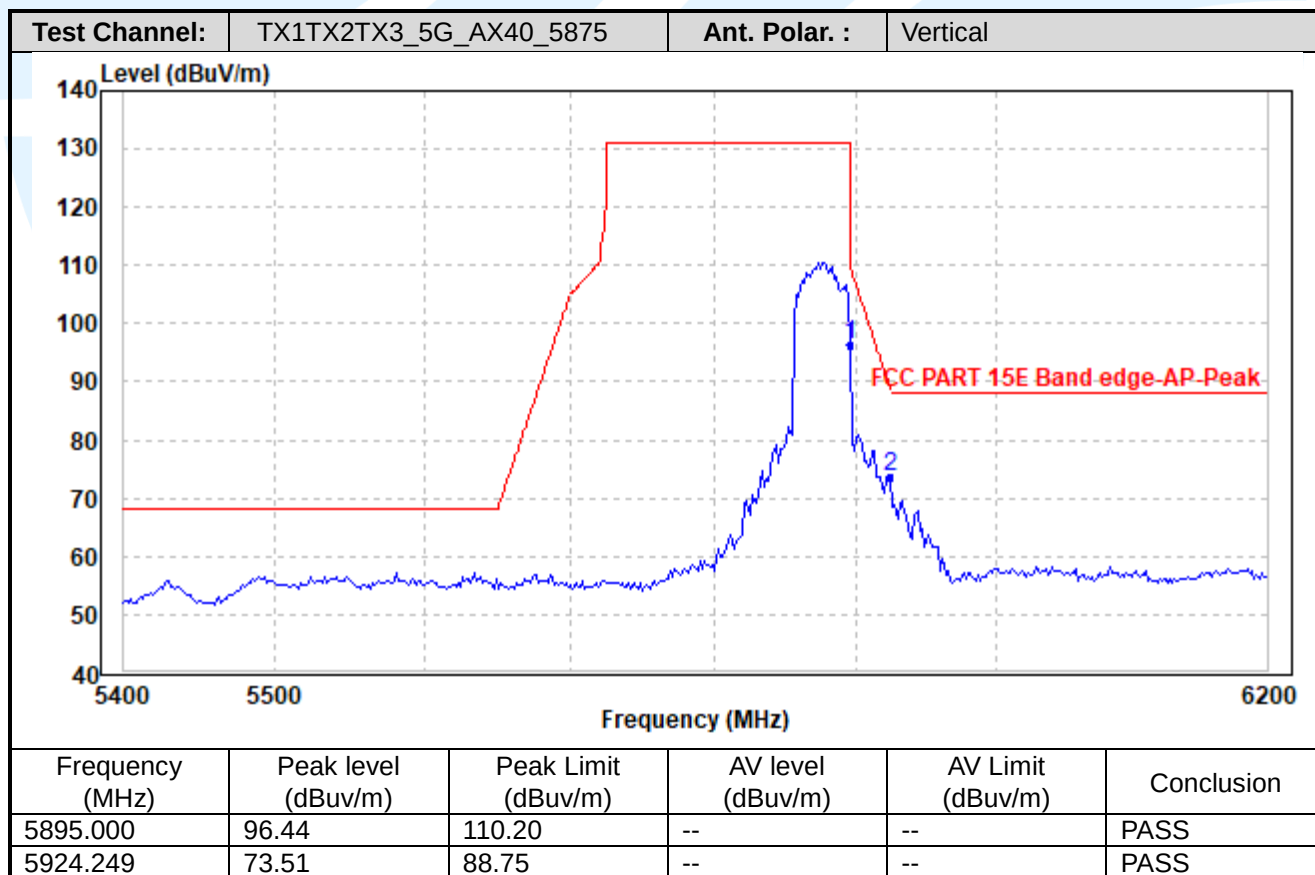
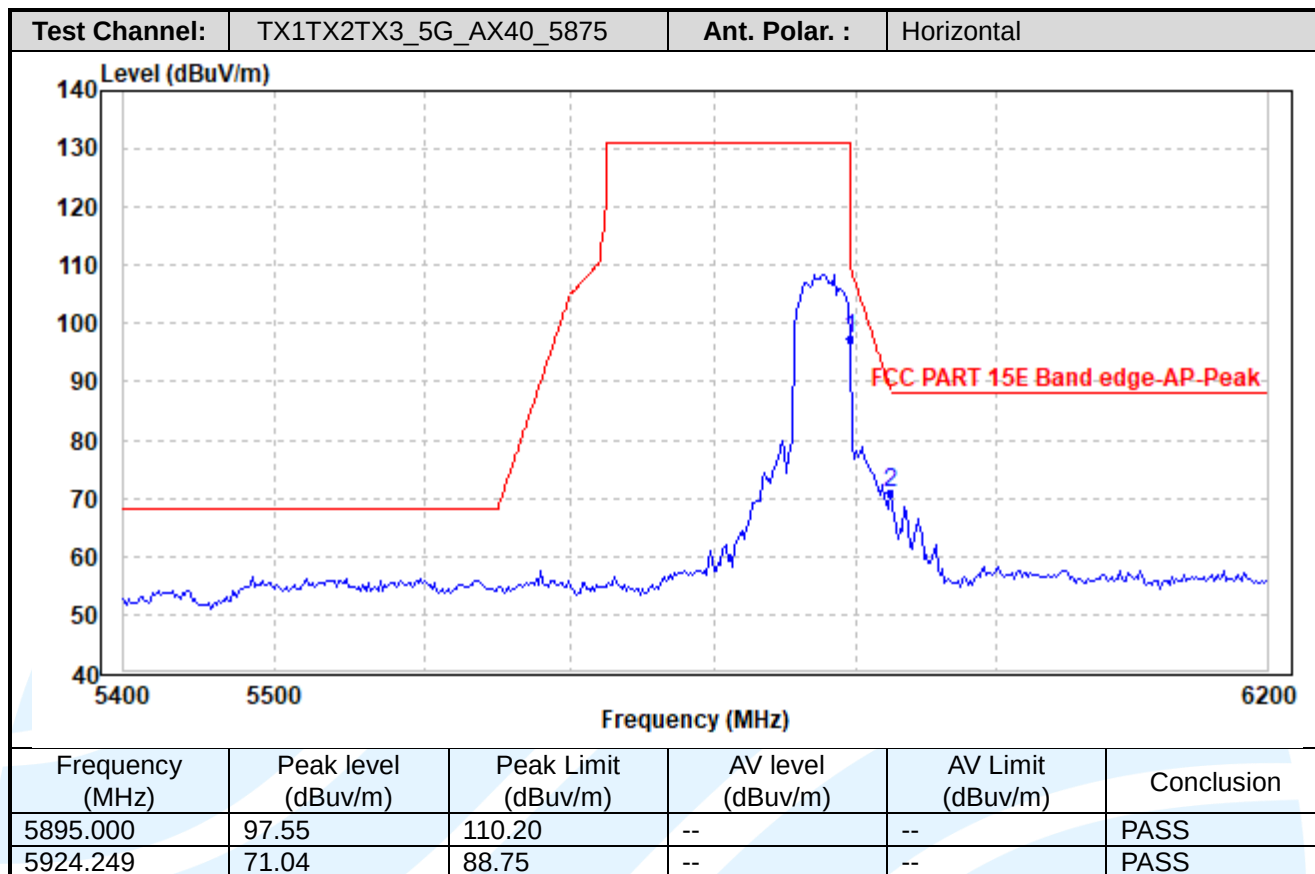
Tel: +86-755-28230888

