

FCC Radio Test Report				
FCC ID: 2ABZMEW9				
This report concerns (check one): ⊠Original Grant				
Project No.: 1807C083Equipment: AC1200 Enterprise Mesh WiFi SystemTest Model: EW9Series Model: EP9Applicant: SHENZHEN IP-COM NETWORKS CO.,LTDAddress: Unit A, First Floor, Tower E3, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China. 518052				
Date of Receipt       : Jul. 17, 2018         Date of Test       : Jul. 17, 2018~Jul. 26, 2018         Issued Date       : Jul. 31, 2018         Tested by       : BTL Inc.				
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The information, data and test plan are provided by manufacturer, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements in all the possible configurations as representative of its intended use.

#### Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.





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# **REPORT ISSUED HISTORY**

Issued No.	Description	Issued Date
BTL-FCCP-2-1807C083	Original Issue.	Jul. 31, 2018



# **1. CERTIFICATION**

Equipment : Brand Name :	AC1200 Enterprise Mesh WiFi System IP-COM
Test Model :	
Series Model :	EP9
	SHENZHEN IP-COM NETWORKS CO.,LTD
Manufacturer :	SHENZHEN IP-COM NETWORKS CO.,LTD
Address :	Unit A, First Floor, Tower E3, No. 1001, Zhongshanyuan Road, Nanshan
	District, Shenzhen, China. 518052
Date of Test :	Jul. 17, 2018~Jul. 26, 2018
Test Sample :	Engineering Sample No.: D180705799
Standard(s) :	FCC Part15, Subpart E(15.407) / ANSI C63.10-2013

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-2-1807C083) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of NVLAP according to the ISO-17025 quality assessment standard and technical standard(s).

# 2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart E(15.407)					
Standard(s) Section	Judgment	Remark			
15.207	AC Power Line Conducted Emissions	PASS			
15.407(a)	26dB Spectrum Bandwidth	PASS			
15.407(a)	Maximum Conducted Output Power	PASS			
15.407(a)	Power Spectral Density	PASS			
15.407(a)	Radiated Emissions	PASS			
15.407(b)	Band Edge Emissions	PASS			
15.407(g)	Frequency Stability	PASS			
15.203	Antenna Requirements	PASS			

## NOTE:

(1)" N/A" denotes test is not applicable in this test report.



# 2.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China. BTL's test firm number for FCC: 854385 BTL's designation number for FCC: CN5020

## 2.2 MEASUREMENT UNCERTAINTY

The measurement uncertainty figures shall be calculated according the methods described in the ETSI TR 100 028 and shall correspond to an expansion factor (coverage factor) k=1.96 or k=2(which provide confidence levels of respectively 90% and 95.45% in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). Measurement Uncertainty for a Level of Confidence of 95 %, U=2xUc(y).

The BTL measurement uncertainty as below table:

A. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)
DG-C02	CISPR	150 KHz ~ 30MHz	2.32

B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)					
		9kHz~30MHz	V	3.79					
		9kHz~30MHz	Н	3.57					
		30MHz ~ 200MHz	V	3.82					
	CISPR	30MHz ~ 200MHz	Н	3.60					
DG-CB03		200MHz ~ 1,000MHz	V	3.86					
DG-CB03		200MHz ~ 1,000MHz	Н	3.94					
		1GHz~18GHz	V	3.12					
	1GHz~18GHz 18GHz~40GHz					1GHz~18GHz	1GHz~18GHz	Н	3.68
		18GHz~40GHz	V	4.15					
		18GHz~40GHz	Н	4.14					

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.



# **3. GENERAL INFORMATION**

# 3.1 GENERAL DESCRIPTION OF EUT

Equipment	AC1200 Enterprise Mesh WiFi System		
Brand Name	IP-COM		
Test Model	EW9		
Series Model	EP9		
Model Difference	EP9 removed 4 Ethernet ports with its peripheral circuits based on EW9, and thus one crystal is reduced for EP9 due to the removement.		
	Operation Frequency	UNII-1: 5150-5250MHz UNII-3: 5725-5850MHz	
Product Description	Modulation Type	OFDM	
	Bit Rate of Transmitter	1200Mbps	
Power Source	DC voltage supplied from AC/DC a Model:BN036-A12012U	idapter.	
Power Rating	I/P:100-240V~ 50/60Hz 0.4A O/P:12V === 1.0A		
Output Power	Output Power (Max.)for UNII-1	802.11a: 26.55dBm 802.11n (20M): 28.63dBm 802.11n (40M): 28.12dBm 802.11ac (20M): 28.35dBm 802.11ac (40M): 27.72dBm 802.11ac (80M): 21.51dBm	
<ul> <li>Non Beamforming</li> </ul>	Output Power (Max.)for UNII-3	802.11a: 23.45dBm 802.11n (20M): 24.05dBm 802.11n (40M): 27.99dBm 802.11ac (20M): 22.47dBm 802.11ac (40M): 24.99dBm 802.11ac (80M): 28.26dBm	
Output Power	Output Power (Max.)for UNII-1	802.11n (20M): 25.95dBm 802.11n (40M): 25.06dBm 802.11ac (20M): 25.85dBm 802.11ac (40M): 25.73dBm 802.11ac (80M): 21.31dBm	
<ul> <li>With Beamforming</li> </ul>	Output Power (Max.)for UNII-3	802.11n (20M): 23.99dBm 802.11n (40M): 25.25dBm 802.11ac (20M): 22.24dBm 802.11ac (40M): 24.77dBm 802.11ac (80M): 25.23dBm	





## Note:

- 1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- 2. Channel List:

802.11a 802.11n 20MHz 802.11ac 20MHz		802.11n 40MHz 802.11ac 40MHz		802.11ac	c 80MHz
UNI	I-1	UNII-1		UNII-1	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

802.11a 802.11n 20MHz 802.11ac 20MHz		802.11n 40MHz 802.11ac 40MHz		802.11ac 80MHz	
UNI	I-3	UNII-3		UNII-3	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755	155	5775
153	5765	159	5795		
157	5785				
161	5805				
165	5825				





# 3. Antenna Specification:

Ant.	Manufacturer	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	N/A	N/A	PCB	N/A	4	UNII-1
1	N/A	N/A	PCB	N/A	4.5	UNII-3
2	N/A	N/A	PCB	N/A	4	UNII-1
2	N/A	N/A	PCB	N/A	4.5	UNII-3

Note: The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and receivers (2T2R), all transmit signals are completely correlated, then,

For Non-beamforming function,

Direction gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2/N]$ , that are UNII-1 Directional gain= $10 \log[(10^{4/20} + 10^{4/20})^2/2] = 7.01$ dBi UNII-3 Directional gain= $10 \log[(10^{4.5/20} + 10^{4.5/20})^2/2] = 7.51$ dBi

The UNII-1 Output Power limit is 30-7.01+6=28.99dBm The UNII-3 Output Power limit is 30-7.51+6=28.49dBm

The UNII-1 PSD limit is 17-7.01+6=15.99dBm/MHz The UNII-3 PSD limit is 30-7.51+6=28.49dBm/500kHz.

For beamforming function, Beamforming Gain=3 dBi, UNII-1 Directional gain = 7.01dBi UNII-3 Directional gain =7.51dBi

The UNII-1 Output Power limit is 30-7.01-3+6=25.99dBm The UNII-3 Output Power limit is 30- 7.51-3+6=25.49dBm,

The UNII-1 PSD limit is 17-7.01-3+6=12.99dBm/MHz, The UNII-3 PSD limit is 30-7.51-3+6=25.49dBm/500kHz.





4.	Operating Mode		
	TX Mode	1TX	2TX
	802.11a	V (ANT 2)	-
	802.11n (20MHz)	-	V (ANT 1+ANT 2)
	802.11n (40MHz)	-	V (ANT 1+ANT 2)
	802.11ac (20MHz)	-	V (ANT 1+ANT 2)
	802.11ac (40MHz)	-	V (ANT 1+ANT 2)
	802.11ac (80MHz)	-	V (ANT 1+ANT 2)

ANT 2 for 1TX was found to be the worst case and recorded

# 3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX A Mode / CH36, CH40, CH48 (UNII-1)
Mode 2	TX N20 Mode / CH36, CH40, CH48 (UNII-1)
Mode 3	TX N40 Mode / CH38, CH46 (UNII-1)
Mode 4	TX AC20 Mode / CH36, CH40, CH48 (UNII-1)
Mode 5	TX AC40 Mode / CH38, CH46 (UNII-1)
Mode 6	TX AC80 Mode / CH42 (UNII-1)
Mode 7	TX A Mode / CH149,CH157,CH165 (UNII-3)
Mode 8	TX N20 Mode / CH149,CH157,CH165 (UNII-3)
Mode 9	TX N40 Mode / CH151,CH159 (UNII-3)
Mode 10	TX AC20 Mode / CH149,CH157,CH165 (UNII-3)
Mode 11	TX AC40 Mode / CH151,CH159 (UNII-3)
Mode 12	TX AC80 Mode / CH155 (UNII-3)
Mode 13	TX Mode

The EUT system operated these modes were found to be the worst case during the pre-scanning test as following:

For Conducted Test		
Final Test Mode	Description	
Mode 13	TX Mode	





For Radiated Test			
Final Test Mode Description			
Mode 1	TX A Mode / CH36, CH40, CH48 (UNII-1)		
Mode 2	TX N20 Mode / CH36, CH40, CH48 (UNII-1)		
Mode 3	TX N40 Mode / CH38, CH46 (UNII-1)		
Mode 4	TX AC20 Mode / CH36, CH40, CH48 (UNII-1)		
Mode 5	TX AC40 Mode / CH38, CH46 (UNII-1)		
Mode 6	TX AC80 Mode / CH42 (UNII-1)		
Mode 7	TX A Mode / CH149,CH157,CH165 (UNII-3)		
Mode 8	TX N20 Mode / CH149,CH157,CH165 (UNII-3)		
Mode 9	TX N40 Mode / CH151,CH159 (UNII-3)		
Mode 10	TX AC20 Mode / CH149,CH157,CH165 (UNII-3)		
Mode 11	TX AC40 Mode / CH151,CH159 (UNII-3)		
Mode 12	TX AC80 Mode / CH155 (UNII-3)		

Note:

(1) For radiated below 1GHz test, the 802.11a mode is found to be the worst case and recorded.



# 3.3 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product

UNII-1				
Test Software Version	MP_TEST			
Frequency (MHz)	5180	5200	5240	
A Mode	53	60	60	
N20 Mode	55/55	63/60	63/60	
AC20 Mode	60/56	61/59	61/59	
Frequency (MHz)	5190	5230		
N40 Mode	50/46	60/60		
AC40 Mode	47/46	60/58		
Frequency (MHz)	5210			
AC80 Mode	43/44			

#### Non Beamforming

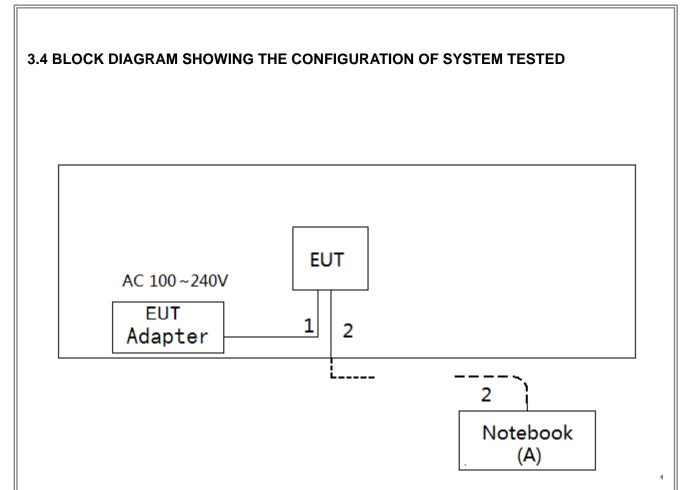
	UNII-3			
Test Software Version		MP_TEST		
Frequency (MHz)	5745	5785	5825	
A Mode	52	49	48	
N20 Mode	50/45	45/40	43/38	
AC20 Mode	46/44	42/41	38/32	
Frequency (MHz)	5755	5795		
N40 Mode	56/55	50/49		
AC40 Mode	53/51	47/46		
Frequency (MHz)	5775			
AC80 Mode	58/56			

# With Beamforming

UNII-1			
Test Software Version	MP_TEST		
Frequency (MHz)	5180	5200	5240
N20 Mode	55/52	55/52	55/51
AC20 Mode	55/52	55/52	55/51
Frequency (MHz)	5190	5230	
N40 Mode	50/46	54/51	
AC40 Mode	47/46	54/51	
Frequency (MHz)	5210		
AC80 Mode	43/44		

	UNII-3				
Test Software Version	MP_TEST				
Frequency (MHz)	5745	5785	5825		
N20 Mode	47/46	45/40	43/38		
AC20 Mode	46/44	42/41	38/32		
Frequency (MHz)	5755	5795			
N40 Mode	46/45	45/44			
AC40 Mode	46/45	45/44			
Frequency (MHz)	5775				
AC80 Mode	47/46				





## **3.5 DESCRIPTION OF SUPPORT UNITS**

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
А	Notebook	DELL	INSPIRON 1420	N/A	JX193A01SDC2

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	1.2m	DC Cable
2	NO	NO	10m	RJ45

# 4. EMC EMISSION TEST

## 4.1 CONDUCTED EMISSION MEASUREMENT

#### 4.1.1 POWER LINE CONDUCTED EMISSION (Frequency Range 150kHz-30MHz)

FREQUENCY (MHz)	Class A	(dBuV)	Class B (dBuV) Quasi-peak Average	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

## 4.1.2 TEST PROCEDURE

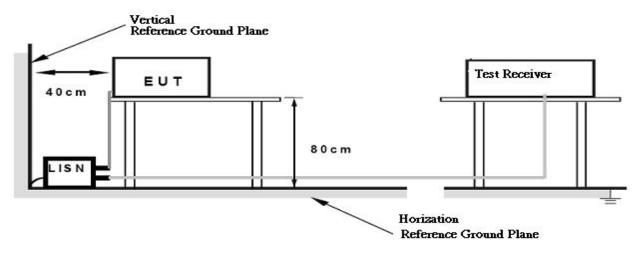
- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

#### 4.1.3 DEVIATION FROM TEST STANDARD

No deviation



# 4.1.4 TEST SETUP



# 4.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

The EUT was programmed to be in continuously transmitting/TX Mode mode.

#### 4.1.6 EUT TEST CONDITIONS

Temperature: 25°C Relative Humidity: 53% Test Voltage: AC 120V/60Hz

## 4.1.7 TEST RESULTS

Please refer to the Appendix A.

Remark:

- (1) All readings are QP Mode value unless otherwise stated AVG in column of Note. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform. In this case, a "\*" marked in AVG Mode column of Interference Voltage Measured.
- (2) Measuring frequency range from 150kHz to 30MHz.



# 4.2 RADIATED EMISSION MEASUREMENT

### **4.2.1 RADIATED EMISSION LIMITS**

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies	Field Strength	Measurement Distance
(MHz)	(micorvolts/meter)	(meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Frequencies	EIRP Limit (dBm)	Equivalent Field Strength
(MHz)		at 3m (dBµV/m)
5150-5250	-27	68.3
5725-5850	-27(Note 2)	68.3
	10(Note 2)	105.3
	15.6(Note 2)	110.9
	27(Note 2)	122.3

Note:

1. The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:  $E = \frac{1000000\sqrt{30P}}{1000000\sqrt{30P}}$ 

 $\mu$ V/m, where P is the eirp (Watts)

2. According to FCC 16-24, All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below theband edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above orbelow the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27dBm/MHz at the band edge.



# 4.2.2 TEST PROCEDURE

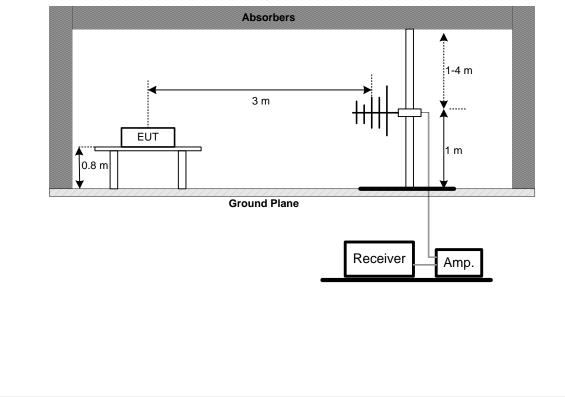
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1GHz)
- i. For the actual test configuration, please refer to the related Item -EUT Test Photos.

## 4.2.3 DEVIATION FROM TEST STANDARD

#### No deviation

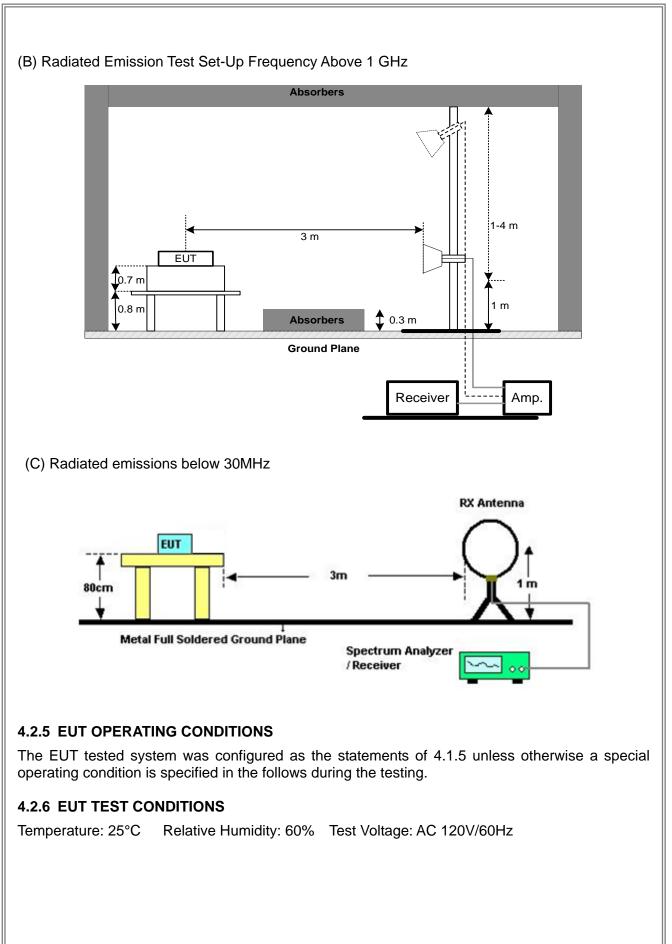
# 4.2.4 TEST SETUP

(A)Radiated Emission Test Set-Up Frequency Below 1GHz











# 4.2.7 TEST RESULTS (9K TO 30MHz)

Please refer to the Appendix B

Remark:

- (1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
- (2) Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
- (3) Limit line = specific limits (dBuV) + distance extrapolation factor.

#### 4.2.8 TEST RESULTS (BETWEEN 30 TO 1000 MHz)

Please refer to the Appendix C.

#### 4.2.9 TEST RESULTS (ABOVE 1000 MHz)

Please refer to the Appendix D.

Remark:

(1) No limit: This is fundamental signal, the judgment is not applicable. For fundamental signal judgment was referred to Peak output test.

# 5. 26dB SPECTRUM BANDWIDTH

## 5.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E				
Test Item Limit Frequency Range Result				
	26 dB Bandwidth	5150-5250	PASS	
Bandwidth	Bandwidth Minimum 500kHz 6dB		PASS	
	Bandwidth	5725-5850		

#### 5.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b.	Spectrum Parameters	Setting
	Attenuation	Auto
	Span Frequency	> 26dB Bandwidth
	RBW	300 kHz(Bandwidth 20MHz)
	NBW	1MHz(Bandwidth 40MHz and 80MHz)
	VBW	1MHz(Bandwidth 20MHz)
	V B VV	3MHz(Bandwidth 40MHz and 80MHz)
	Detector	Peak
Trace Max Hold		Max Hold
Sweep Time Auto		Auto

c. Measured the spectrum width with power higher than 26dB below carrier

## 5.1.2 DEVIATION FROM STANDARD

No deviation.

#### 5.1.3 TEST SETUP

EUT	SPECTRUM	
	ANALYZER	

## 5.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.





# 5.1.5 EUT TEST CONDITIONS

Temperature: 25°C Relative Humidity: 60% Test Voltage: AC 120V/60Hz

# 5.1.6 TEST RESULTS

Please refer to the Appendix E.



# 6. MAXIMUM CONDUCTED OUTPUT POWER

# 6.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E				
Test Item	Limit Frequency Range Result (MHz)			
	Fixed:1 Watt (30dBm)			
Conducted Output	Mobile and portable:	5150-5250	PASS	
Power	250mW (24dBm)			
	1 Watt (30dBm)	5725-5850	PASS	
Note: The maximum e.i.r.p at anyelevation angle above 30 degrees as measured from the				

horizon must not exceed 125mW(21dBm)

## 6.1.1 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Used spectrum analyzer band power measurement function.
- c.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency         Encompass the entire emissions bandwidth (EBW)           signal	
RBW = 1MHz.	
VBW	≥ 3MHz.
Sweep points	≥2 x span / RBW
Detector	RMS
Traca	Trace average at least 100 traces in power
Trace	averaging(rms) mode.
Sweep Time auto	

c. Test was performed in accordance with method of KDB 789033 D02.



### 6.1.2 DEVIATION FROM STANDARD

No deviation.

### 6.1.3 TEST SETUP



### 6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

#### 6.1.5 EUT TEST CONDITIONS

Temperature: 25°C Relative Humidity: 60% Test Voltage: AC 120V/60Hz

#### 6.1.6 TEST RESULTS

Please refer to the Appendix F.

# 7. POWER SPECTRAL DENSITY TEST

# 7.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E				
Test Item	Limit	Frequency Range (MHz)	Result	
Power Spectral Density			PASS	
	30dBm/500kHz	5725-5850	PASS	

# 8.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b.	Spectrum Parameter	Setting
	Attenuation	Auto
	Shan Eraquanay	Encompass the entire emissions bandwidth (EBW) of the
Span Frequency signal		signal
	RBW	= 1MHz.30
	VBW	≥ 3MHz.
	Detector	RMS
	Trace average	100 trace
	Sweep Time	Auto

Note:

- For UNII-3, according to KDB publication 789033 D02 General UNII Test Procedures New Rules v01r02, section II.F.5., it is acceptable to set RBW at 1MHz and VBW at 3MHz if the spectrum analyzer does not have 500kHz RBW.
- The value measured with RBW=1MHz is to be added with 10log(500kHz/1MHz) which is -3dB. For example, if the measured value is +10dBm using RBW=1MHz (that is +10dBm/MHz), then the converted value will be +7dBm/500kHz.



# 7.1.1 DEVIATION FROM STANDARD

No deviation.

# 7.1.2 TEST SETUP

EUT	SPECTRUM
	ANALYZER

# 7.1.3 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

## 7.1.4 EUT TEST CONDITIONS

Temperature: 25°C Relative Humidity: 60% Test Voltage: AC 120V/60Hz

7.1.5 TEST RESULTS Please refer to the Appendix H.



# 8. FREQUENCY STABILITY MEASUREMENT

# 8.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E				
Test Item Limit Frequency Range Result				
Specified in the		5150-5250	PASS	
Frequency Stability	user's manual	5725-5850	PASS	

# 8.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b.	Spectrum Parameter	Setting
Attenuation Auto		Auto
	Span Frequency	Entire absence of modulation emissions bandwidth
	RBW	10 kHz
	VBW	10 kHz
	Sweep Time	Auto

- c. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.
- d. User manual temperature is 0°C~40°C.

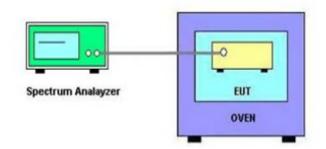
# 8.1.2 DEVIATION FROM STANDARD

No deviation.





# 8.1.3 TEST SETUP



# 8.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

### 8.1.5 EUT TEST CONDITIONS

Temperature: 25°C Relative Humidity: 55% Test Voltage: AC 120V/60Hz

8.1.6 TEST RESULTS Please refer to the Appendix I.



# 9. MEASUREMENT INSTRUMENTS LIST

	Conducted Emission Measurement				
Item	Item Kind of Equipment Manufacturer Type No. Serial No.			Serial No.	Calibrated until
1	EMI Test Receiver	R&S	ESCI	100382	Mar. 11, 2019
2	LISN	EMCO	3816/2	52765	Mar. 11, 2019
3	50Ω Terminator	SHX	TF2-3G-A	8122901	Mar. 11, 2019
4	TWO-LINE V-NETWORK	R&S	ENV216	101447	Mar. 11, 2019
5 Measurement Software Farad		EZ-EMC Ver.NB-03A1-01	N/A	N/A	
6	Cable	N/A	RG223	12m	Oct. 19, 2018

	Radiated Emission Measurement - Below 1GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Antenna	Schwarbeck	VULB9160	9160-3232	Mar. 11, 2019	
2	Amplifier	HP	8447D	2944A09673	Oct. 19, 2018	
3	3 Receiver Agilent		N9038A	MY52130039	Aug. 20, 2018	
4	Cable	emci	LMR-400(30MHz-1 GHz)(8m+5m)	N/A	Jun. 26, 2019	
5	Controller	СТ	SC100	N/A	N/A	
6	Controller	MF	MF-7802	MF780208416	N/A	
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A	
8 Antenna EM		EM	EM-6876-1	230	Feb. 07, 2019	

	Radiated Emission Measurement - Above 1GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Double Ridged Guide Antenna	ETS	3115	75789	Mar. 11, 2019	
2	Broad-Band Horn Antenna	Schwarzbeck		9170319	Jun. 30, 2019	
3	Amplifier	Agilent	8449B	3008A02274	Mar. 11, 2019	
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 11, 2019	
5	Receiver	Agilent	N9038A	MY52130039	Aug. 20, 2018	
6	Controller	СТ	SC100	N/A	N/A	
7	Controller	MF	MF-7802	MF780208416	N/A	
8	Cable	emci	EMC104-SM-SM-1 2000(12m)	N/A	Jun. 26, 2019	
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A	



	Spectrum Bandwidth Measurement				
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

Maximum Conducted Output Power Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

Power Spectral Density Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

	Frequency Stability Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018	
2	Precision Oven Tester	Bell	BTH-50C	20170306001	Mar. 11, 2019	

Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.





# **10. EUT TEST PHOTOS**

**Conducted Measurement Photos** 







# **Radiated Measurement Photos**

9kHz to 30MHz







# **Radiated Measurement Photos**

30MHz to 1000MHz

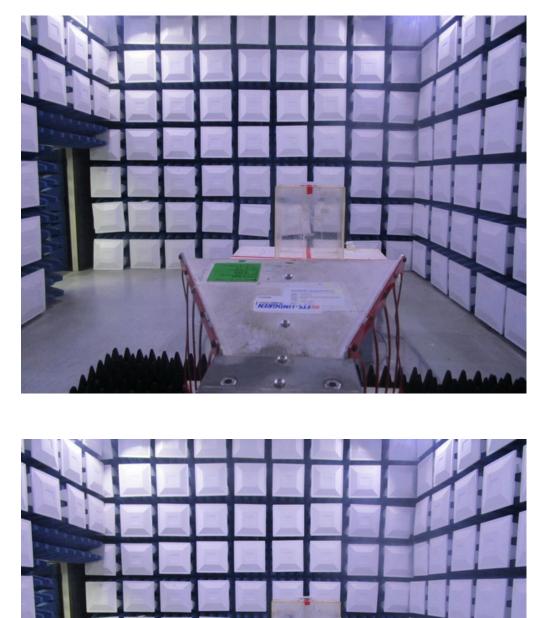






### **Radiated Measurement Photos**

Above 1000MHz

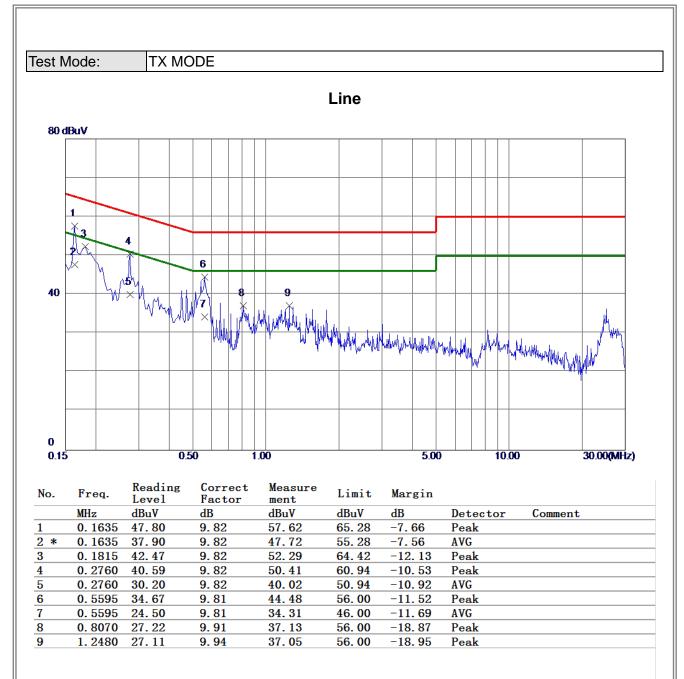




# **APPENDIX A - CONDUCTED EMISSION**

# ЗĨL

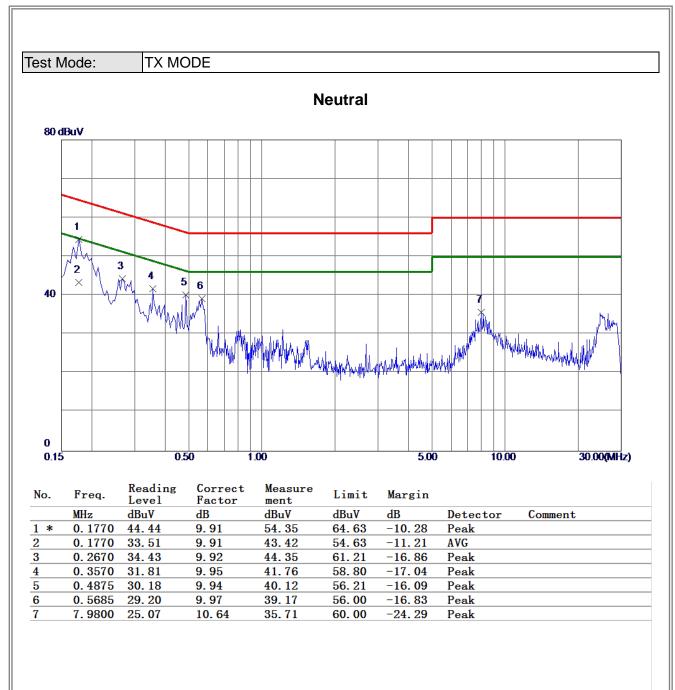




Note : The test result has included the cable loss.

# ЗĨL





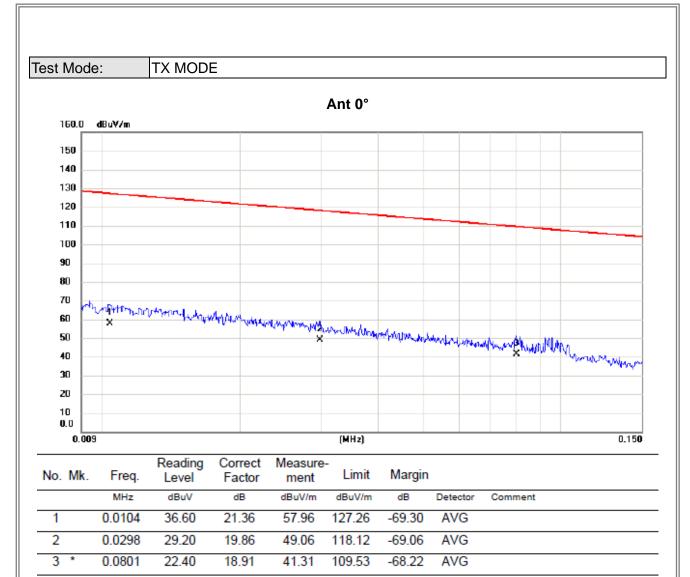
Note : The test result has included the cable loss.



## APPENDIX B - RADIATED EMISSION (9KHZ TO 30MHZ)









2

3

\*

0.5293

2.1783

23.80

27.90

16.96

17.00



Test Mode: TX MODE Ant 0° 160.0 dBu¥∕m 150 140 130 120 110 100 90 80 70 60 de la fe 50 Ċ, Ż Mulunianly × х 40 30 20 10 0.0 30.000 0.150 0.5 (MHz) 5 Reading Correct Measure-No. Mk. Freq. Limit Margin Level Factor ment MHz dBuV dB dBuV/m dBuV/m dB Detector Comment 0.3234 26.60 17.03 97.41 -53.78 AVG 1 43.63

73.13

69.54

40.76

44.90

-32.37

-24.64

QP

QP



3

0.0781

22.30

18.96

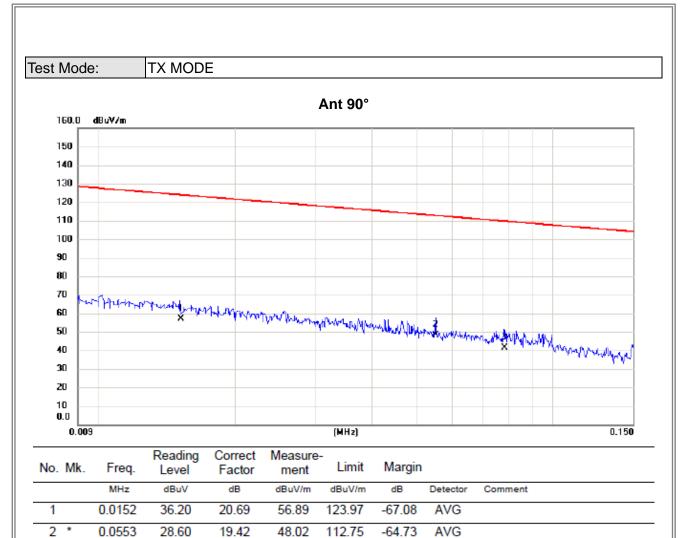
41.26

109.75

-68.49

AVG







2

\* 3

0.8803

2.3090

33.80

27.90

16.73

16.93

50.53

44.83

68.71

69.54



Test Mode: TX MODE Ant 90° dBu¥/m 160.0 150 140 130 120 110 100 90 80 70 60 ant the rest and the second of moundan 50 40 30 20 10 **0**.0 0.150 0.5 (MHz) 5 30.000 Reading Correct Measure-Margin Limit No. Mk. Freq. Level Factor ment MHz dBuV dB dB dBuV/m dBuV/m Detector Comment 0.3321 1 28.50 17.03 45.53 97.18 -51.65 AVG