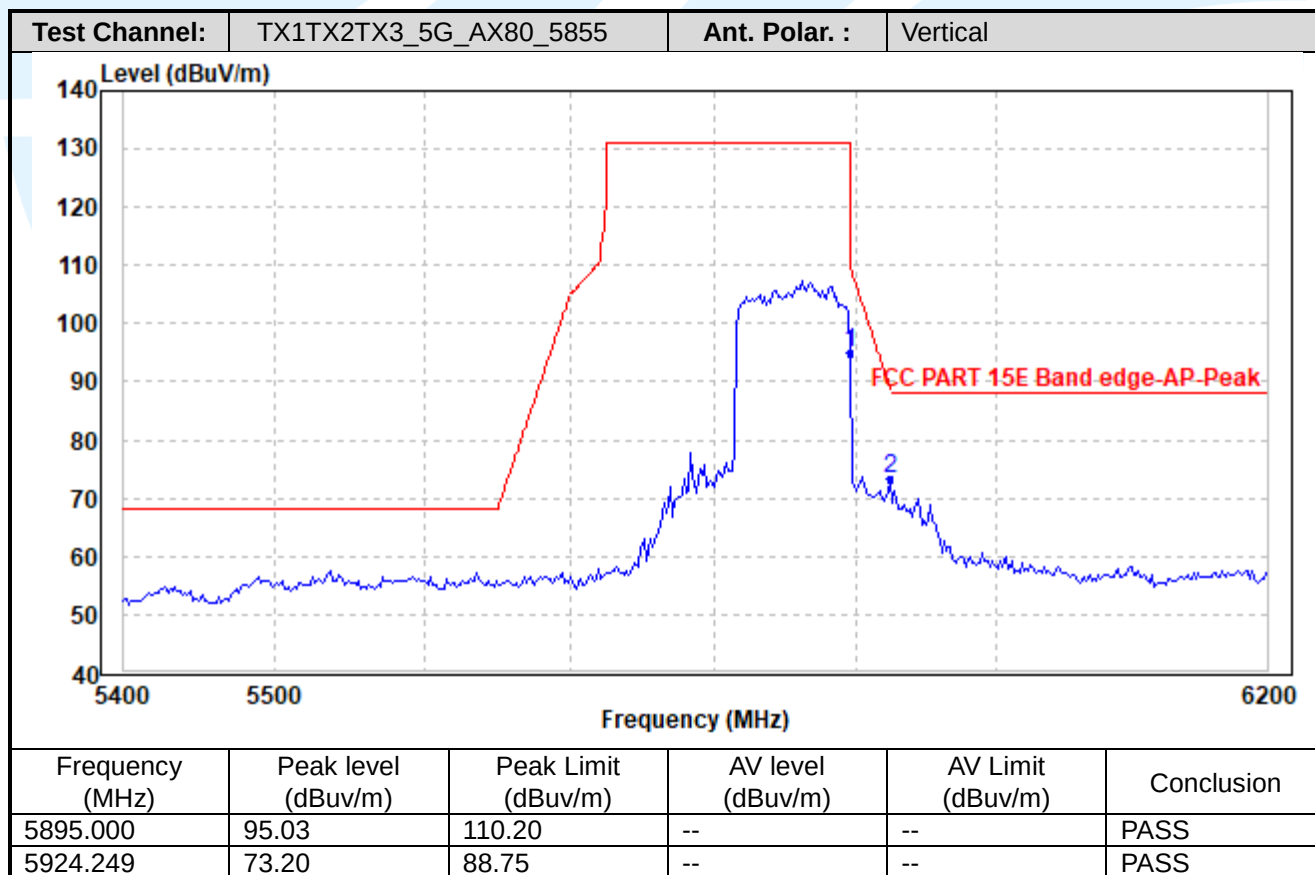
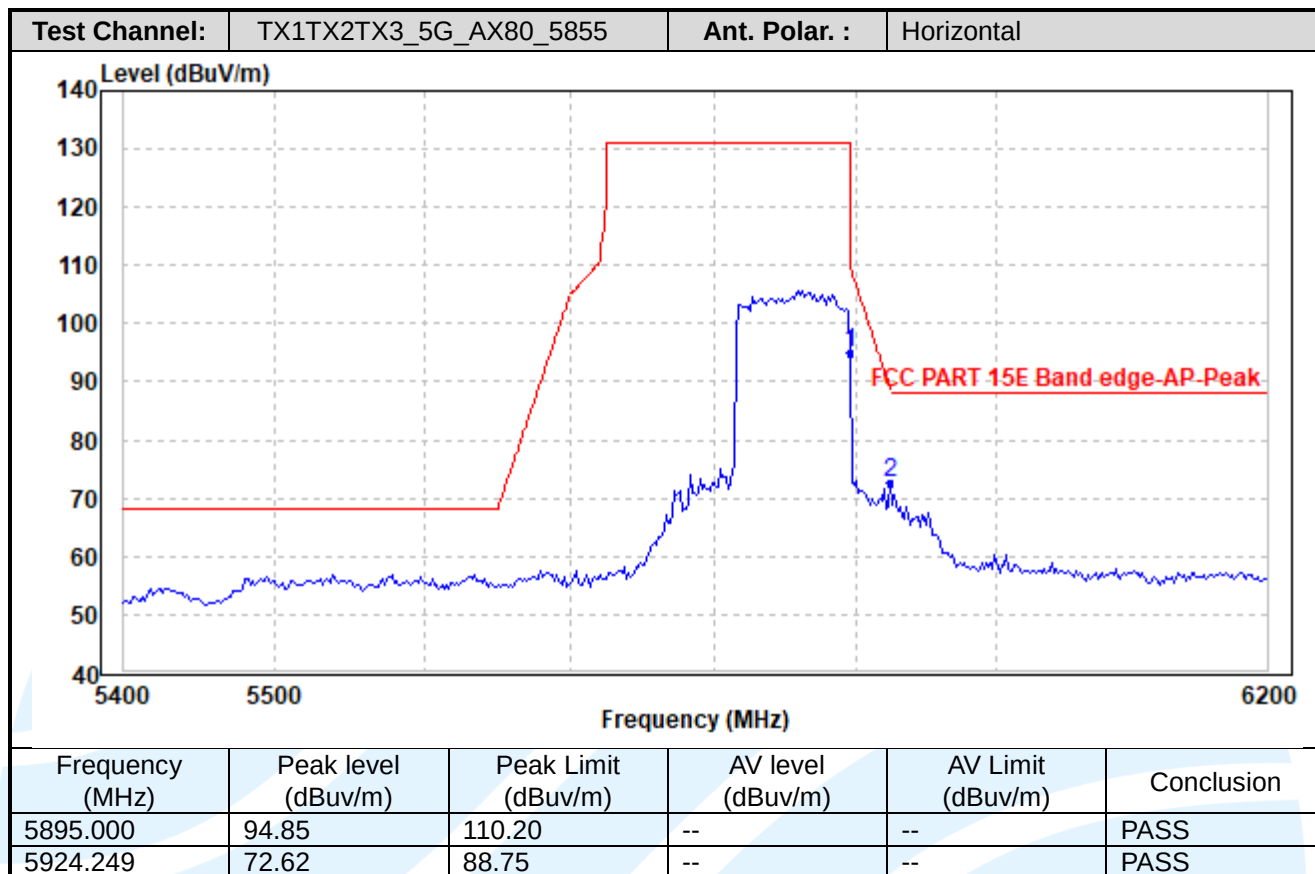
Fax: +86-755-28230886