QP

QP

-18.18

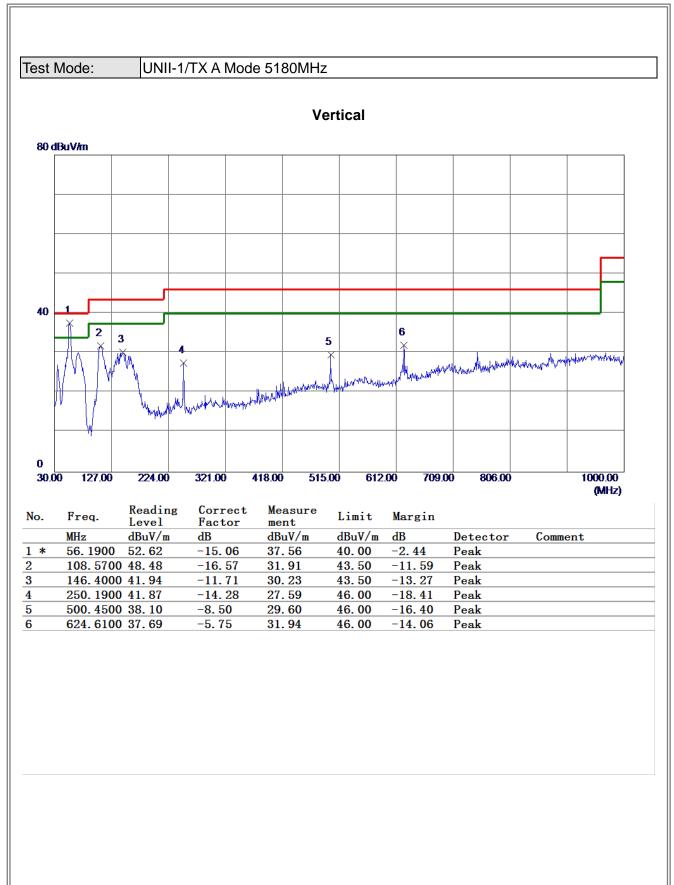
-24.71



# APPENDIX C - RADIATED EMISSION (30MHZ TO 1000MHZ)

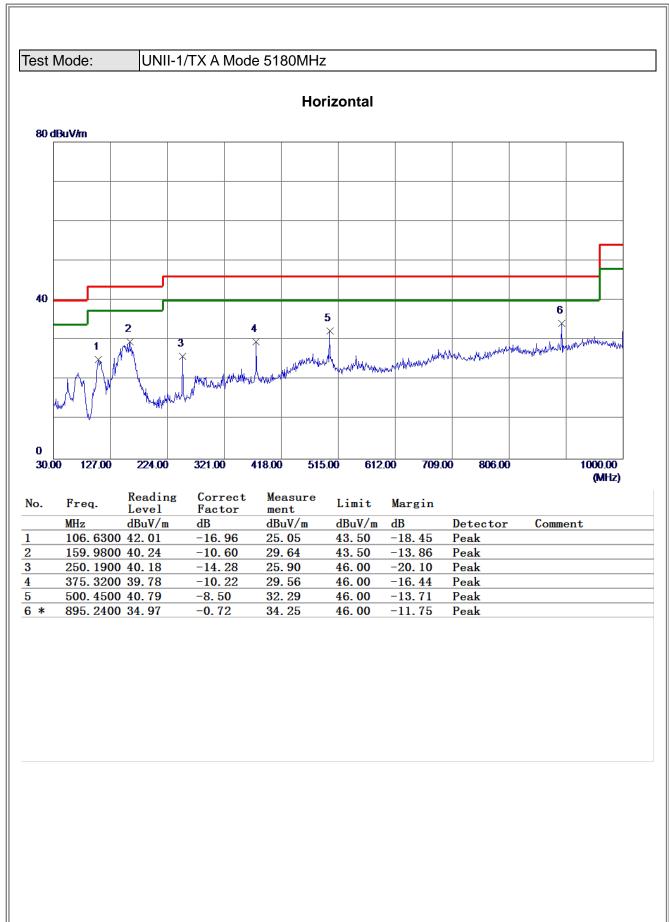






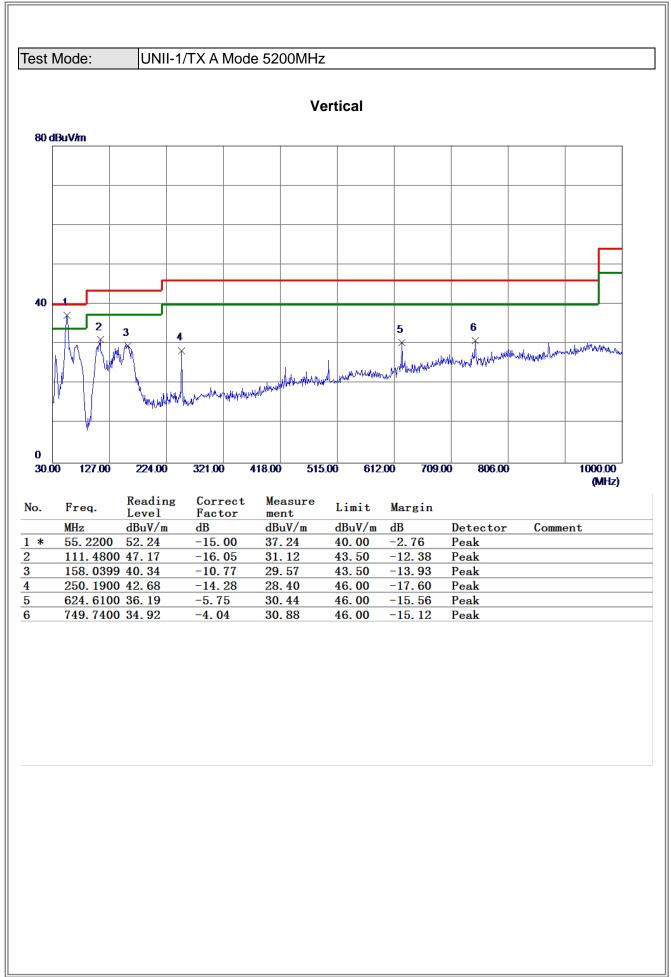






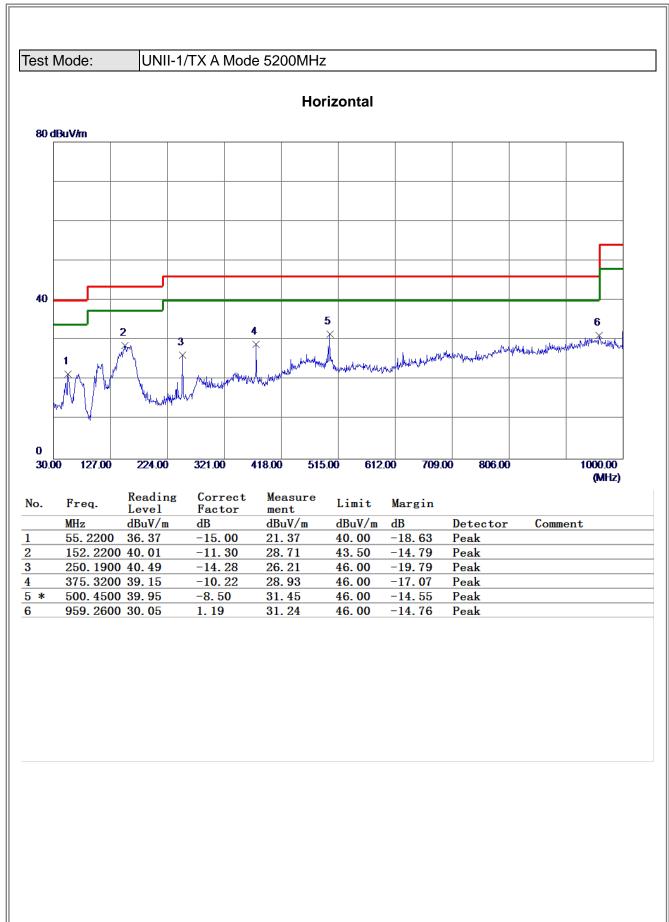






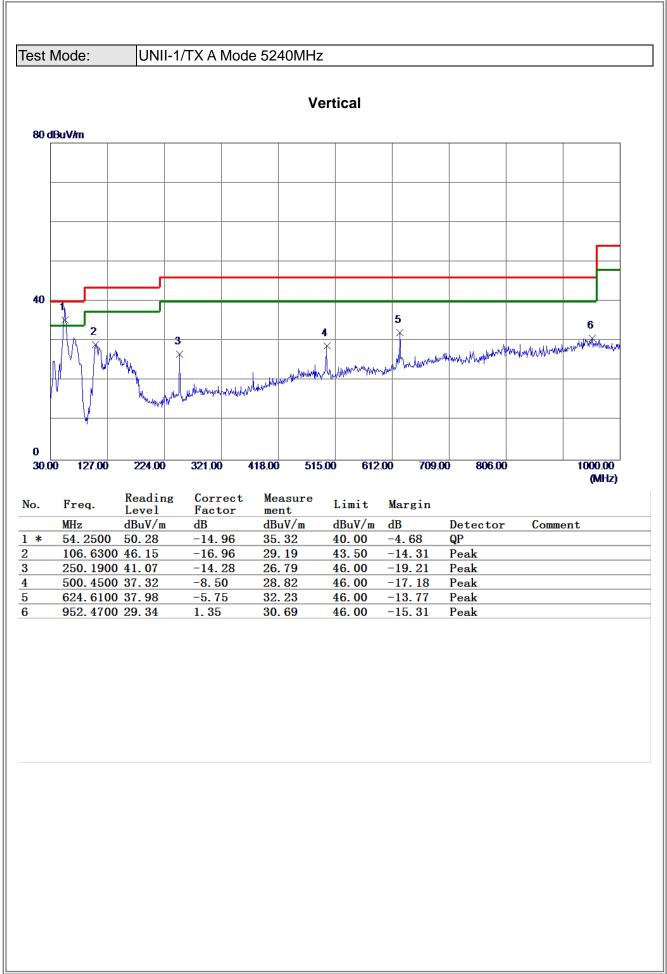






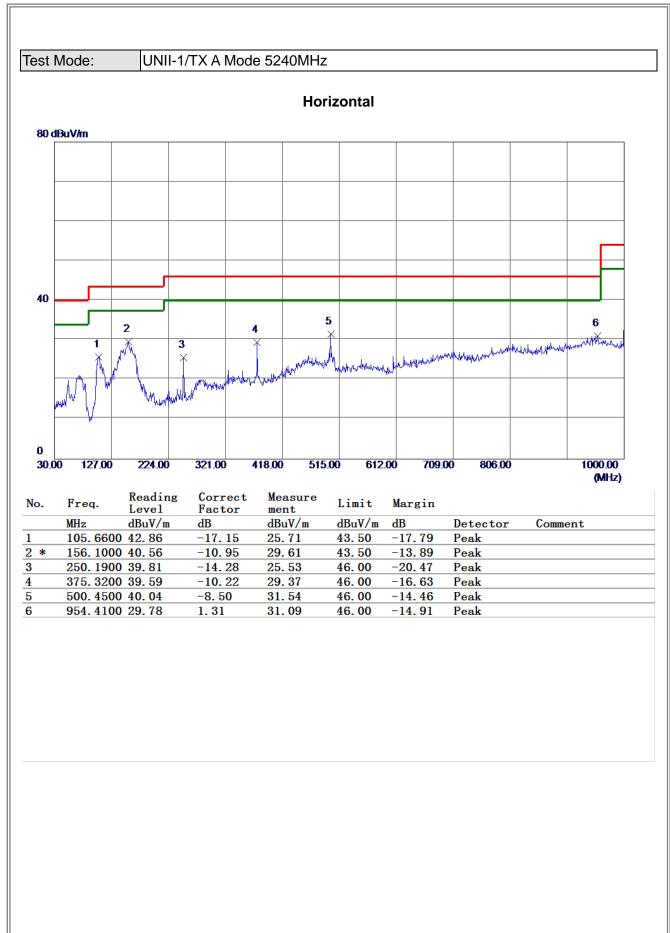






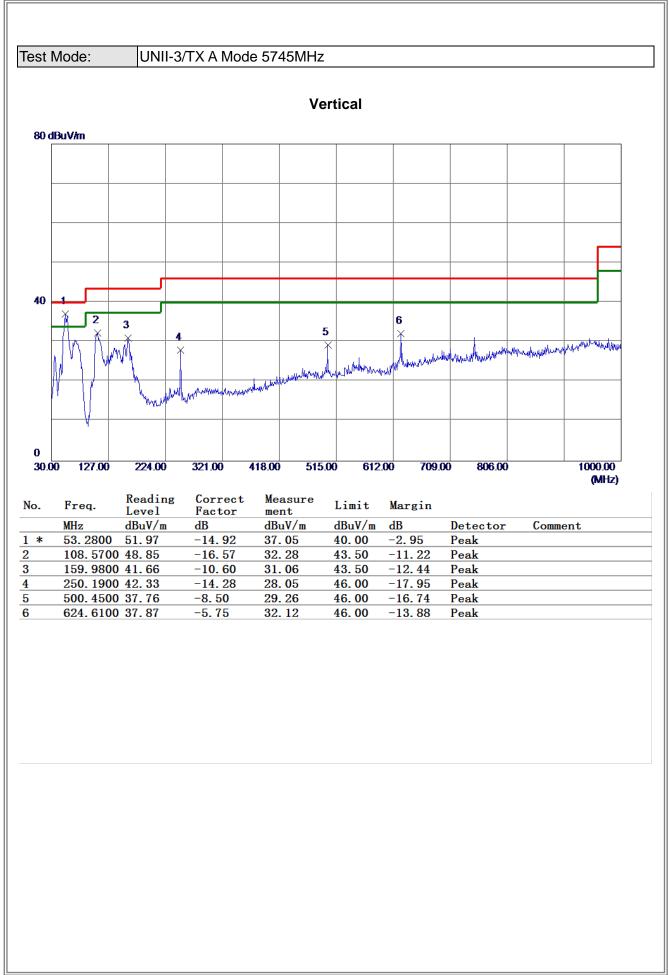






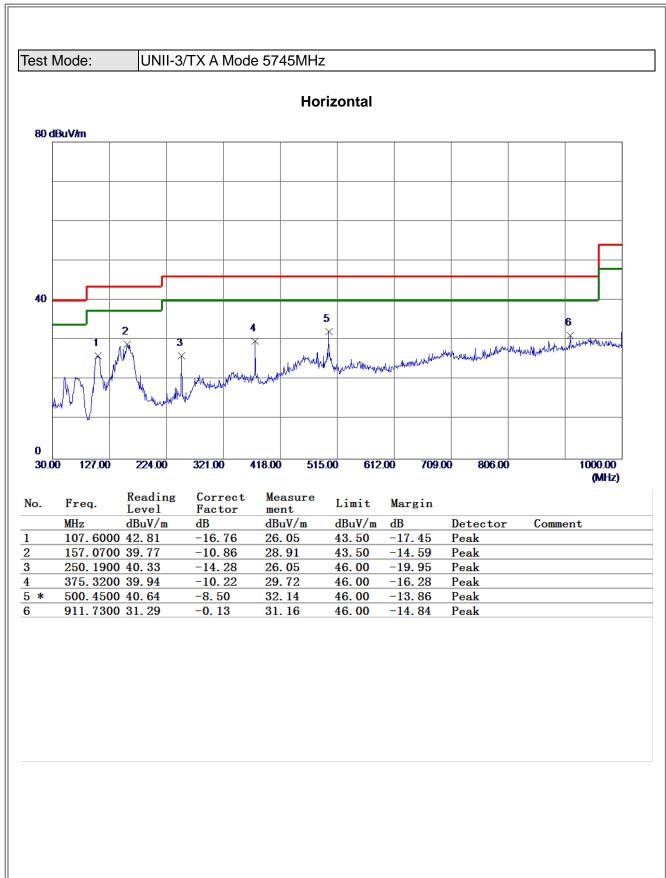






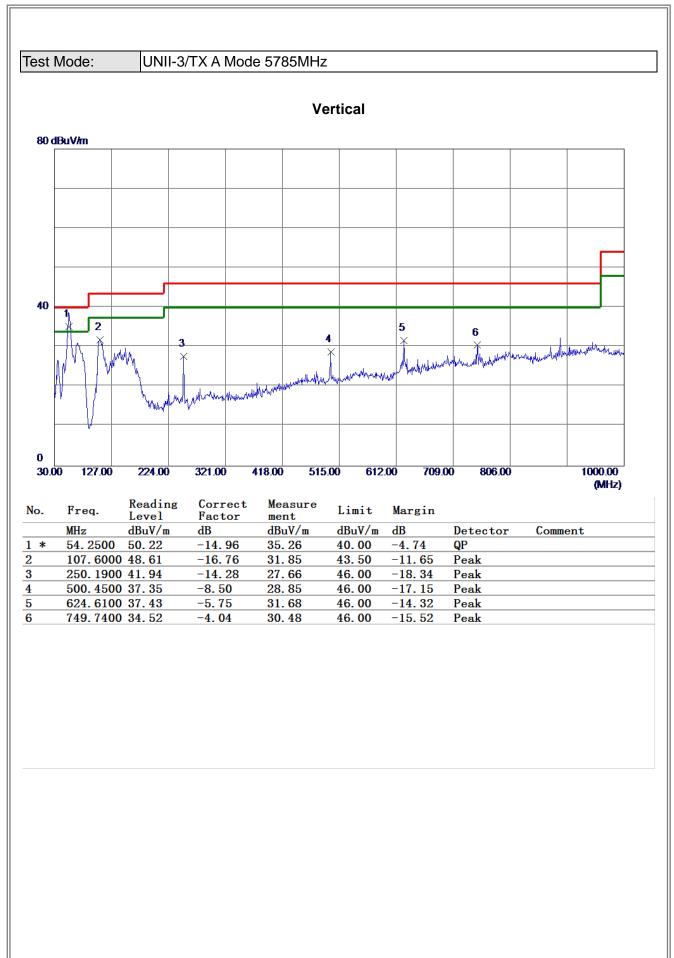






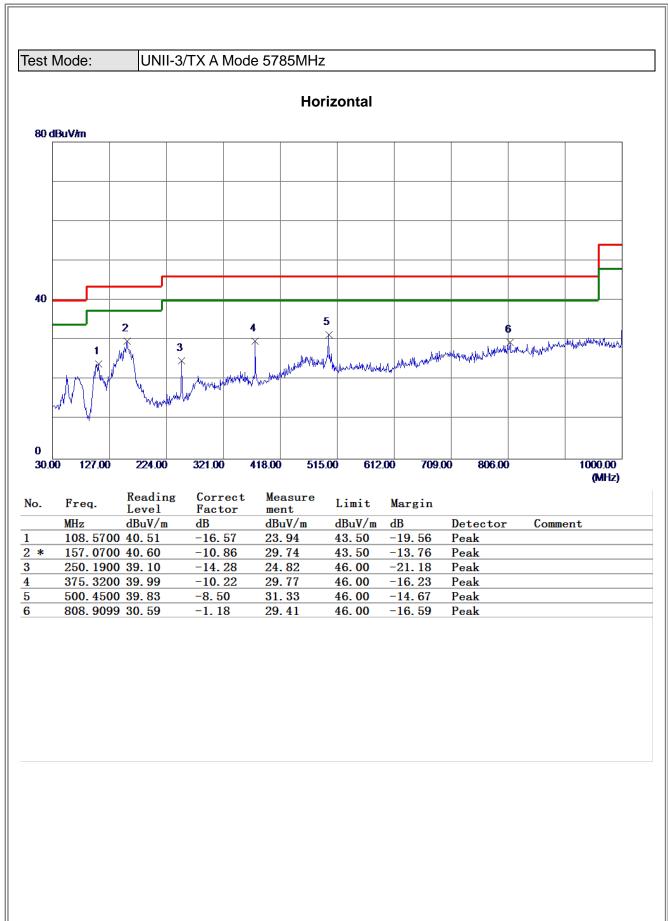






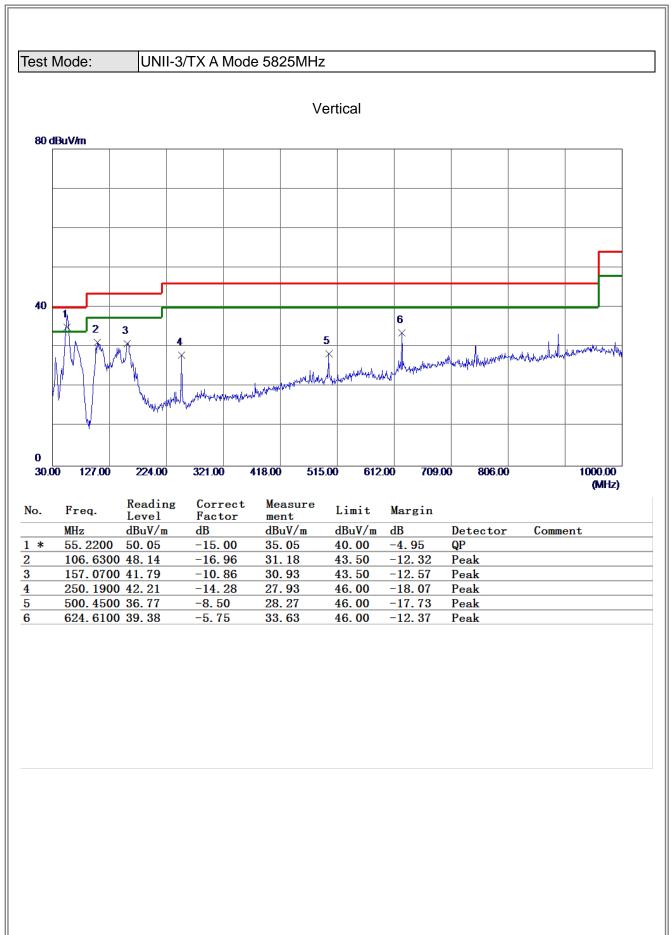






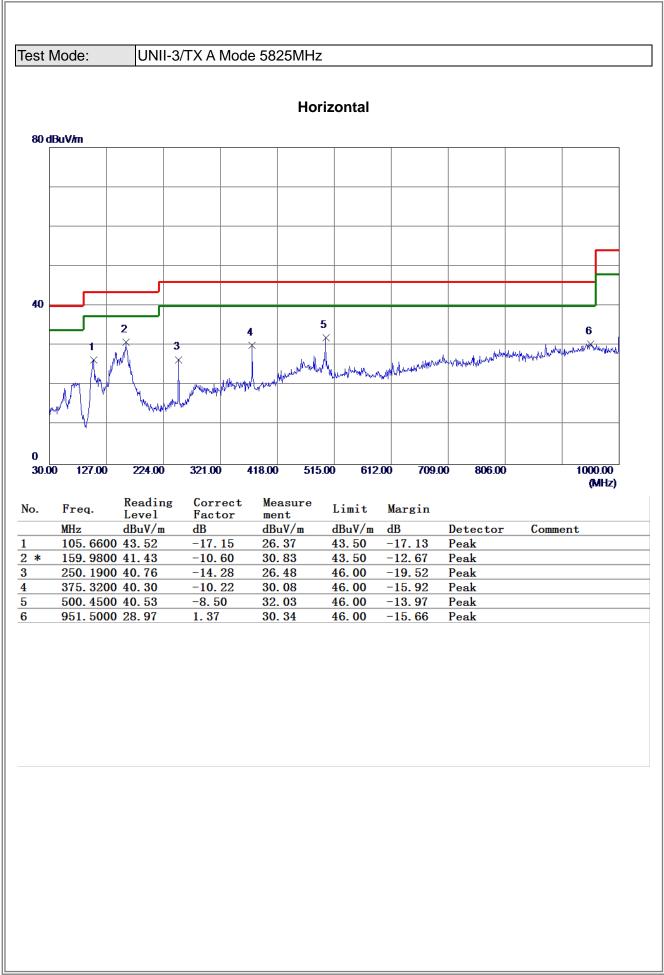










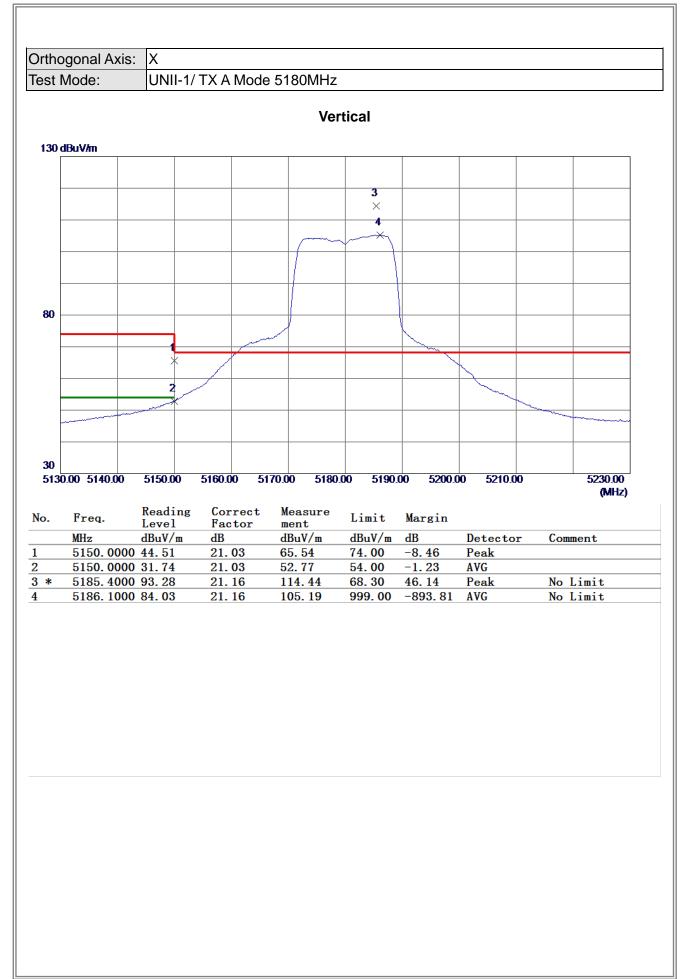




## **APPENDIX D - RADIATED EMISSION (ABOVE 1000MHZ)**

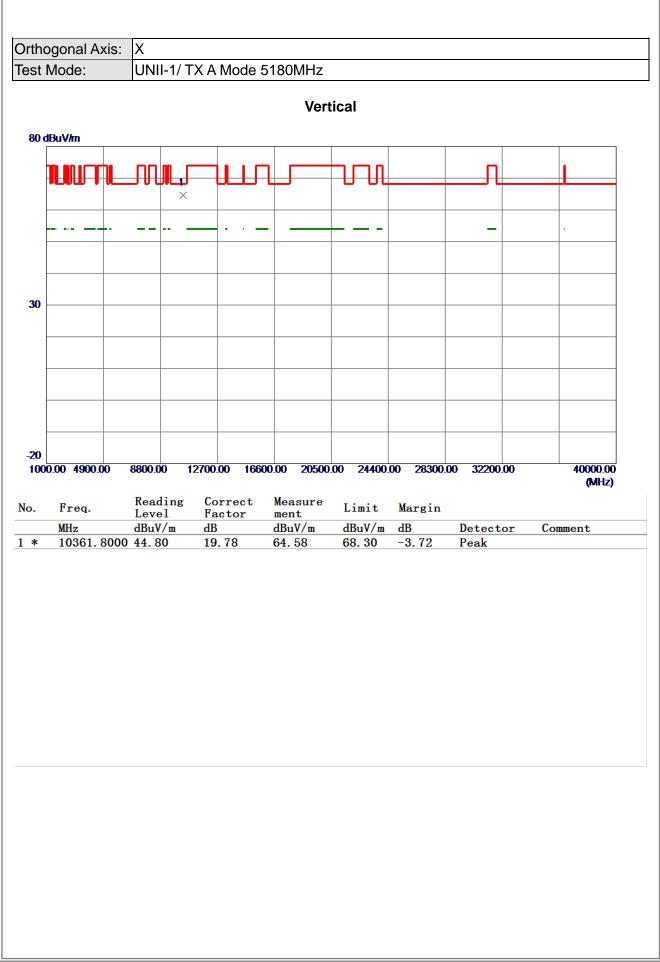






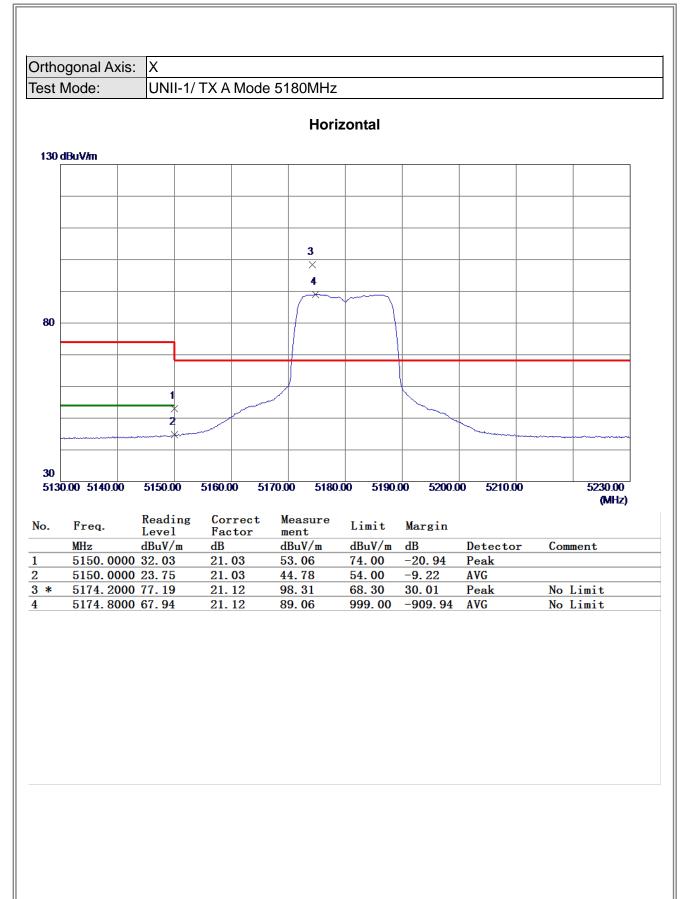






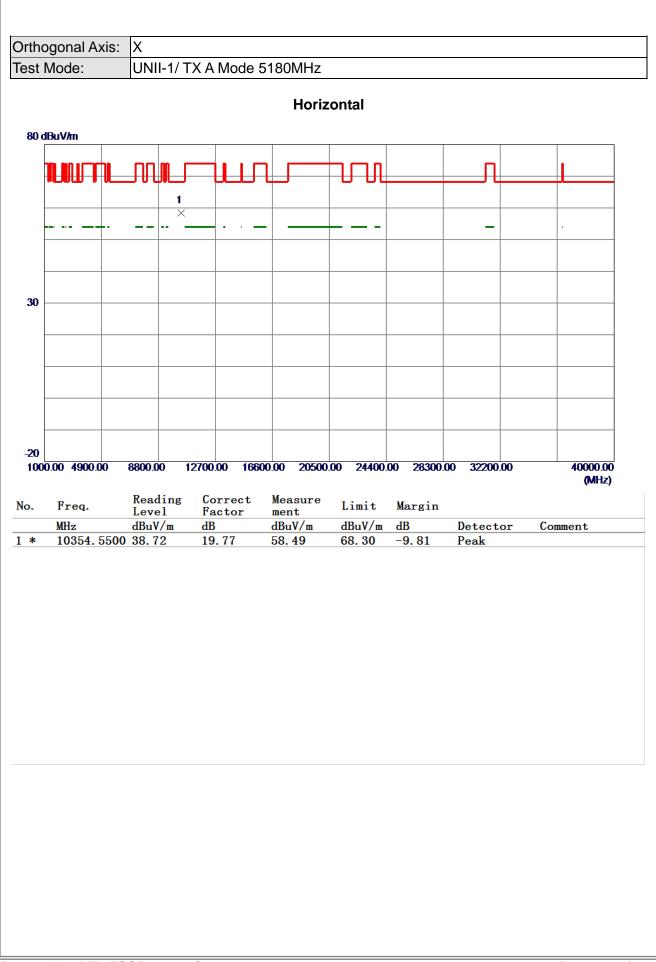






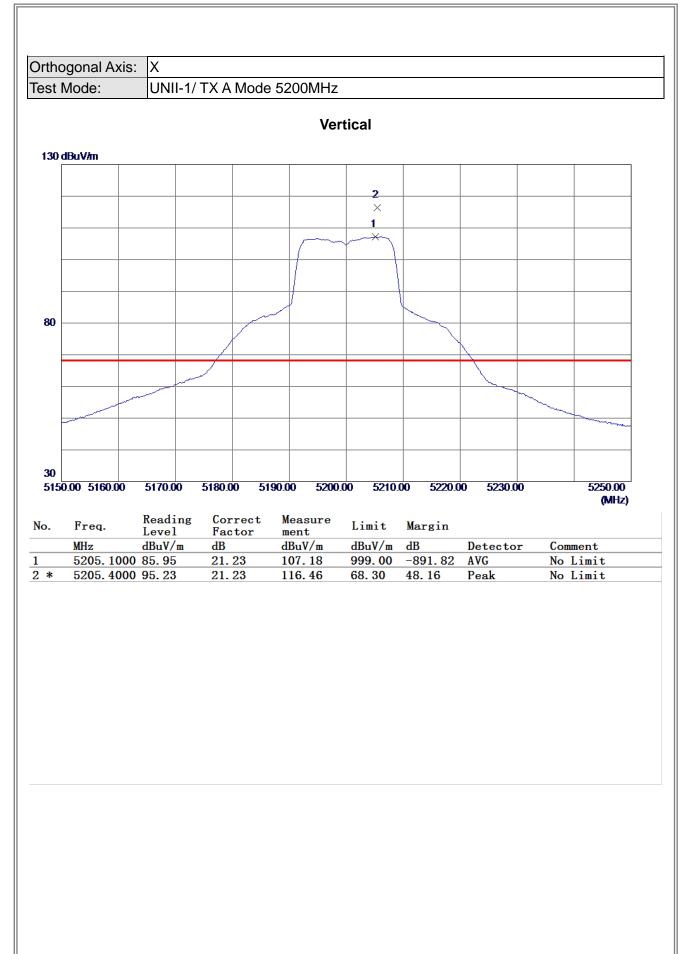






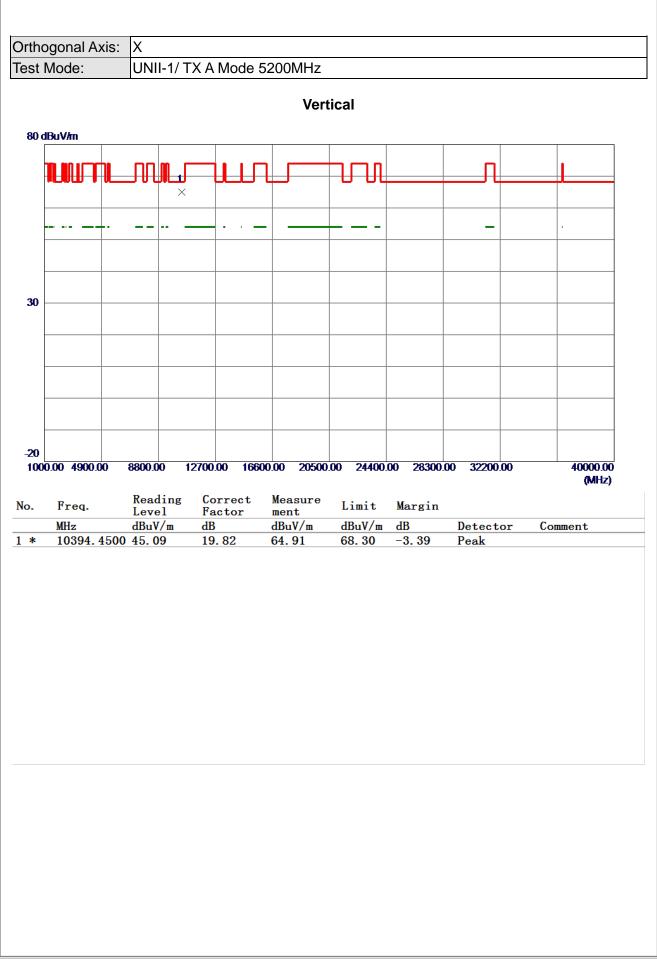






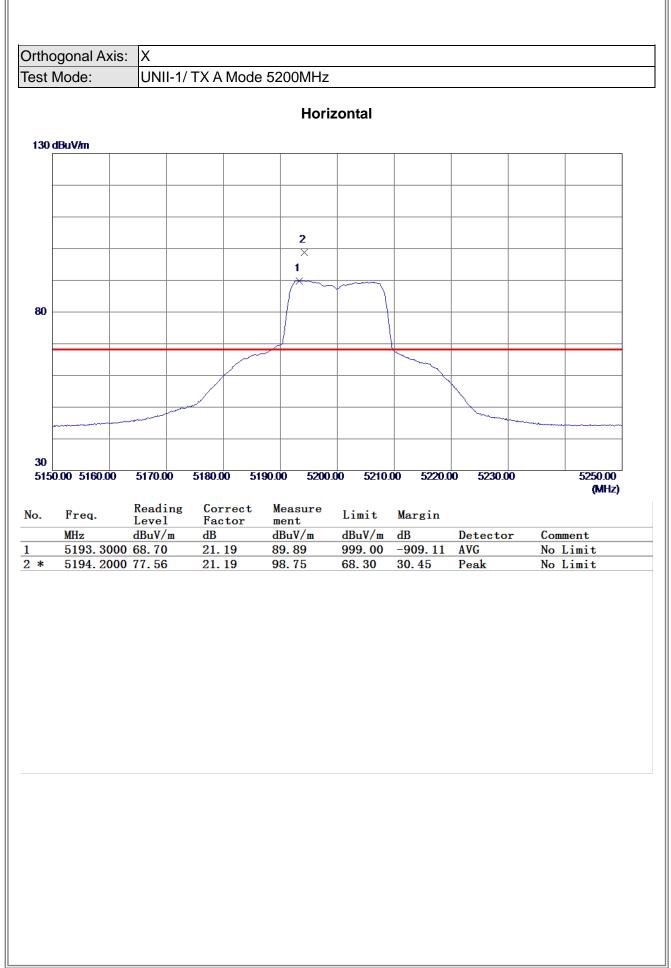






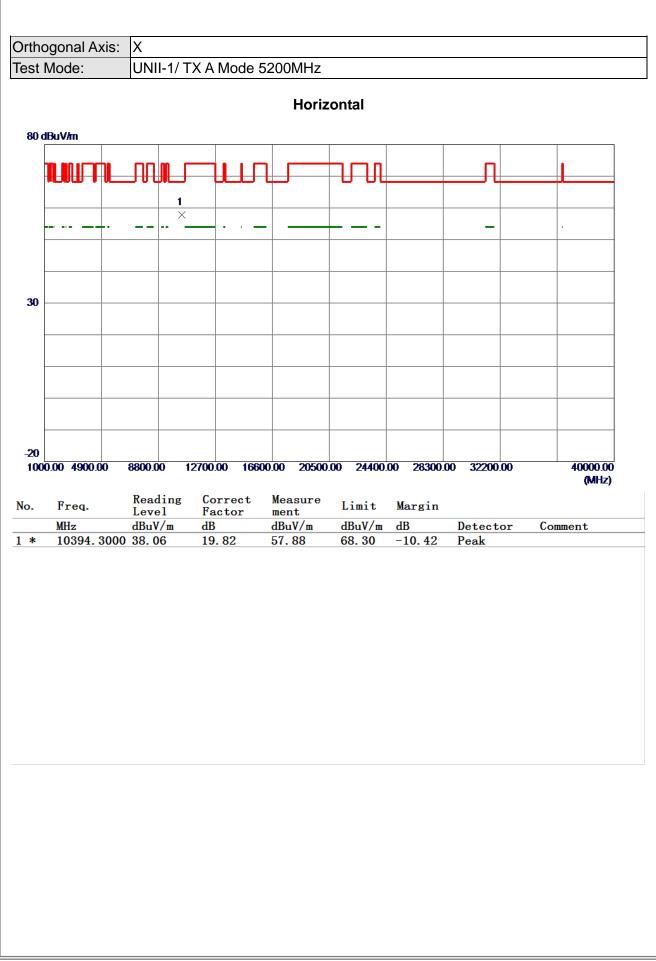






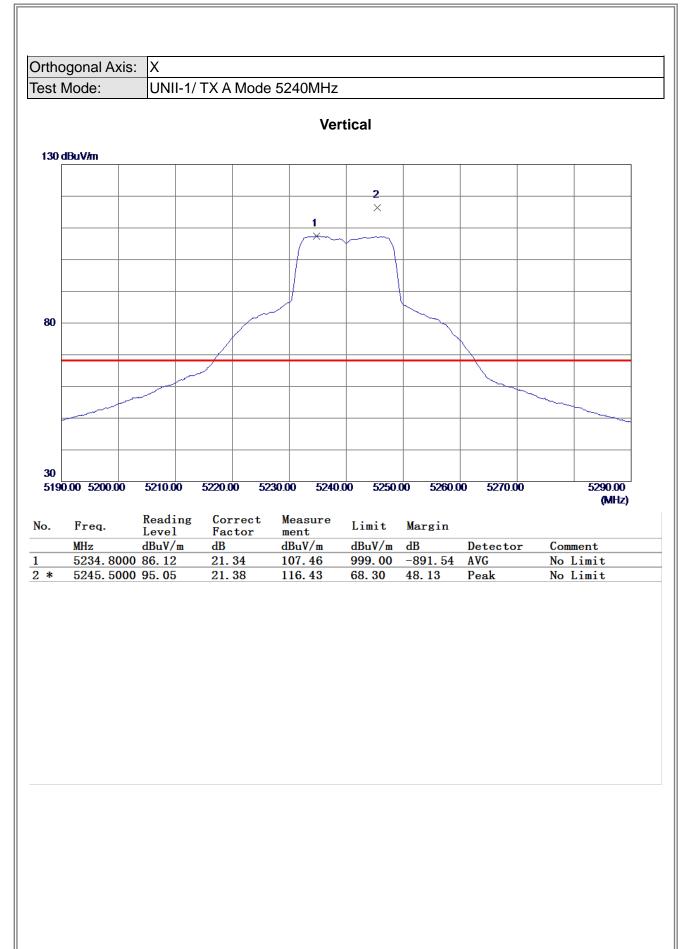