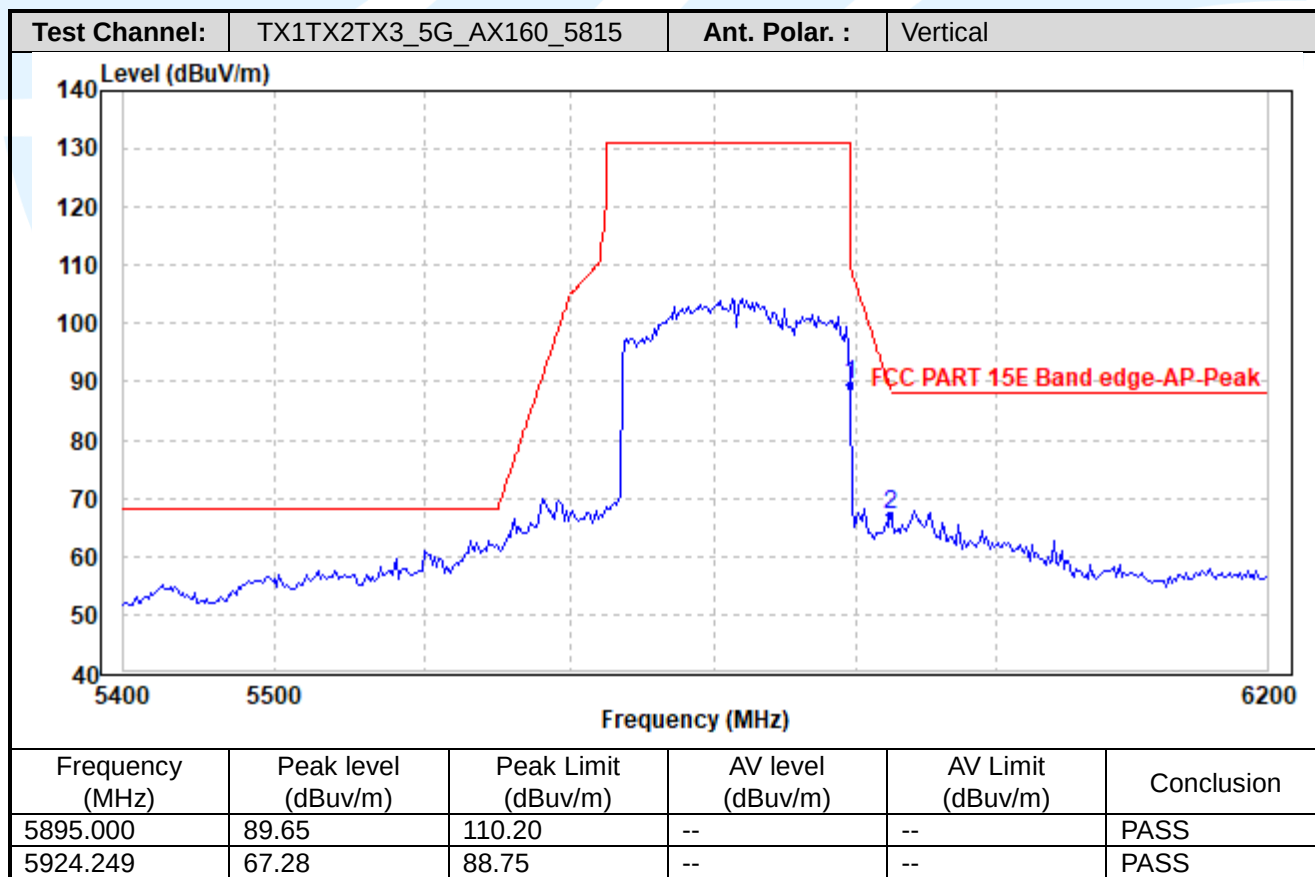
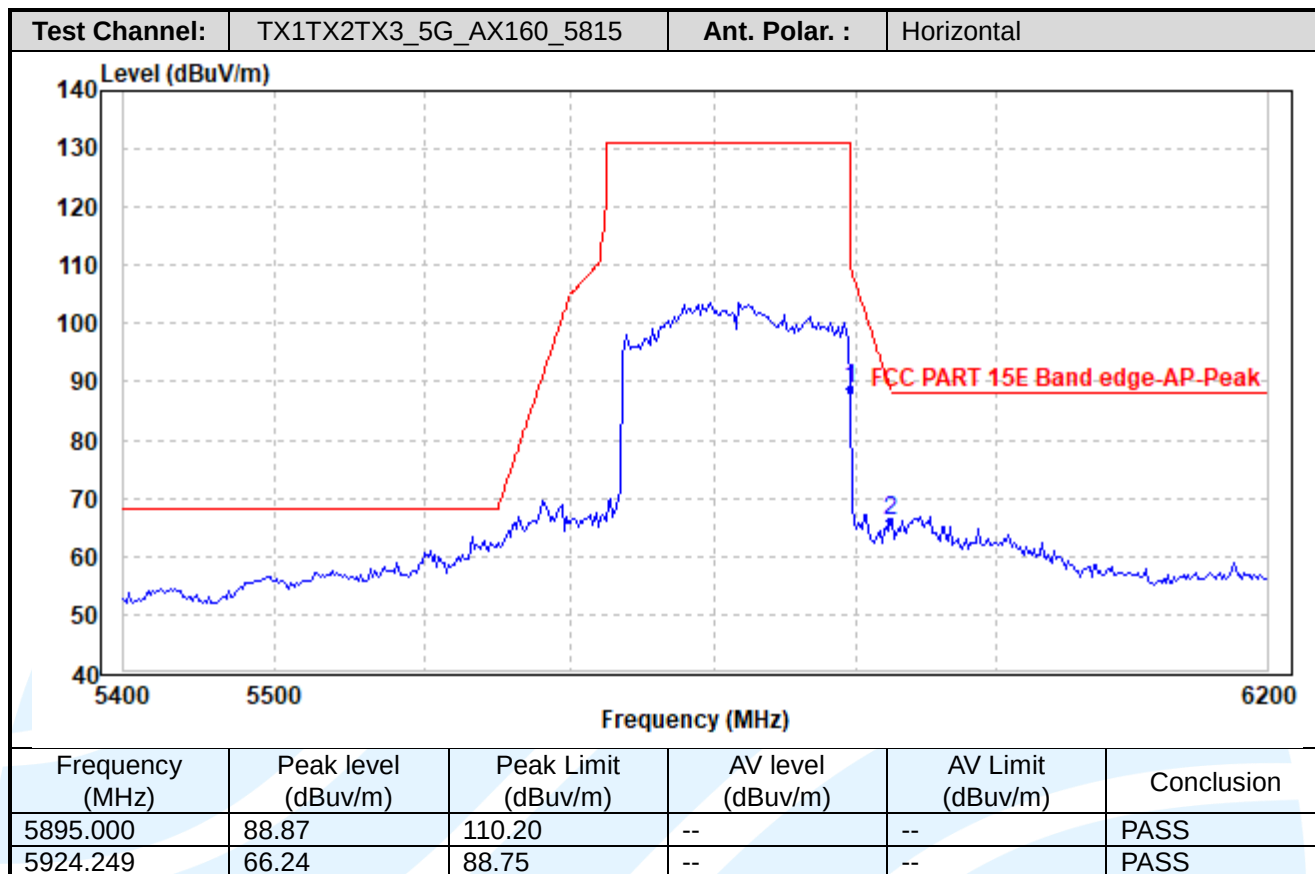
E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3







Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Limit - Result



5.7 AC POWER LINE CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.207

Test Method: ANSI C63.10-2020 Section 6.2

Limits:

Frequency range (MHz)	Limits (dB(μV))	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

Remark:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

Test Setup: Refer to section 4.4.2 for details.

Test Procedures:

Test frequency range :150KHz-30MHz

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Equipment Used: Refer to section 3 for details.

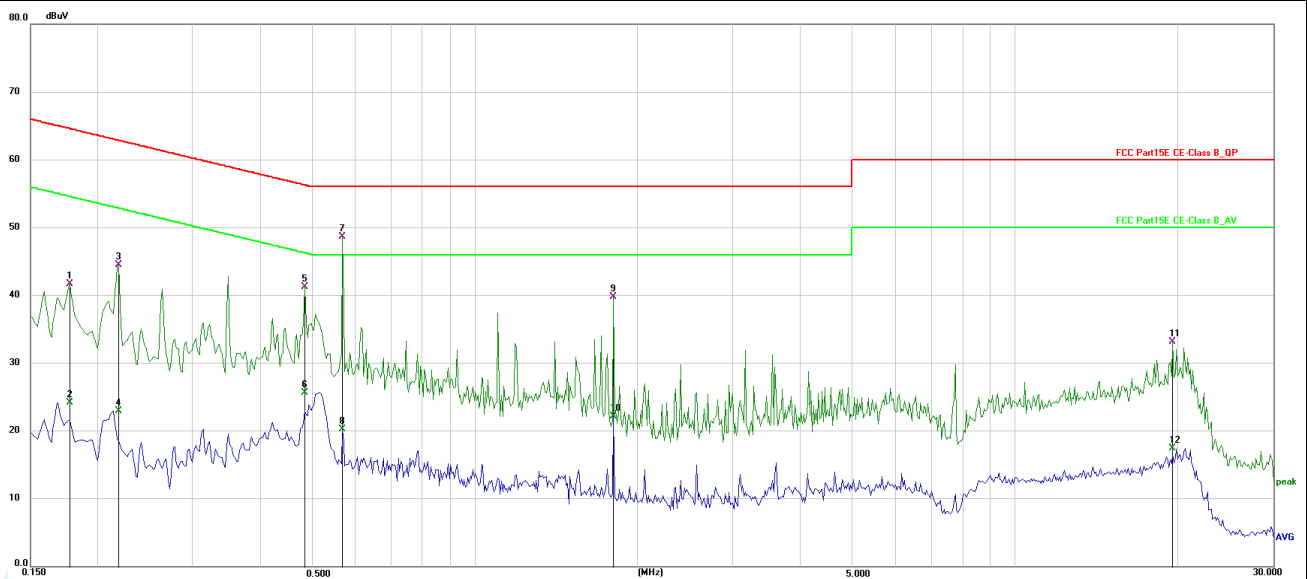
Test Result: Pass

The worst measurement data as follows:

Quasi Peak and Average:

Mode: WIFI Link

Live Line



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1770	31.87	9.78	41.65	64.63	-22.98	QP
2	0.1770	14.36	9.78	24.14	54.63	-30.49	AVG
3	0.2174	34.72	9.79	44.51	62.92	-18.41	QP
4	0.2174	13.16	9.79	22.95	52.92	-29.97	AVG
5	0.4830	31.48	9.80	41.28	56.29	-15.01	QP
6	0.4830	15.85	9.80	25.65	46.29	-20.64	AVG
7	0.5685	38.82	9.79	48.61	56.00	-7.39	QP
8	0.5685	10.43	9.79	20.22	46.00	-25.78	AVG
9	1.8015	30.01	9.71	39.72	56.00	-16.28	QP
10	1.8015	12.46	9.71	22.17	46.00	-23.83	AVG
11	19.6350	23.21	9.91	33.12	60.00	-26.88	QP
12	19.6350	7.55	9.91	17.46	50.00	-32.54	AVG

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

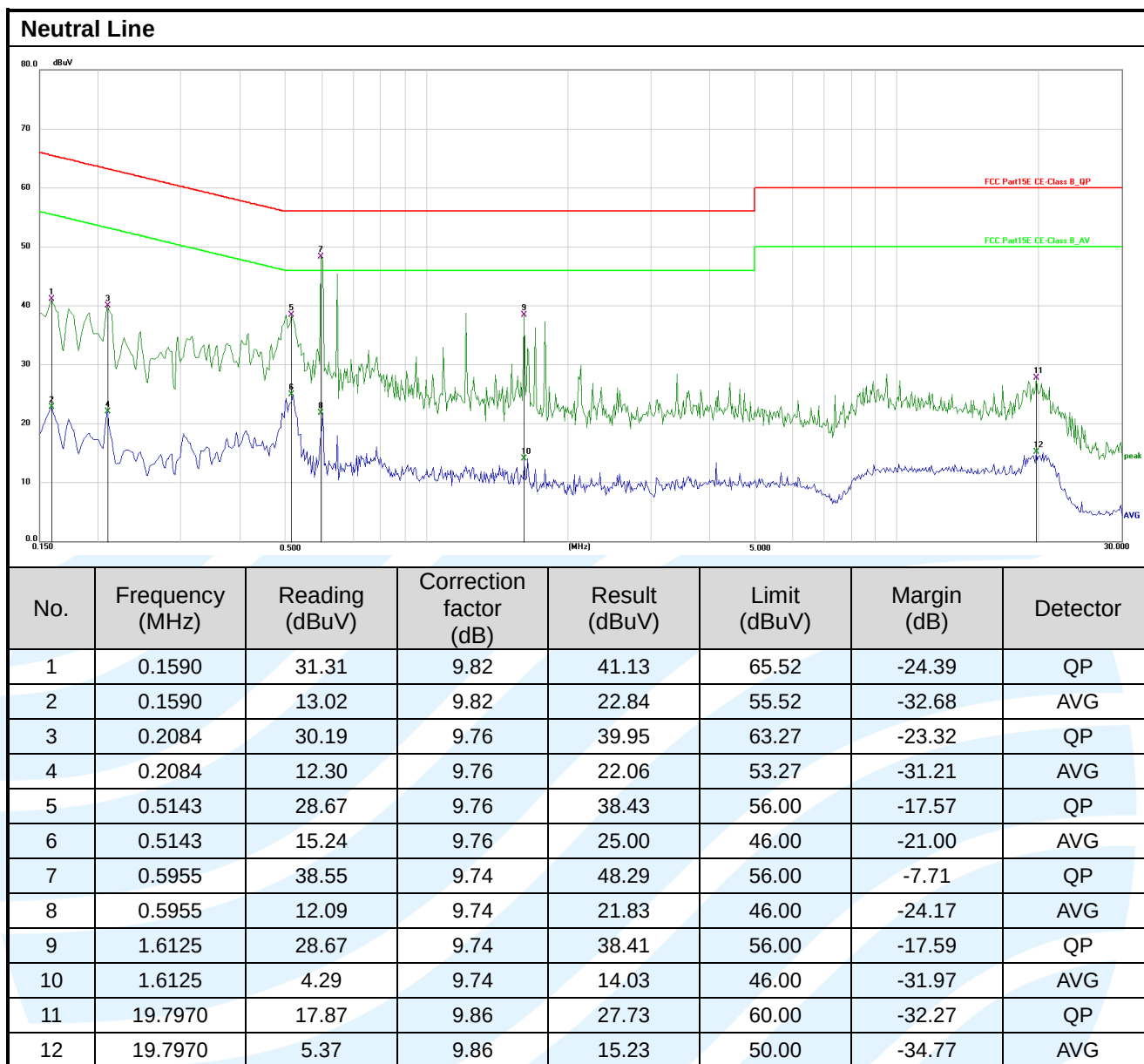
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3



Remark:

1. Correct Factor = LISN Factor + Cable Loss + Pulse Limiter Factor, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result - Limit
4. An initial pre-scan was performed on the Phase and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, 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

APPENDIX A RF TEST DATA

A.1 99% BANDWIDTH

For U-NII-4 Band:

Mode	Channel	RU & Index	Ant.	99% BW (MHz)
IEEE 802.11a	169	N/A	1	16.898
			2	16.946
			3	16.867
	173		1	16.869
			2	17.004
			3	16.887
	177		1	17.084
			2	17.058
			3	16.888
IEEE 802.11n_20	169		1	18.016
			2	17.851
			3	17.855
	173		1	17.919
			2	17.898
			3	17.821
	177		1	17.890
			2	17.905
			3	17.842
IEEE 802.11n_40	167		1	36.265
			2	36.245
	175		3	36.319
			1	36.318
			2	36.177
			3	36.264
IEEE 802.11ac_20	169		1	17.939
			2	17.912
			3	17.818
	173	1	17.945	
		2	17.911	
		3	17.857	
	177	1	17.935	
		2	17.928	
		3	17.825	
IEEE 802.11ac_40	167	1	36.368	
		2	36.391	
	175	3	36.289	
		1	36.338	
		2	36.374	
		3	36.305	
IEEE 802.11ac_80	171	1	75.532	
		2	75.530	
		3	75.405	
IEEE 802.11ac_160	163	1	154.64	
		2	153.51	
		3	153.81	
IEEE 802.11ax_20	169	SU	1	19.069
			2	19.107
			3	19.075
	173		1	19.042
			2	19.082
			3	19.100
	177		1	19.073
			2	19.094