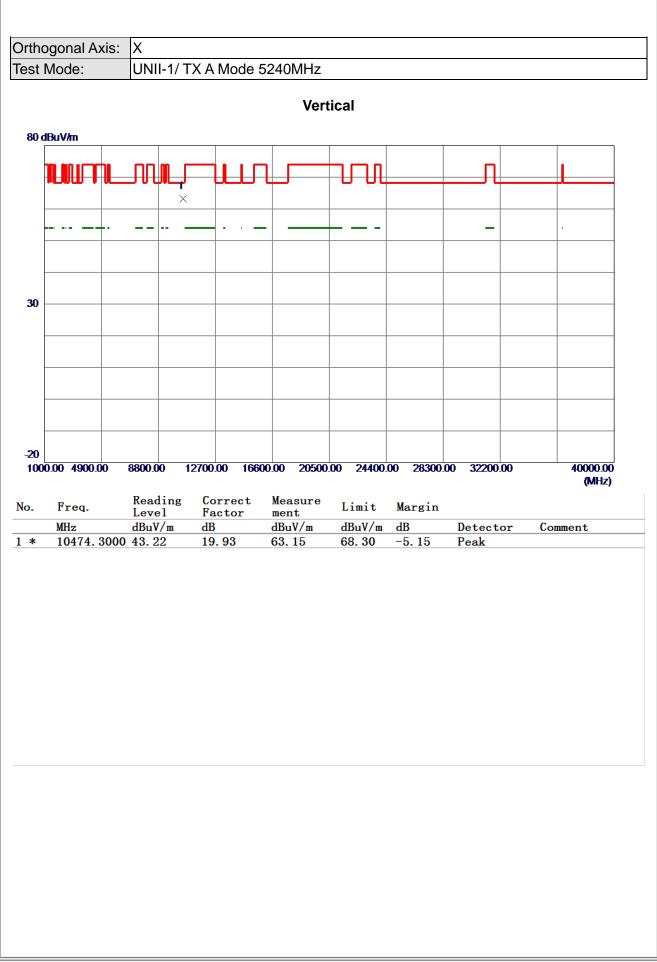






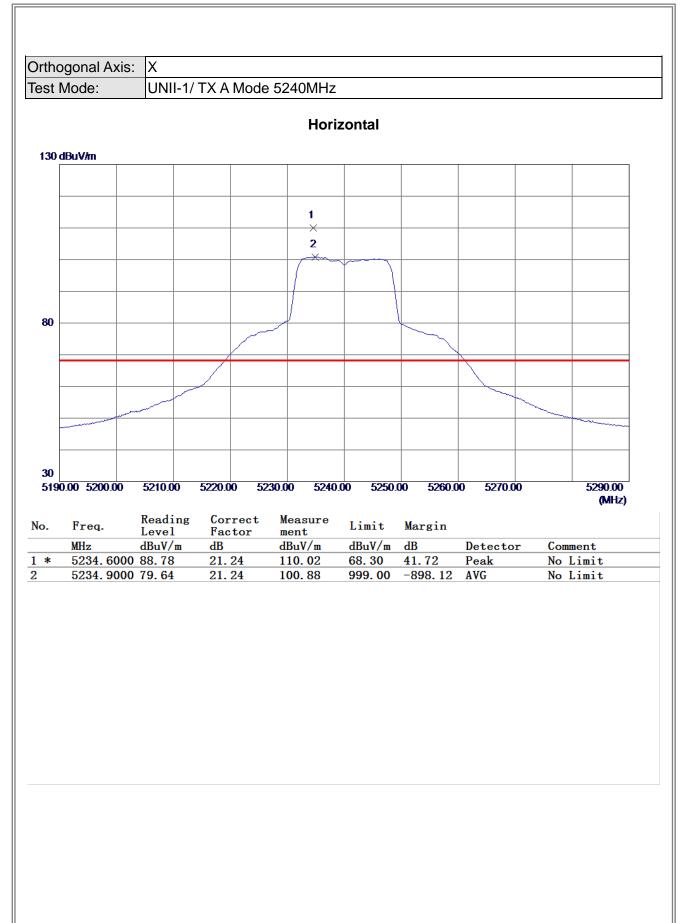






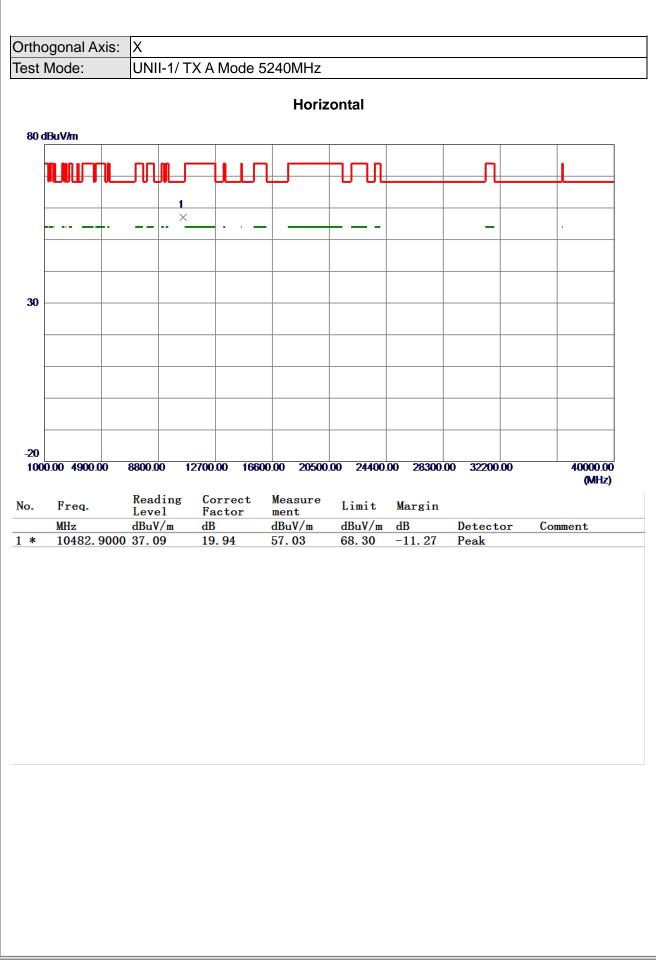






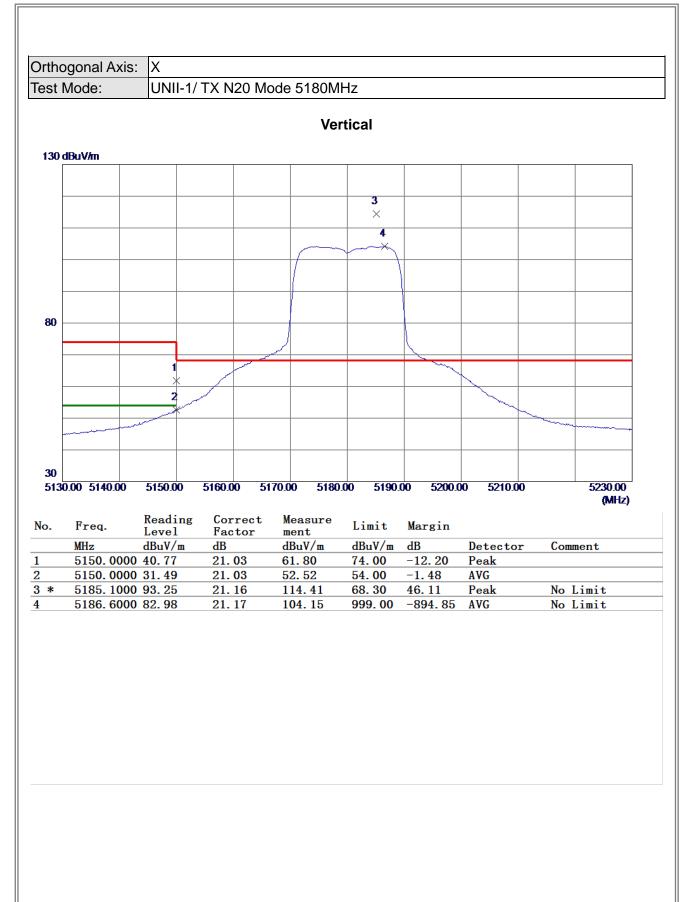






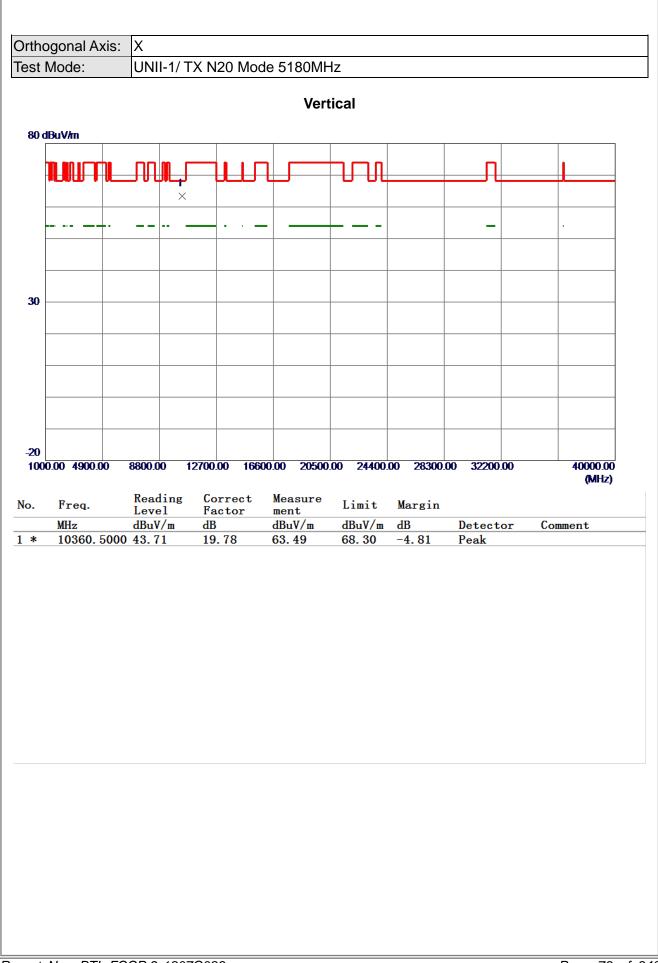






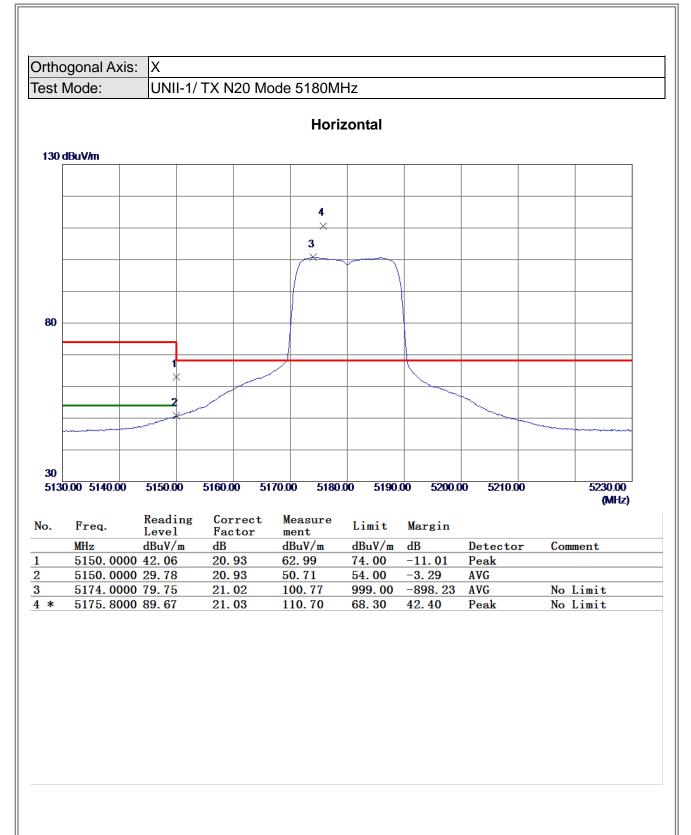






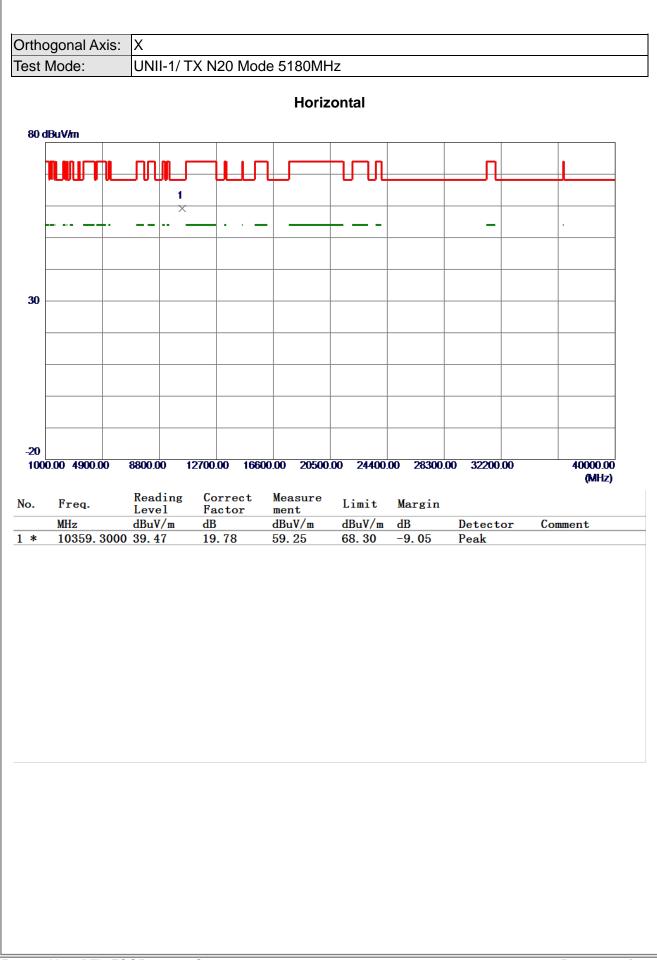






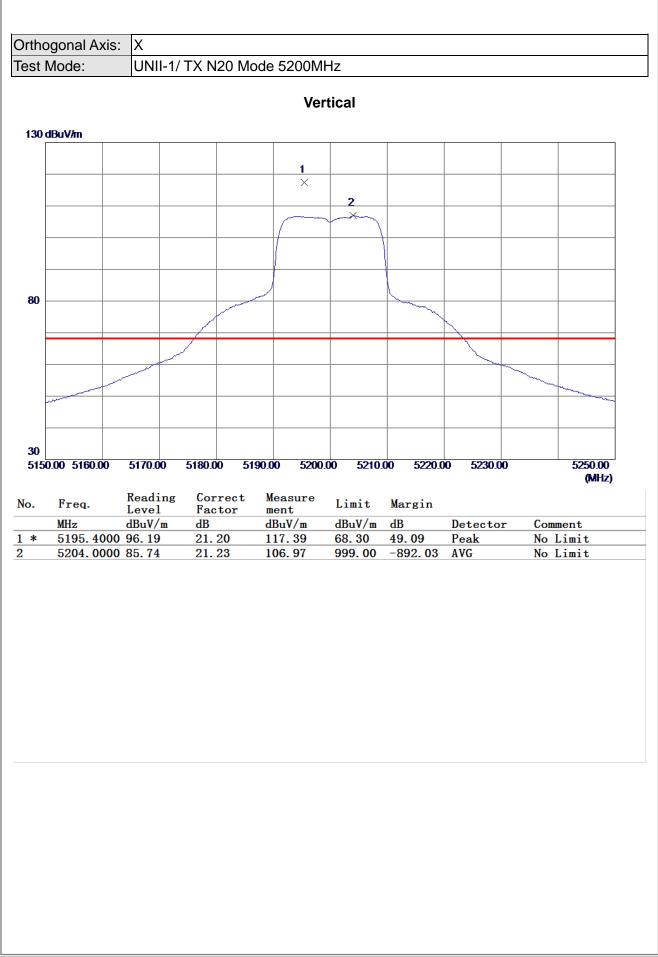






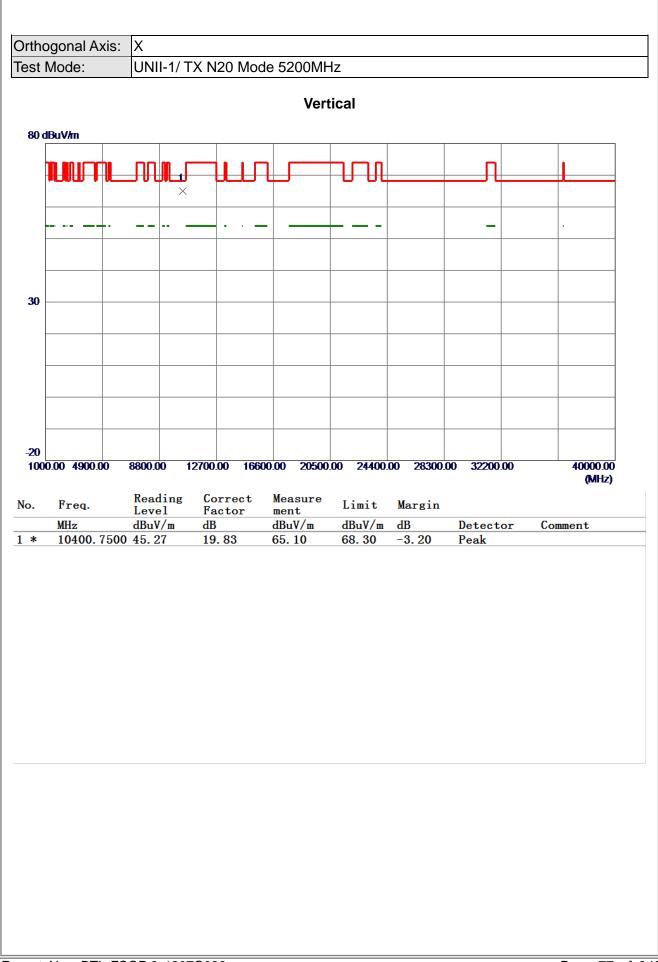






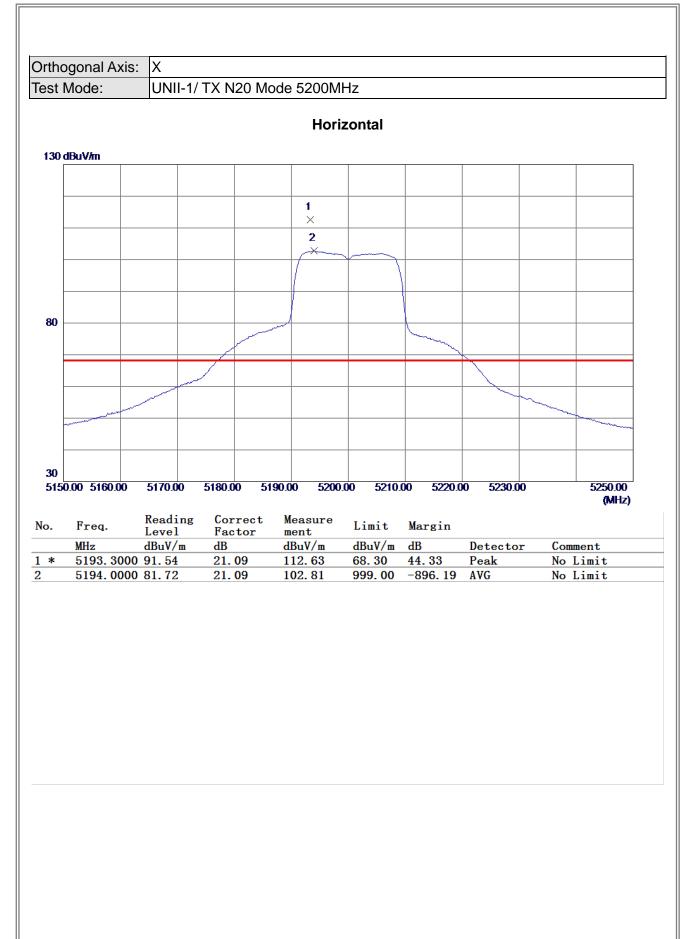






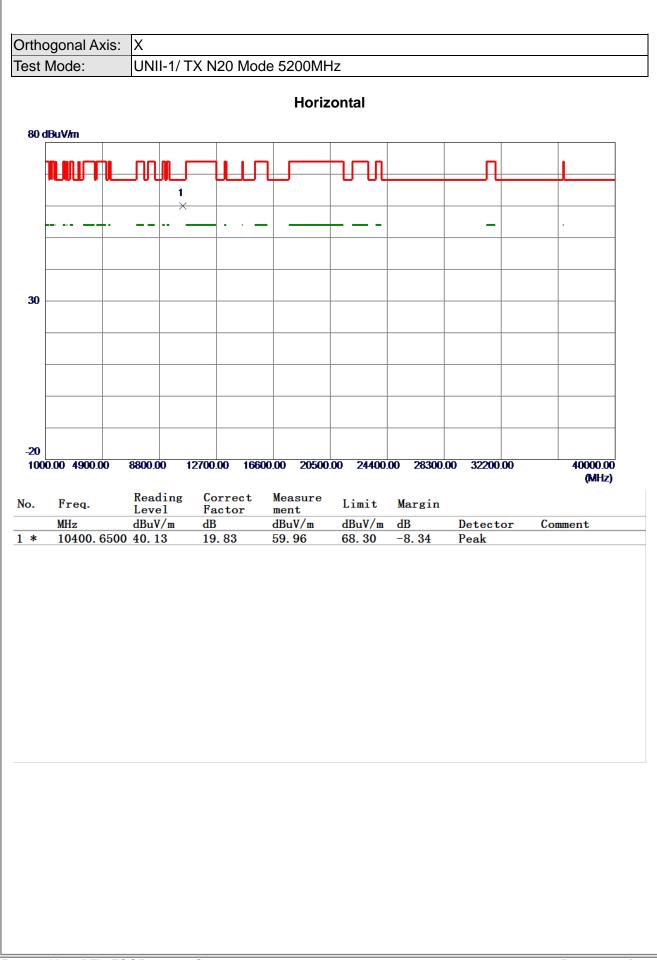






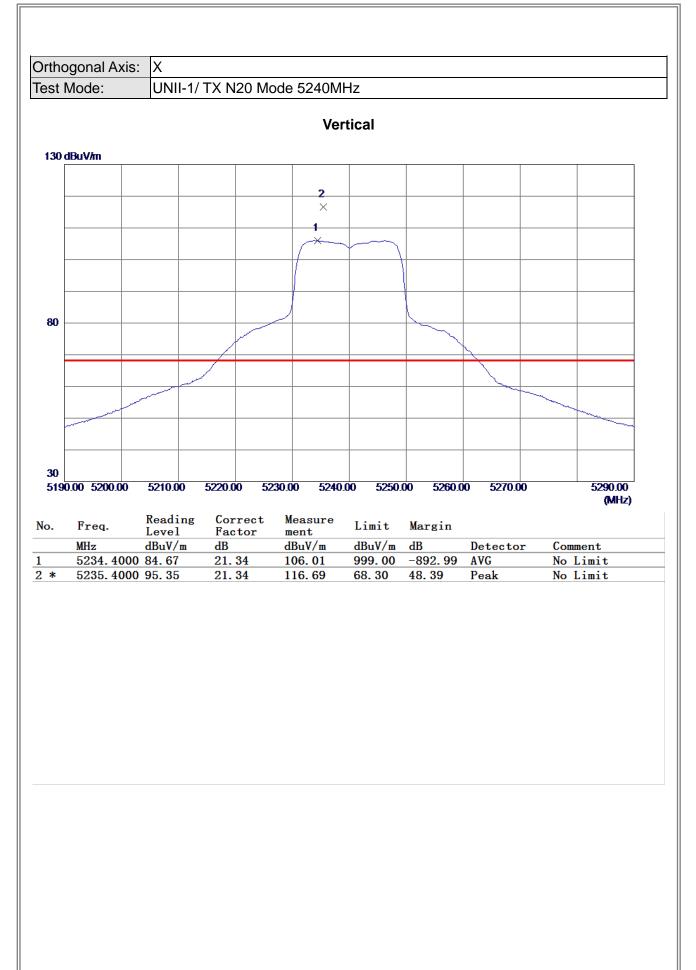






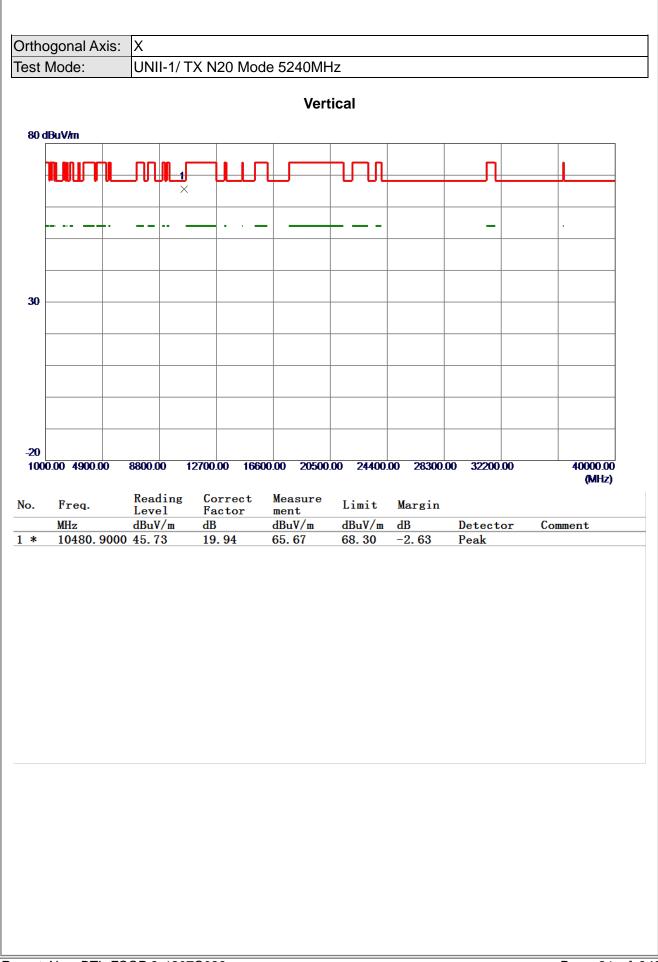






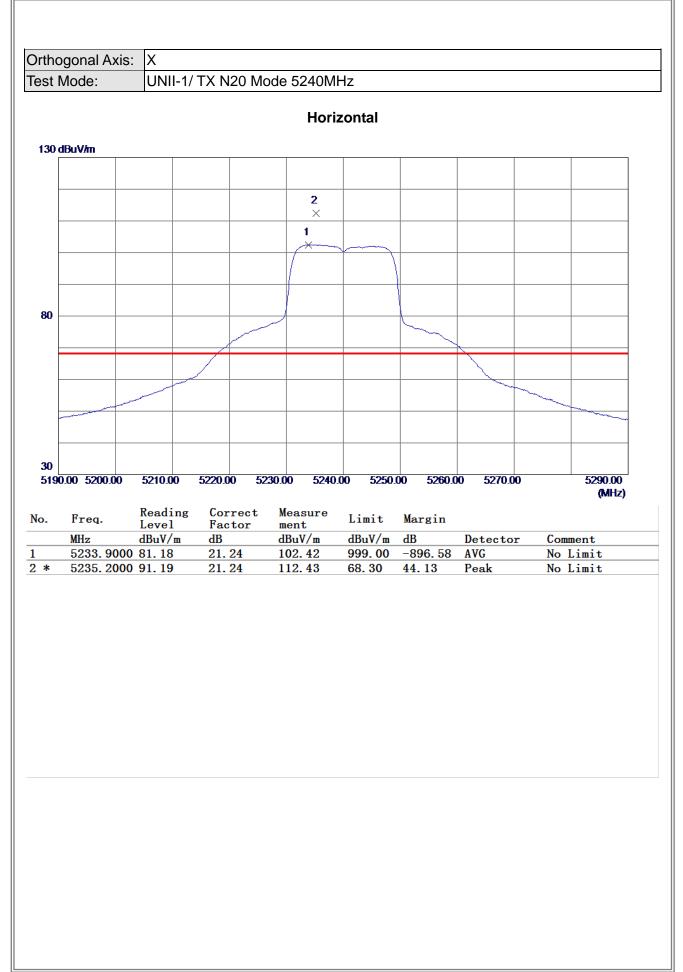






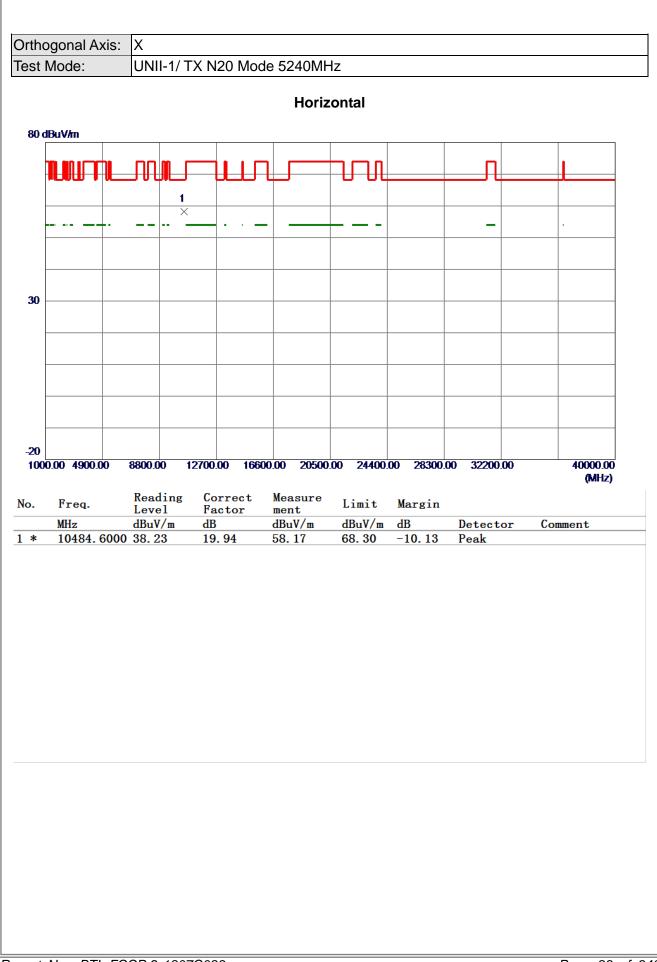






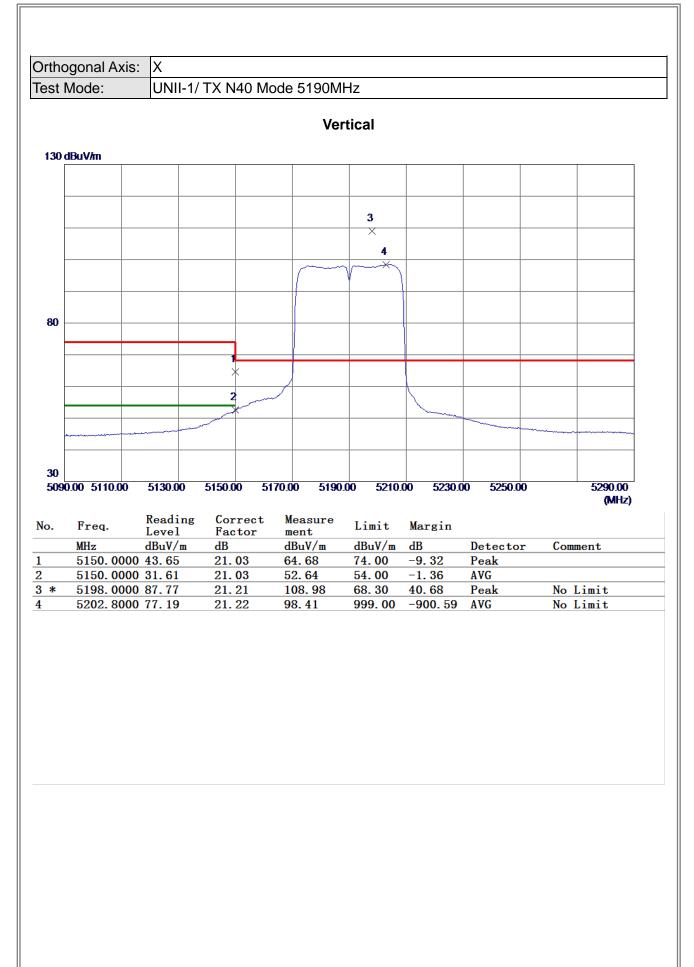






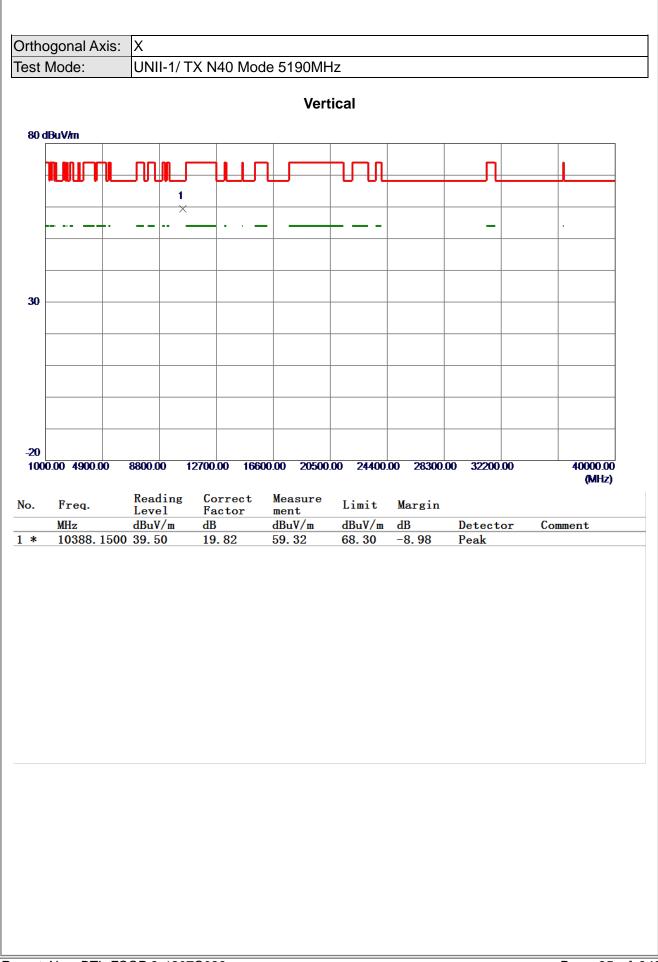






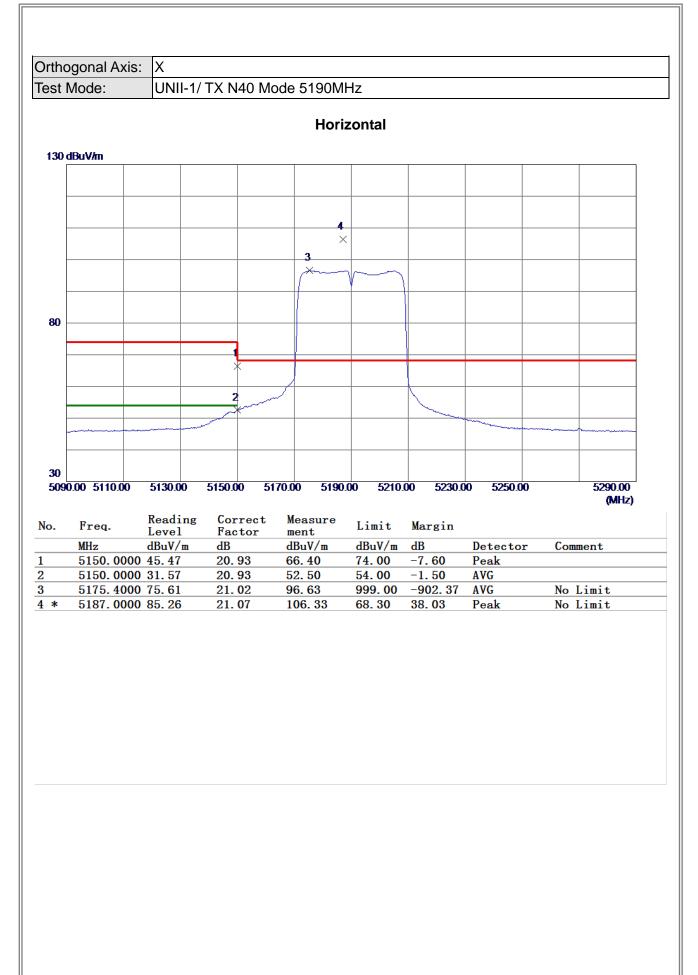






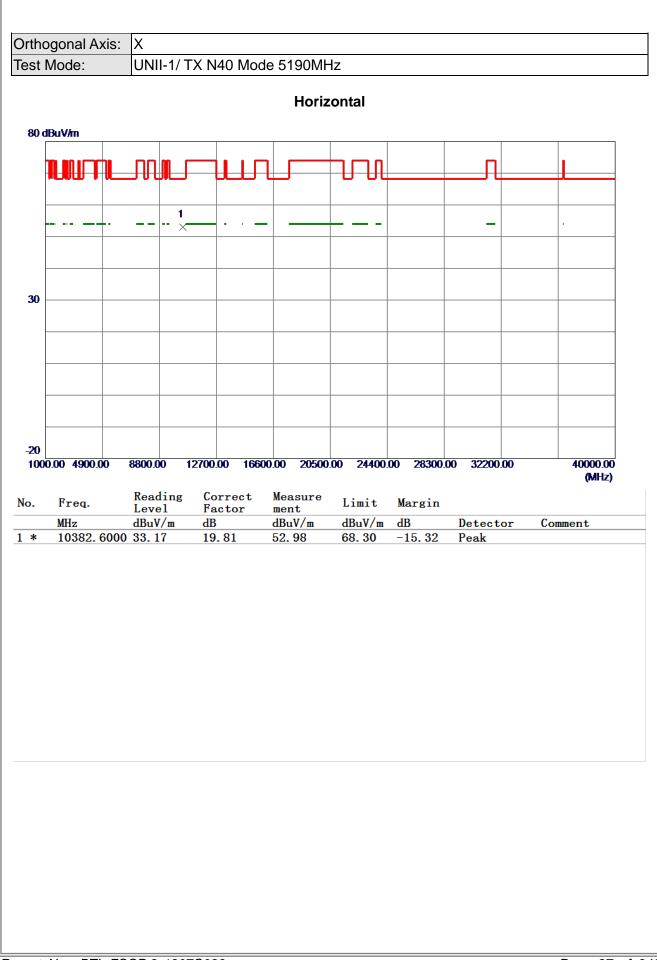






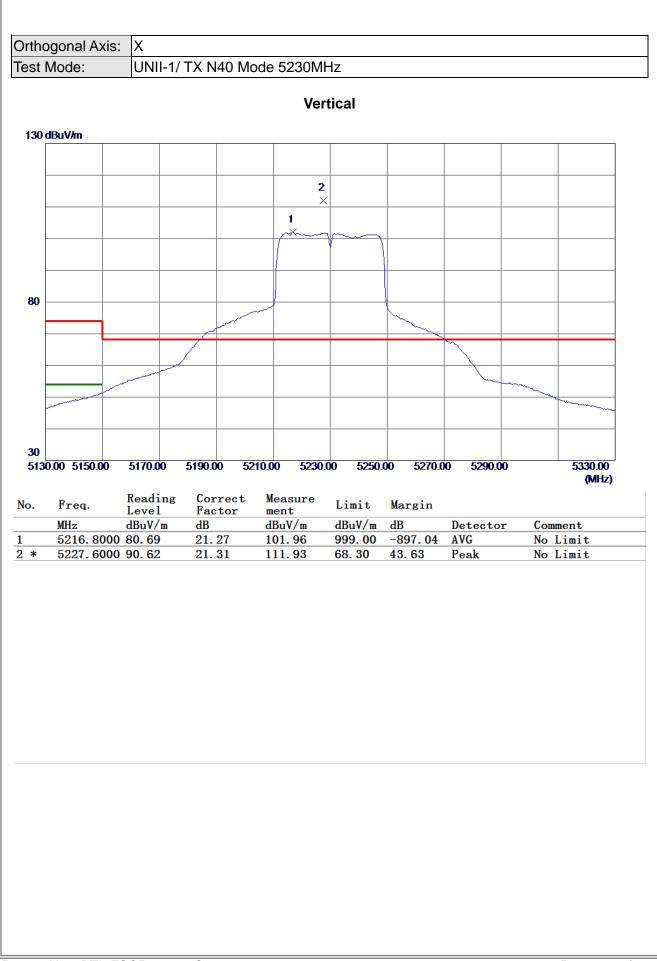






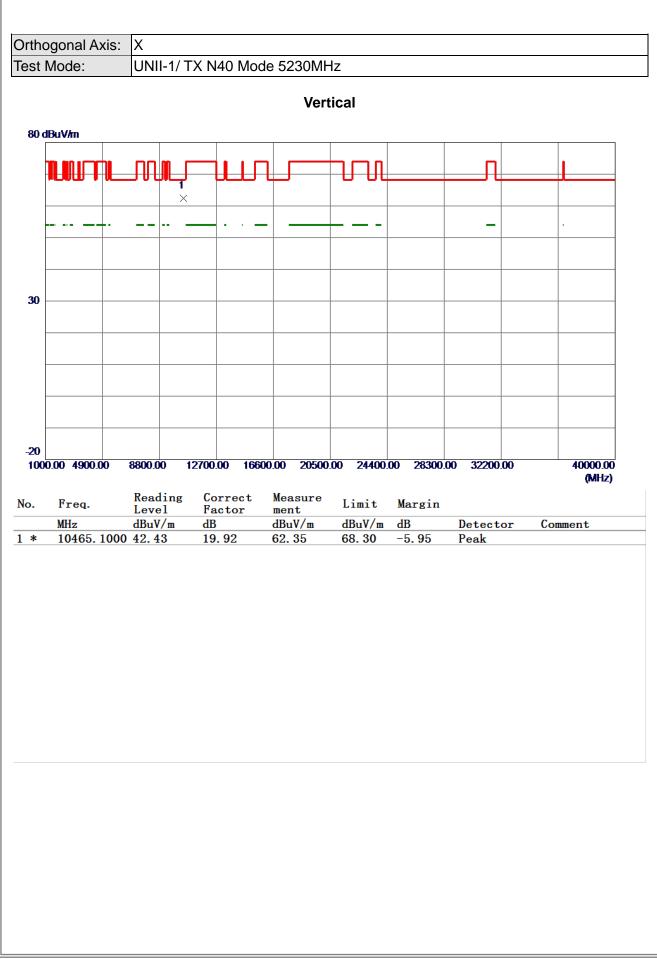






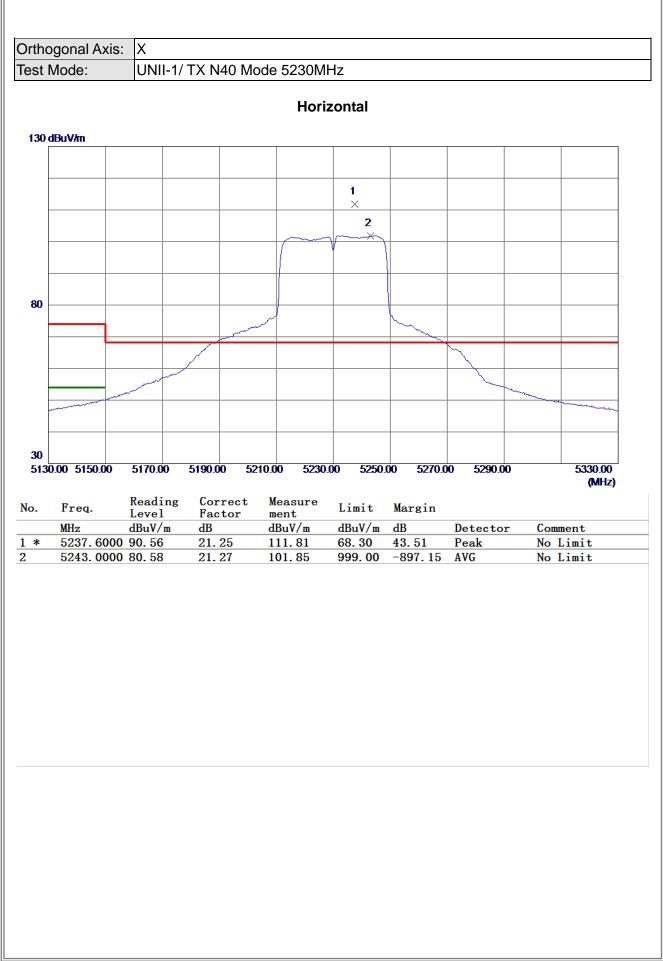






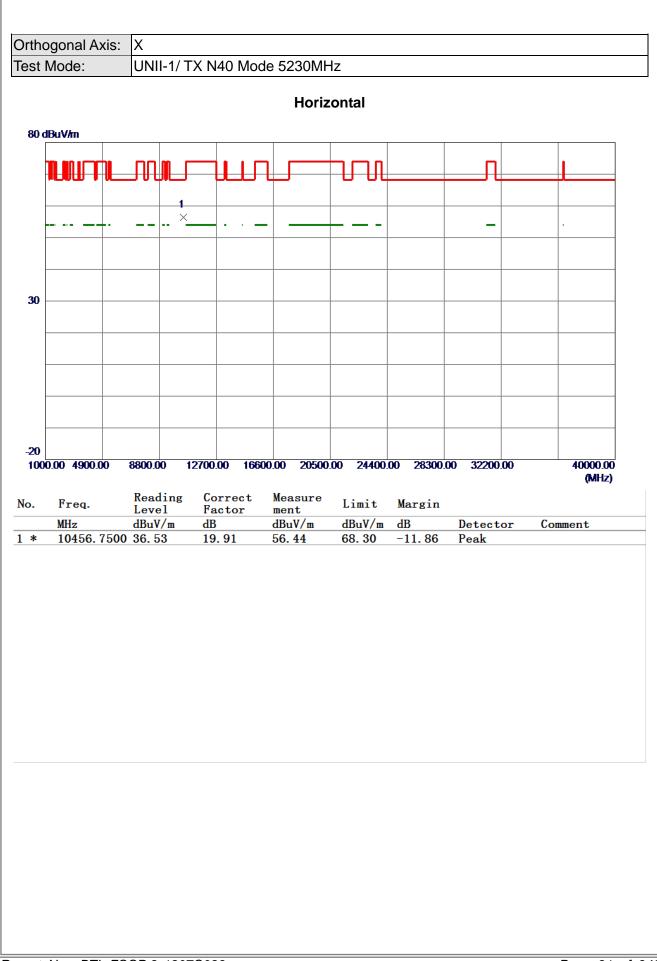