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

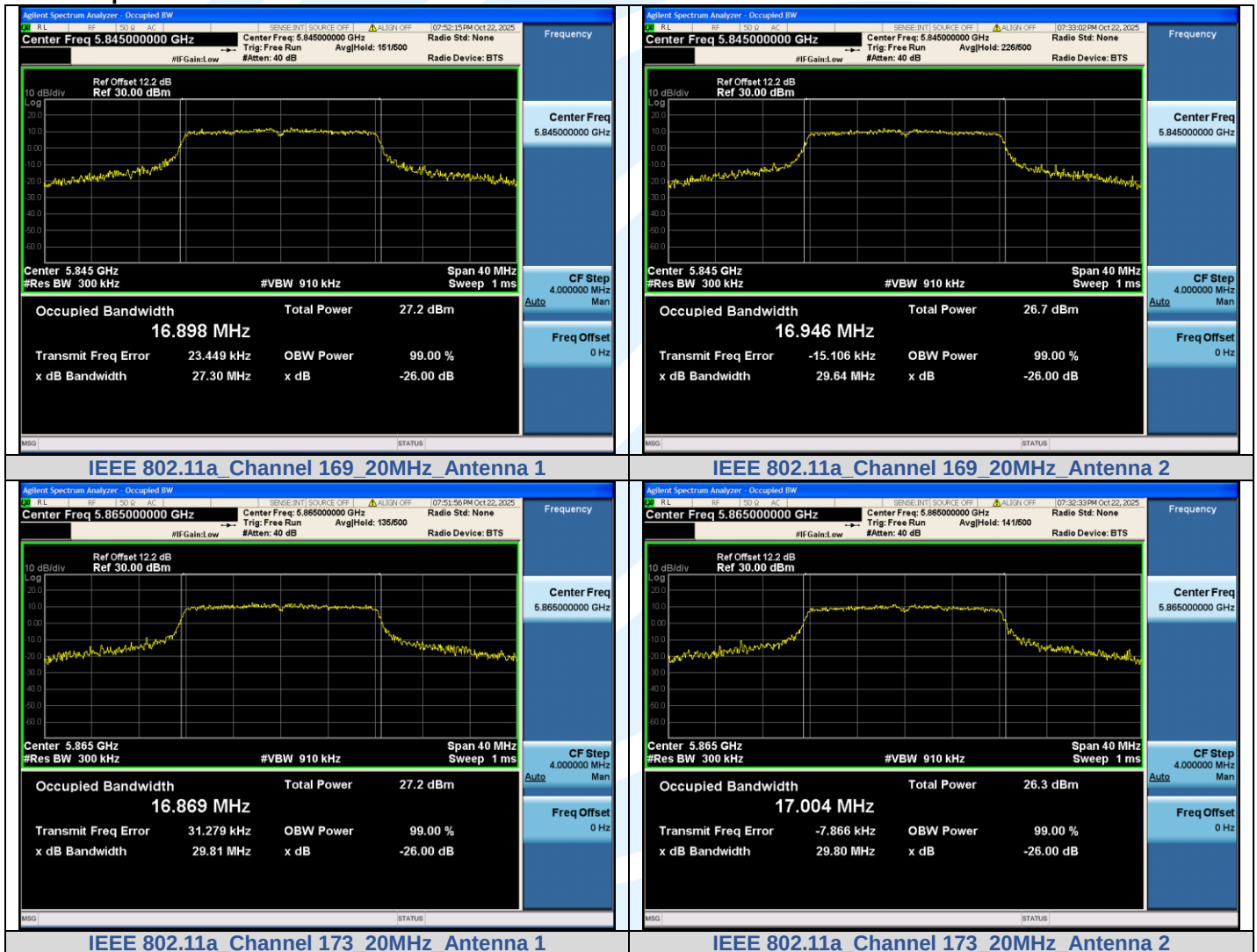
E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.3

IEEE 802.11ax_40	167		3	19.041
			1	37.815
			2	37.700
			3	37.731
			1	37.818
IEEE 802.11ax_80	175		2	37.671
			3	37.733
			1	77.043
			2	77.408
			3	77.018
IEEE 802.11ax_160	171		1	155.49
			2	155.14
			3	155.28