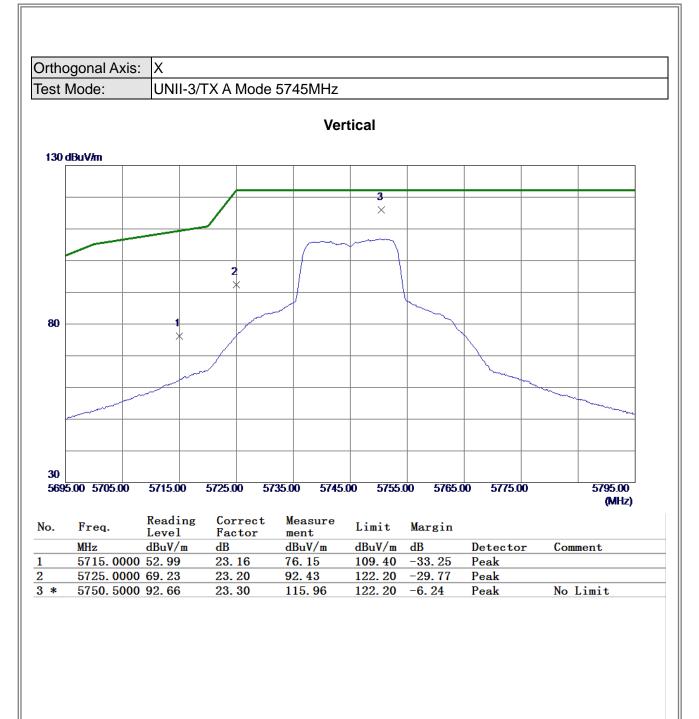






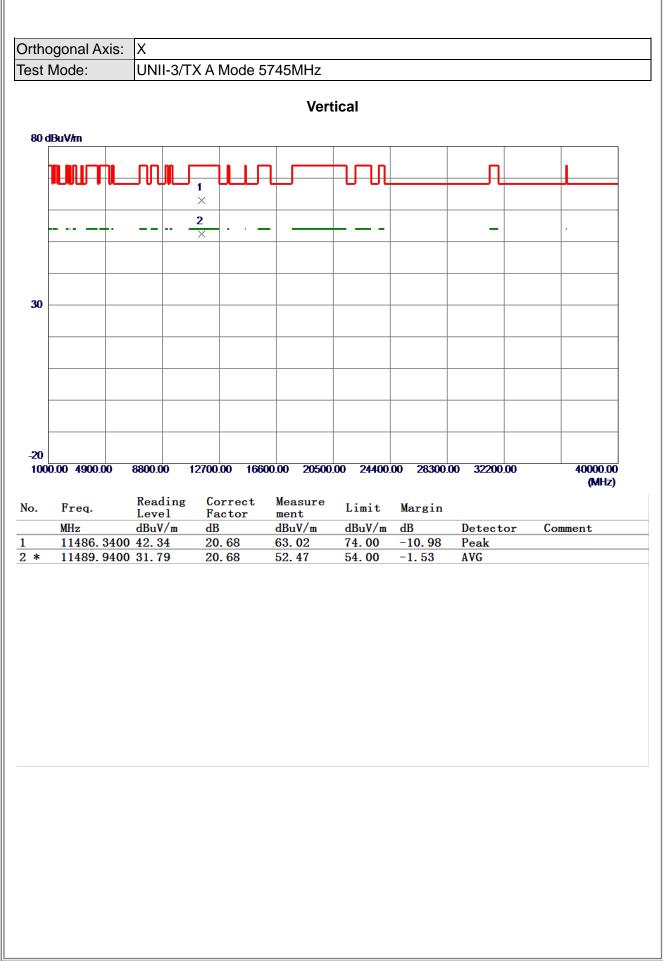






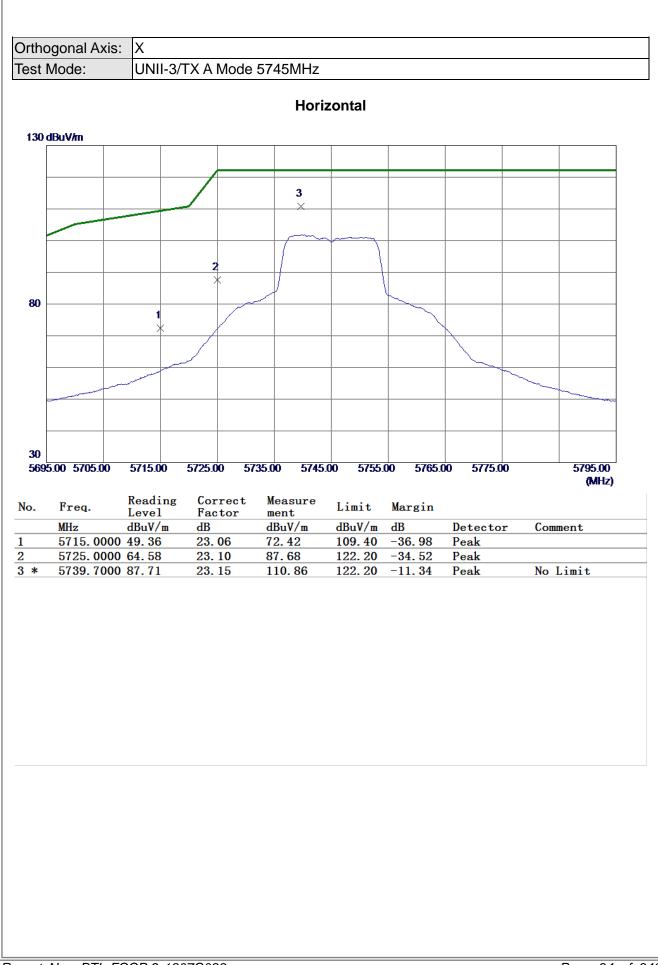






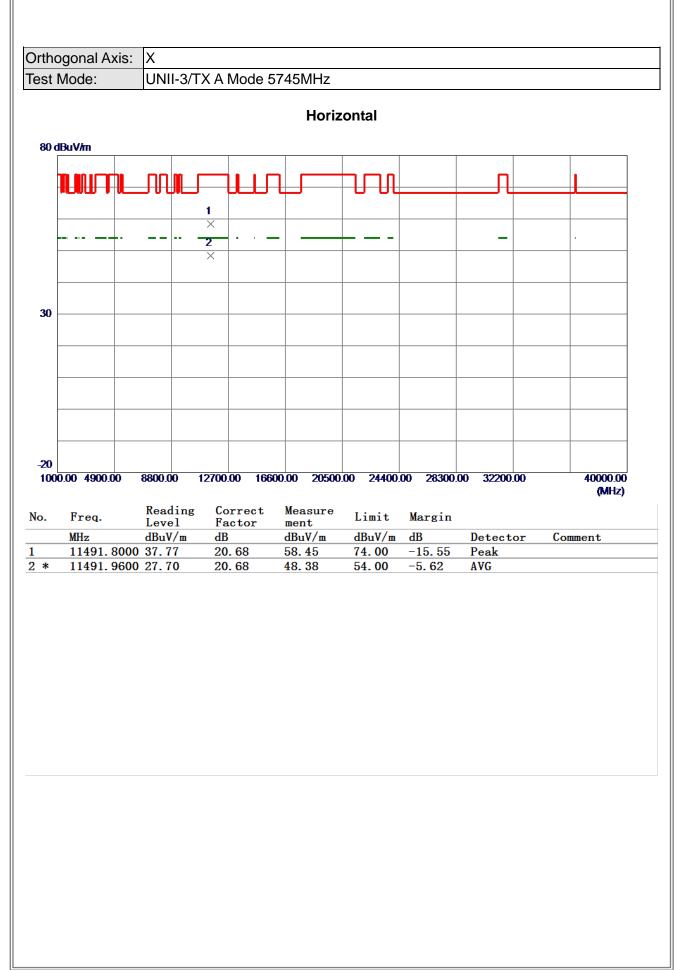






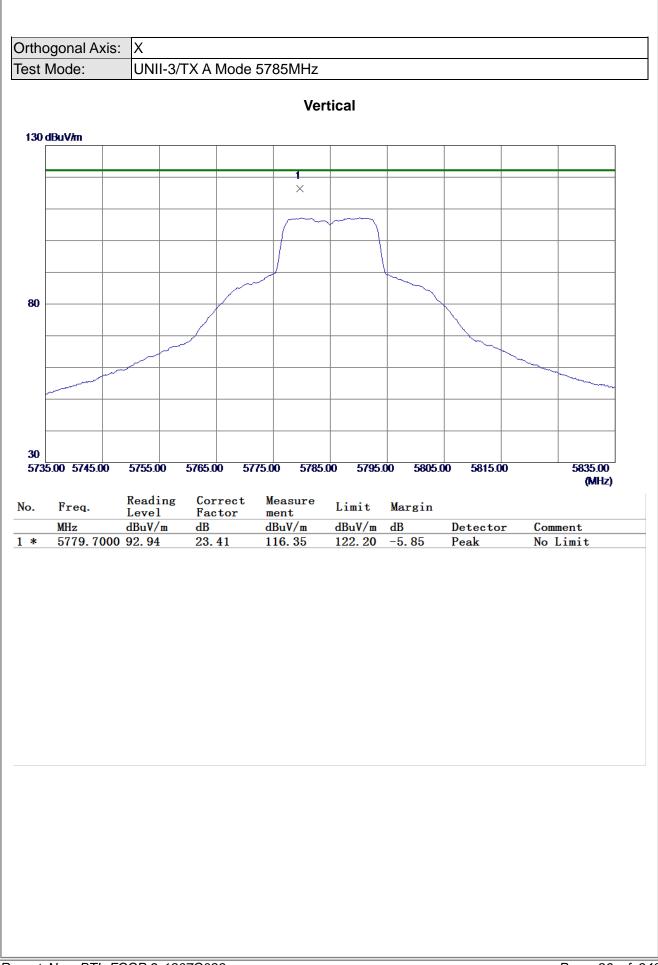






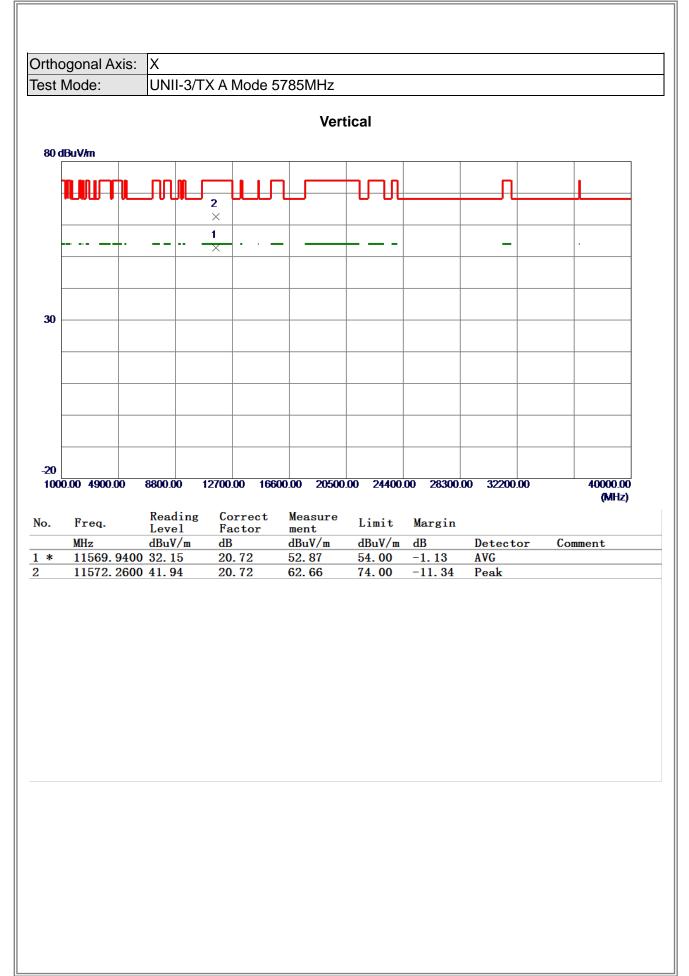






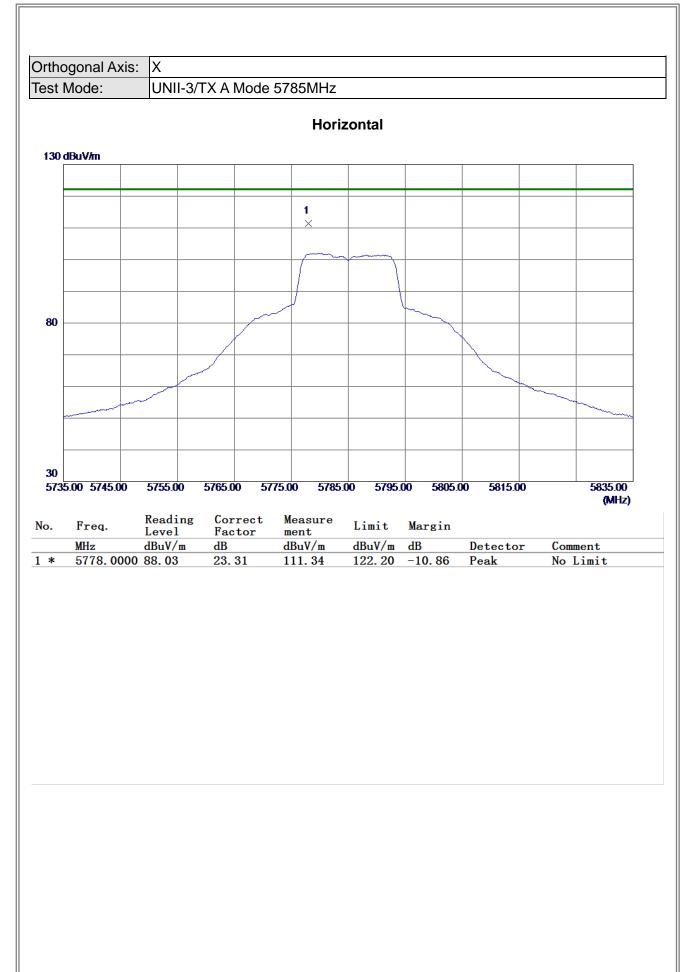












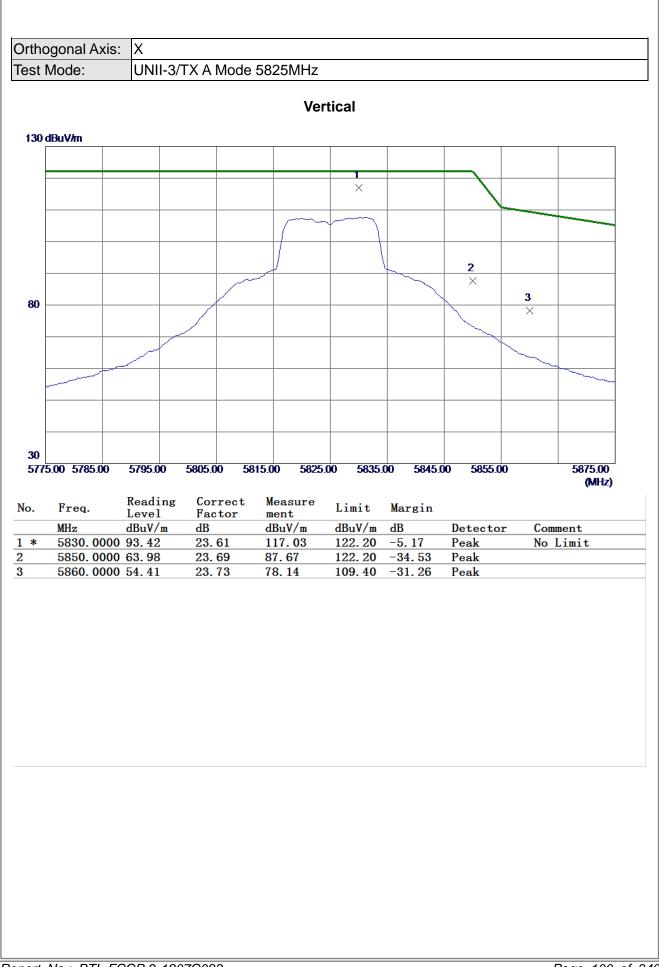






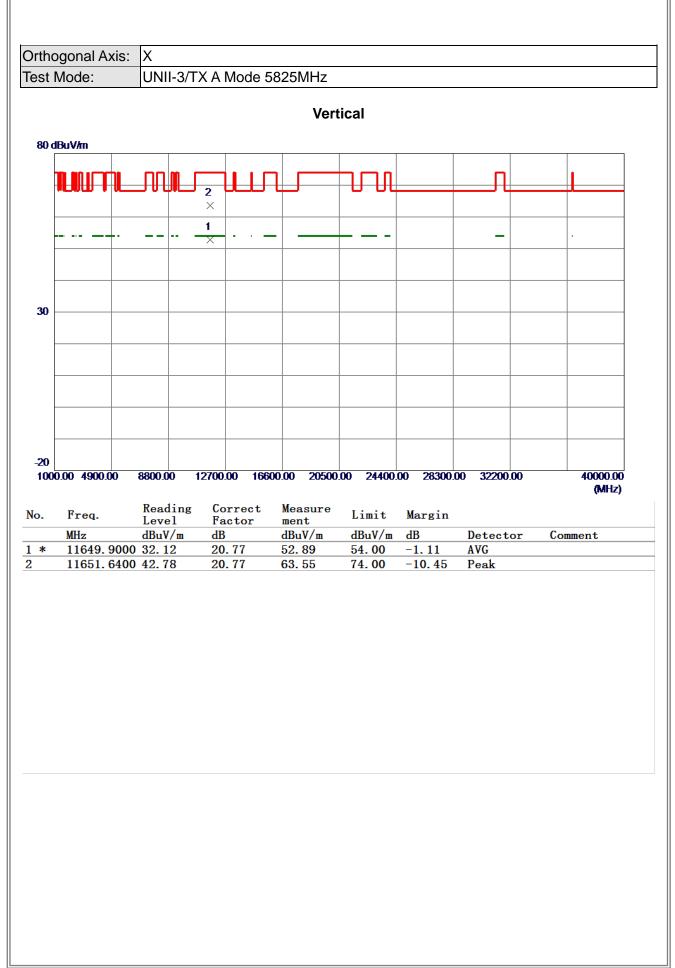






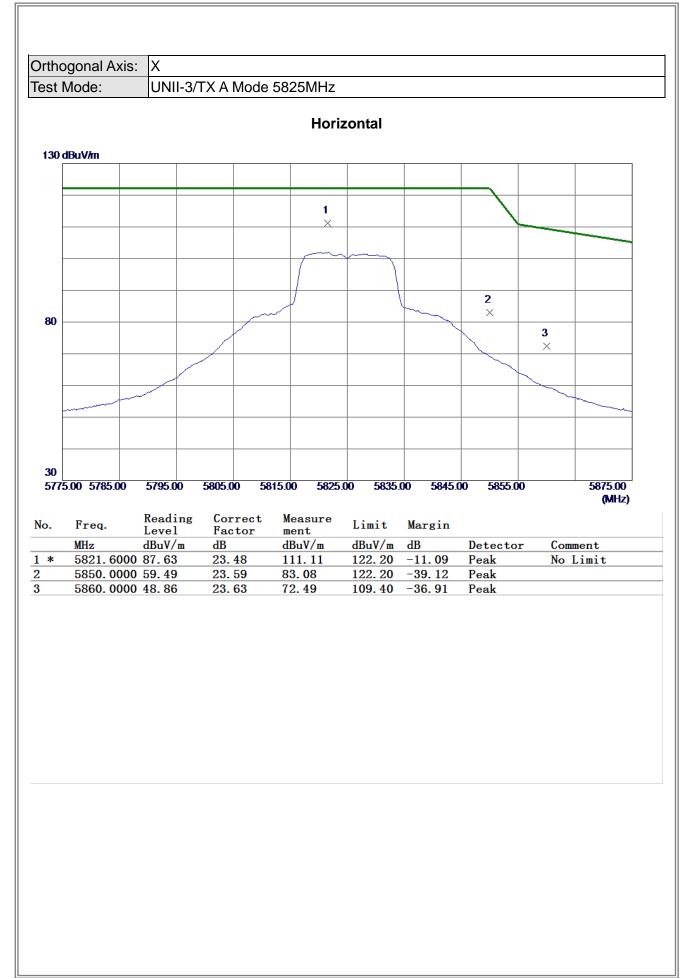






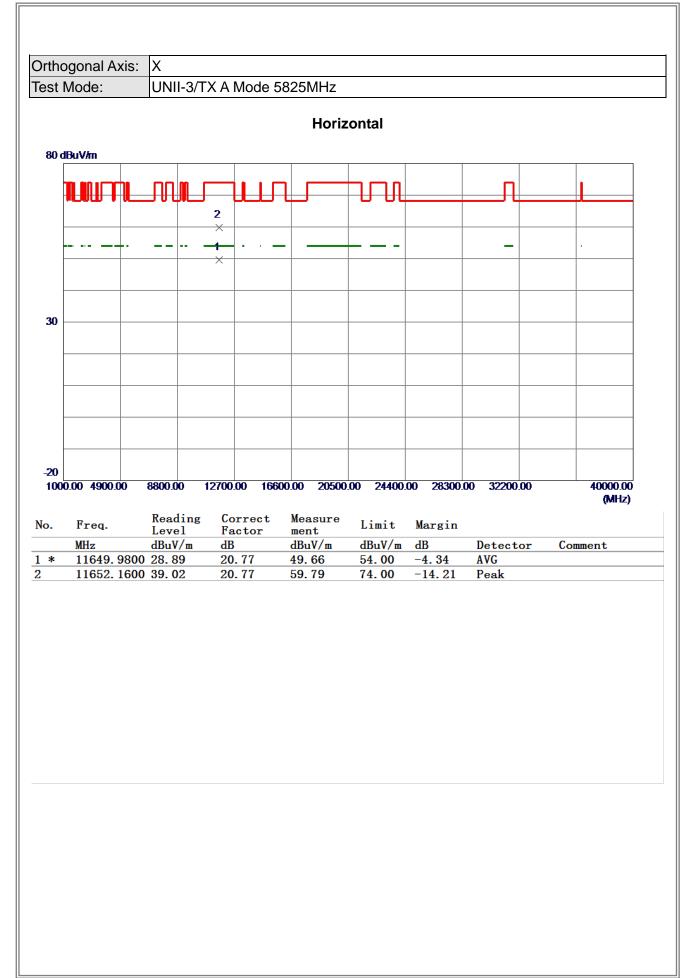






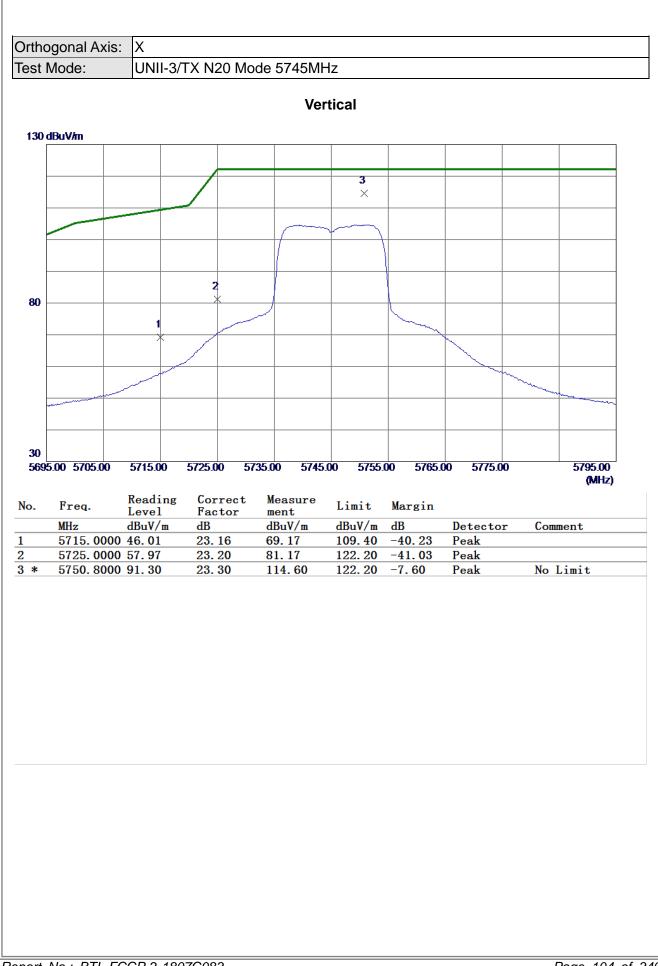