Test Graphs



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

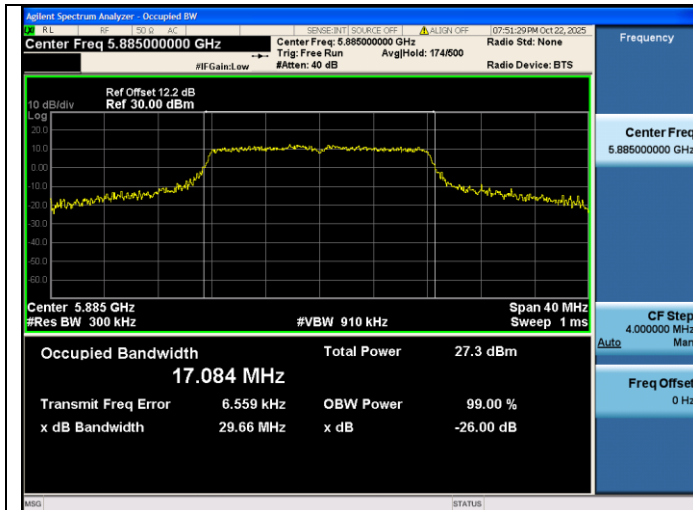
Tel: +86-755-28230888

Fax: +86-755-28230886

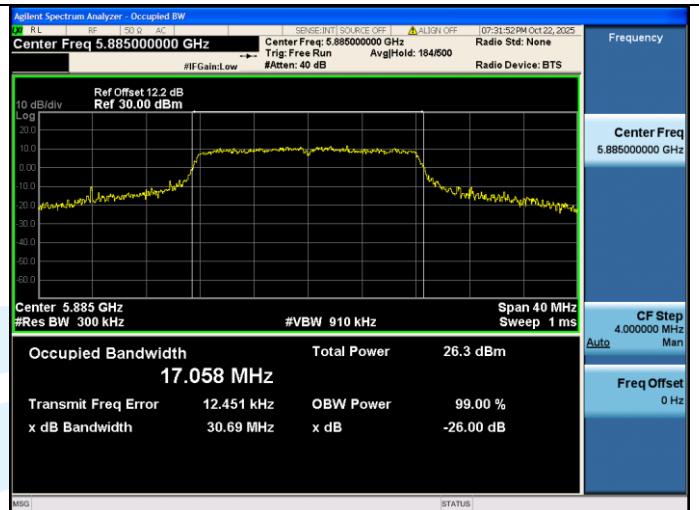
E-mail: info@uttlab.com

<http://www.uttlab.com>

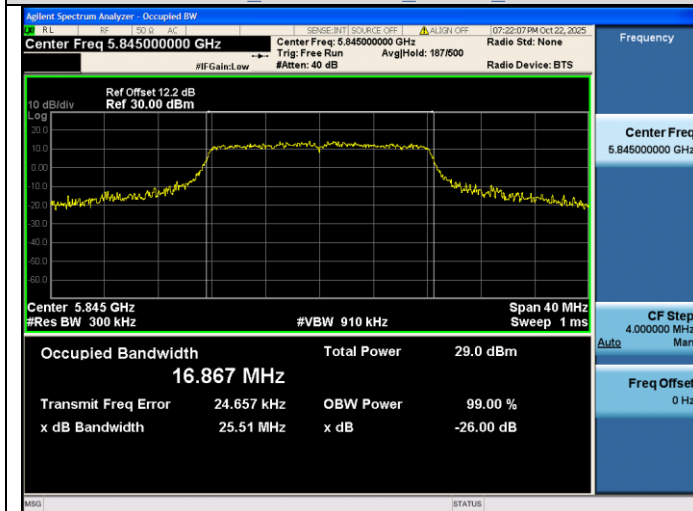
UTTR-RF-FCCPART15.407-V1.3



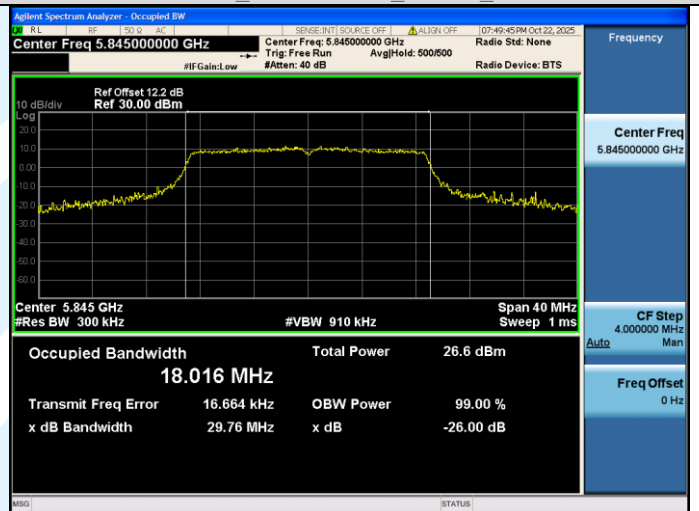
IEEE 802.11a Channel 177 20MHz Antenna 1



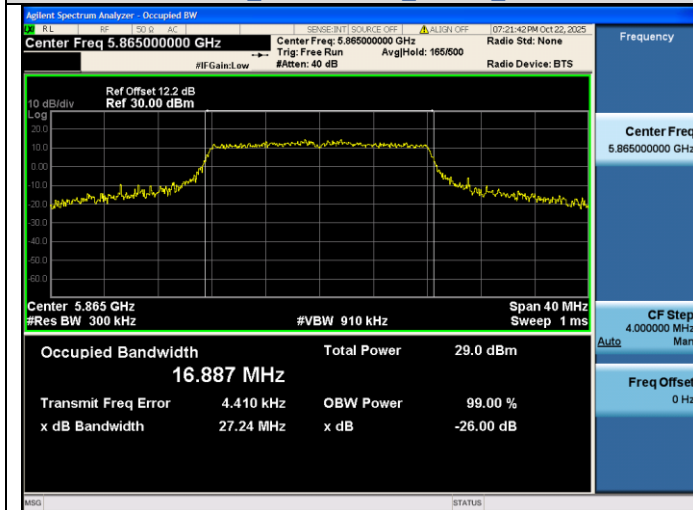
IEEE 802.11a Channel 177 20MHz Antenna 2



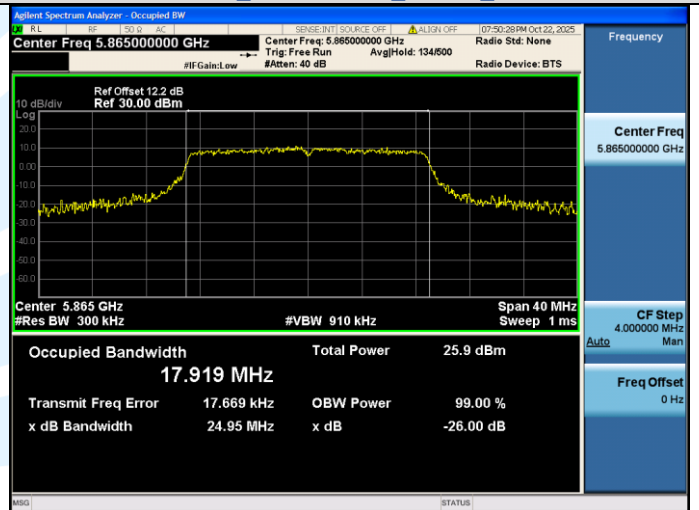
IEEE 802.11a Channel 169 20MHz Antenna 3



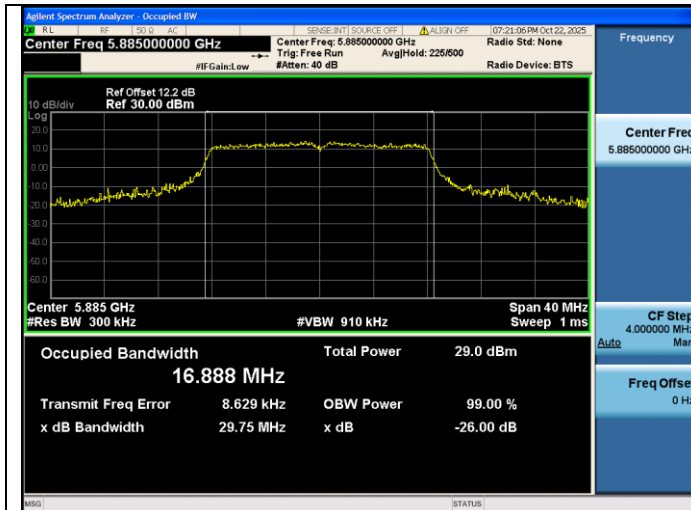
IEEE 802.11n Channel 169 20MHz Antenna 1



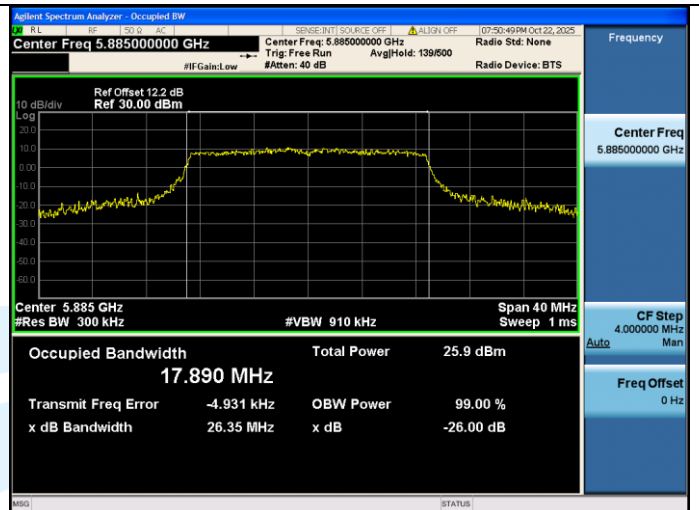
IEEE 802.11a Channel 173 20MHz Antenna 3



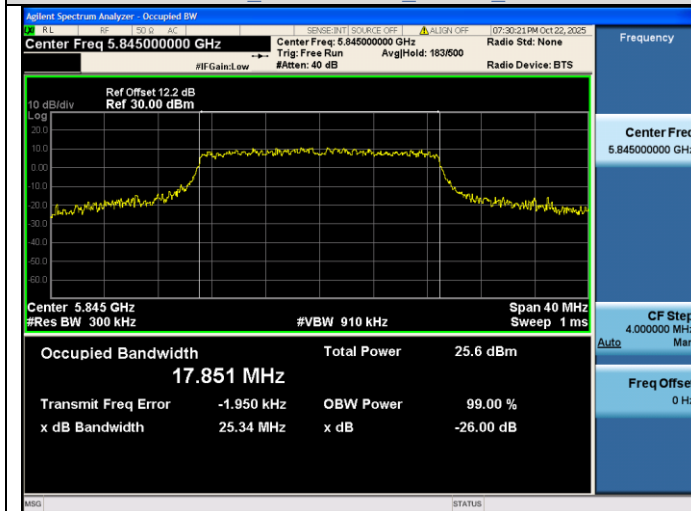
IEEE 802.11n Channel 173 20MHz Antenna 1



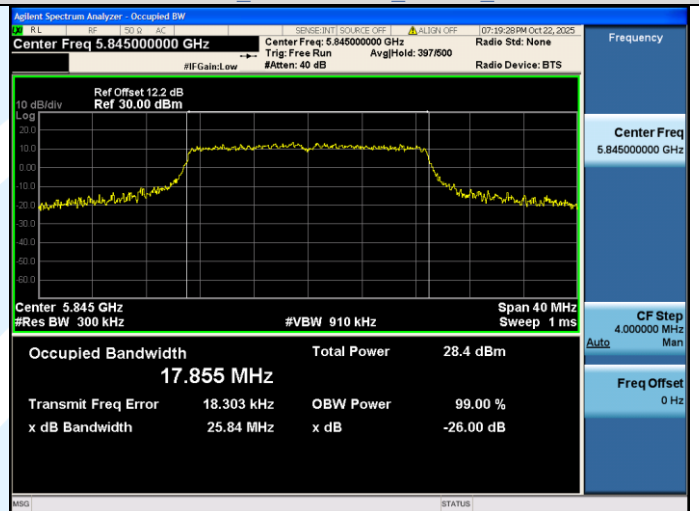
IEEE 802.11a Channel 177 20MHz Antenna 3



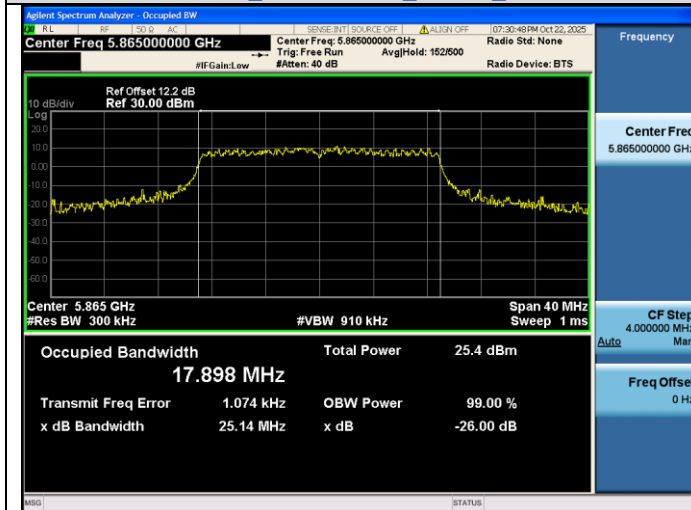
IEEE 802.11n Channel 177 20MHz Antenna 1



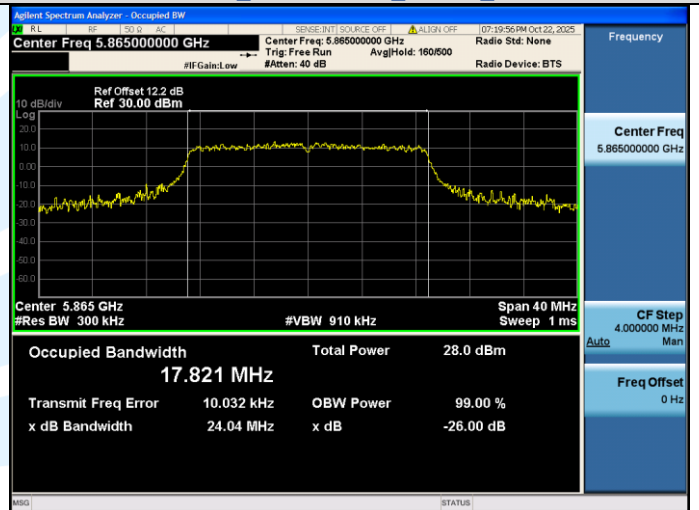
IEEE 802.11n Channel 169 20MHz Antenna 2



IEEE 802.11n Channel 169 20MHz Antenna 3



IEEE 802.11n Channel 173 20MHz Antenna 2



IEEE 802.11n Channel 173 20MHz Antenna 3