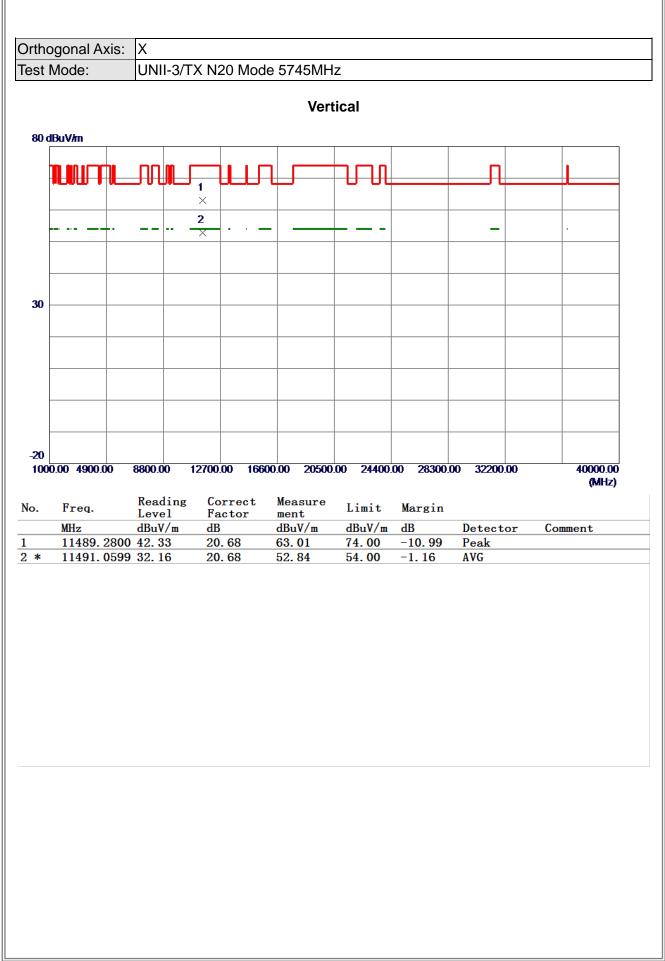






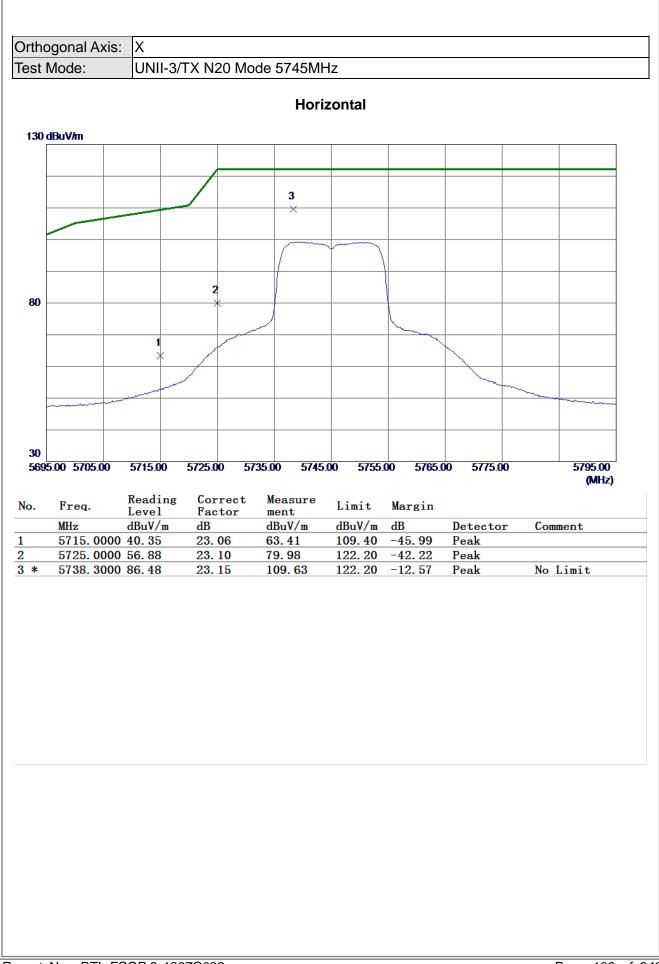






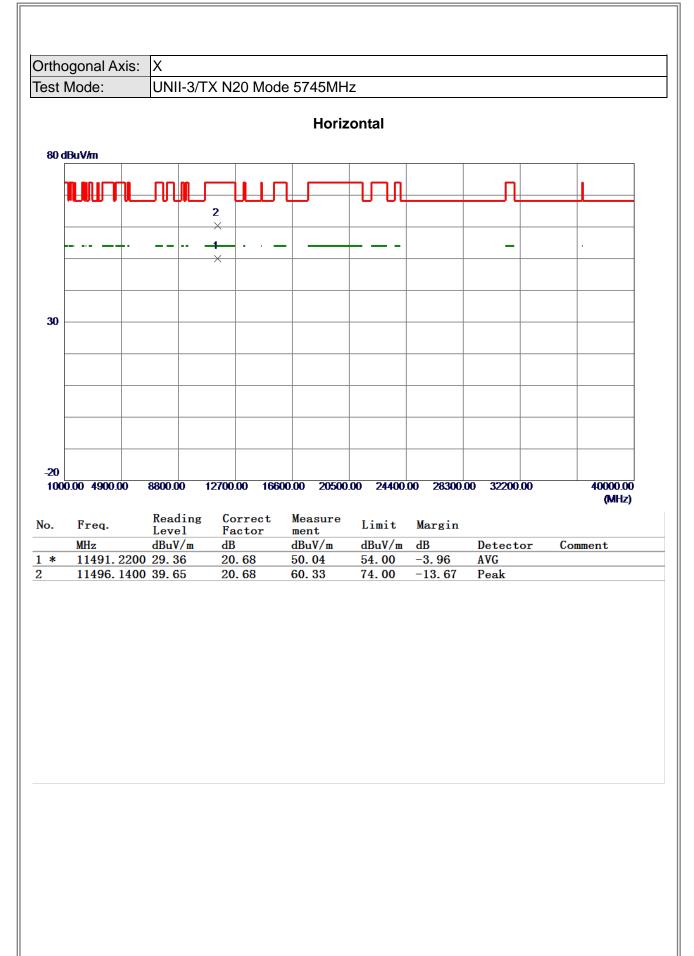






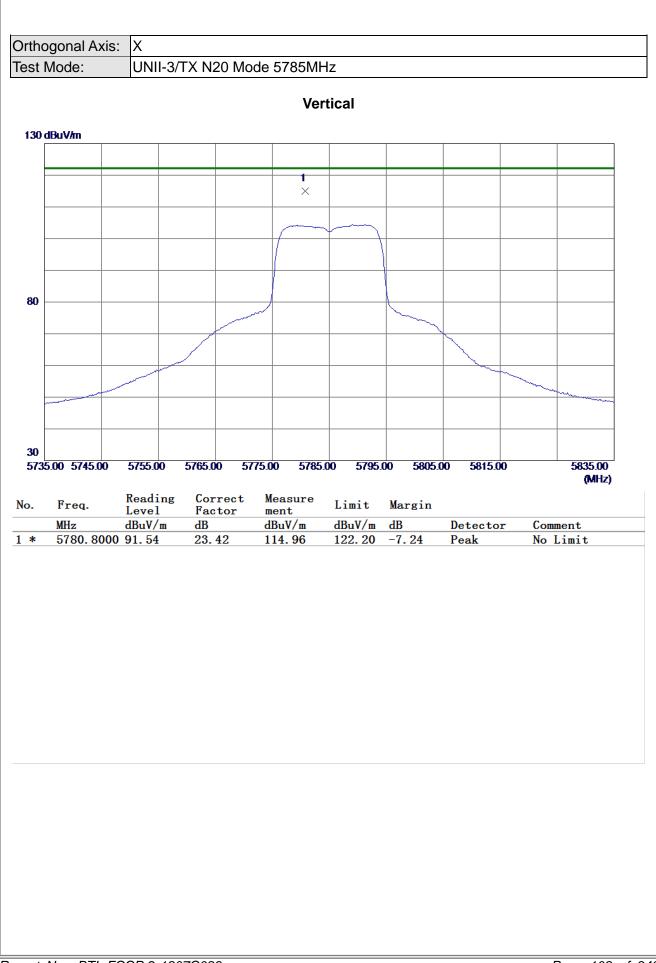






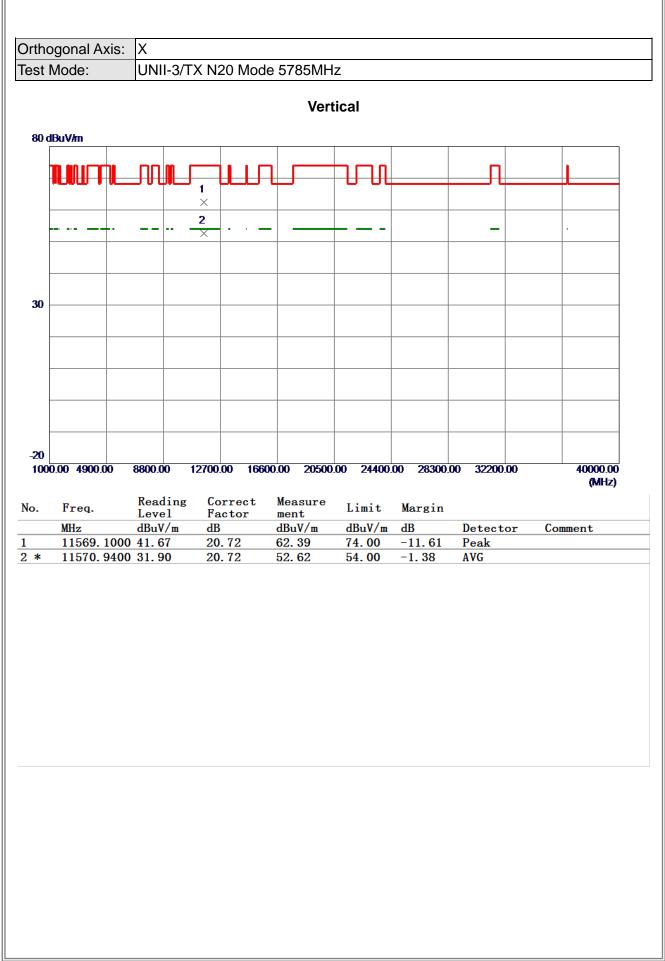






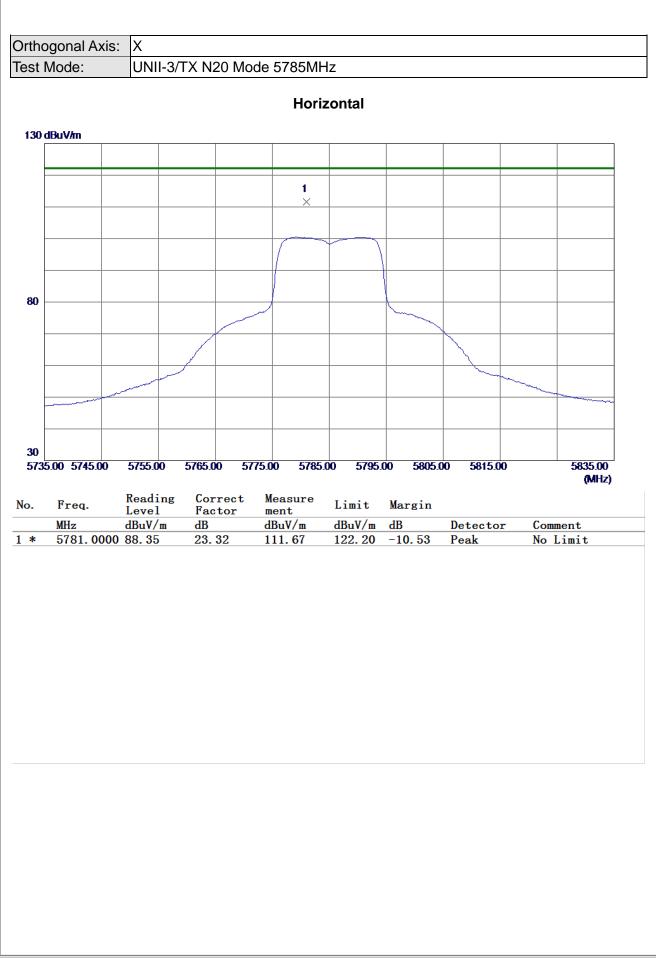






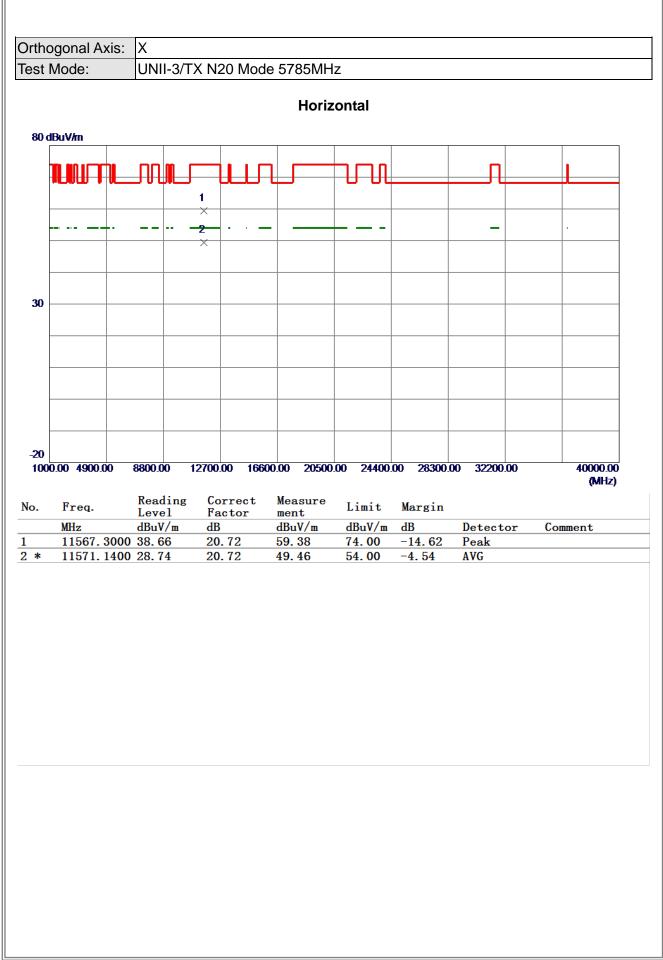






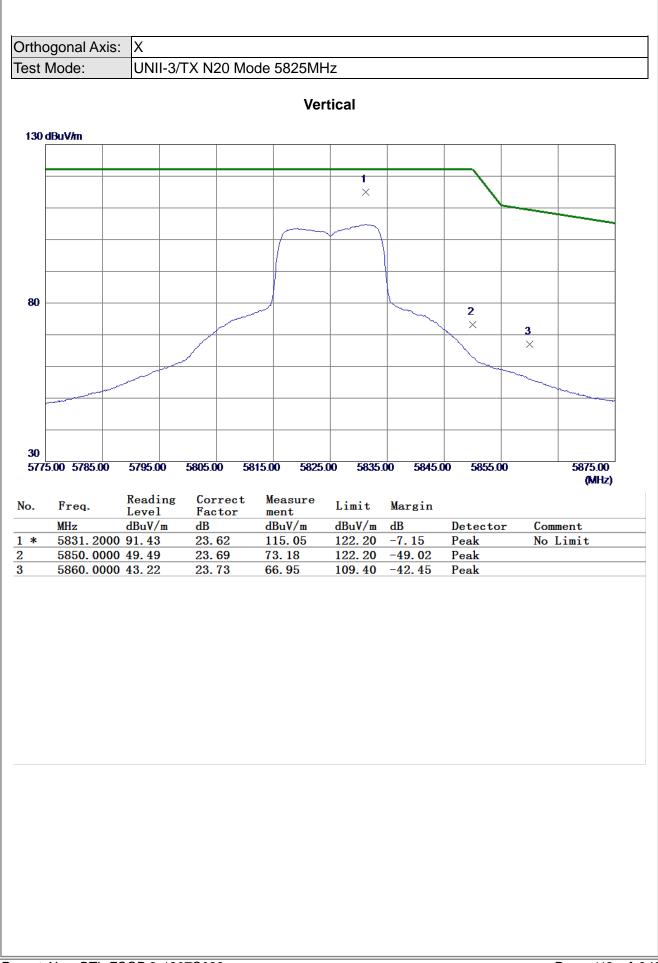






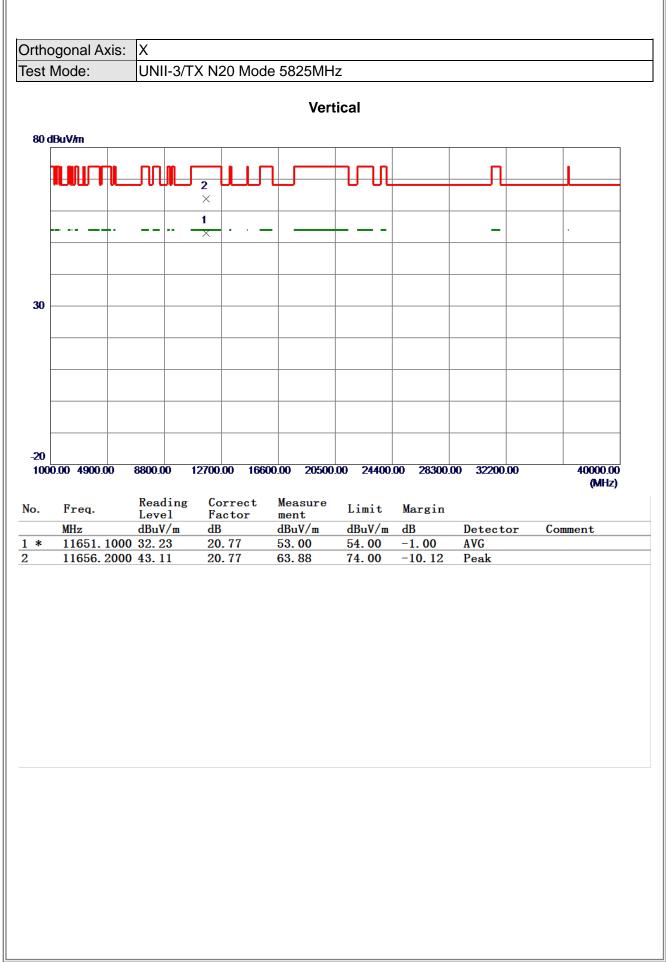






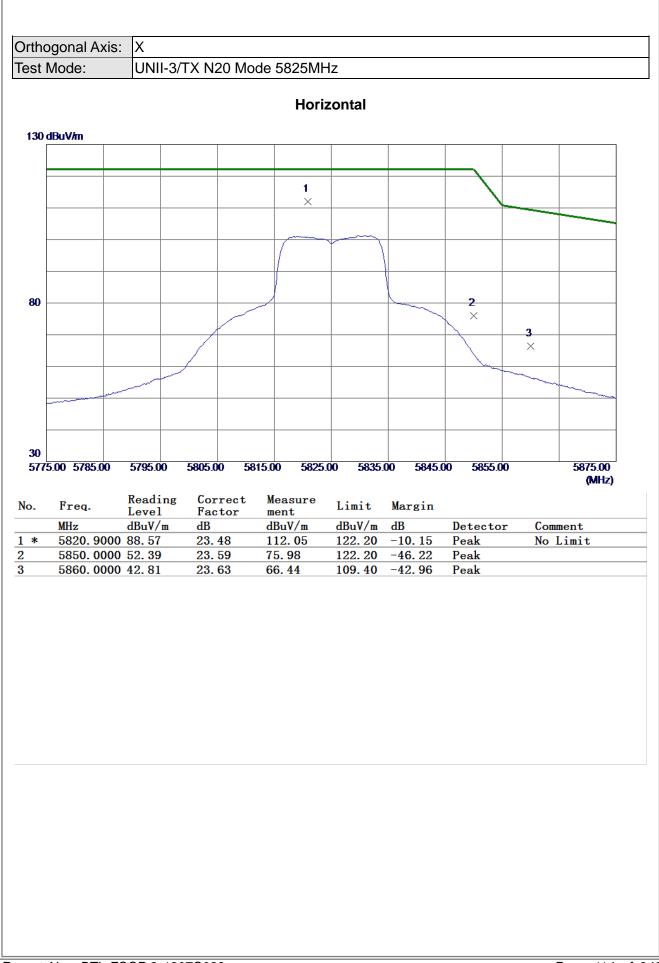






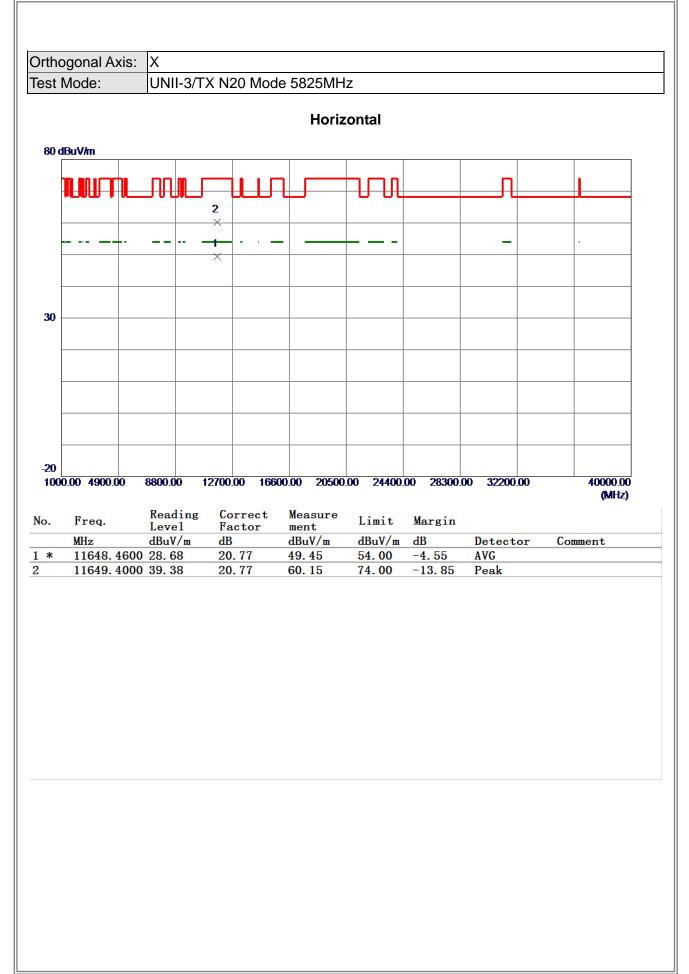






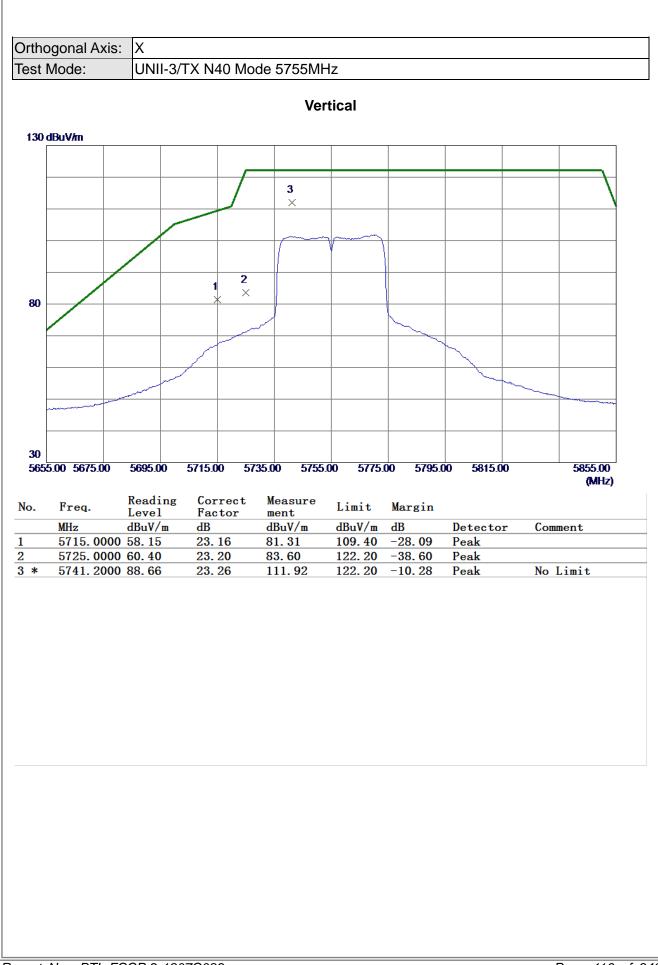






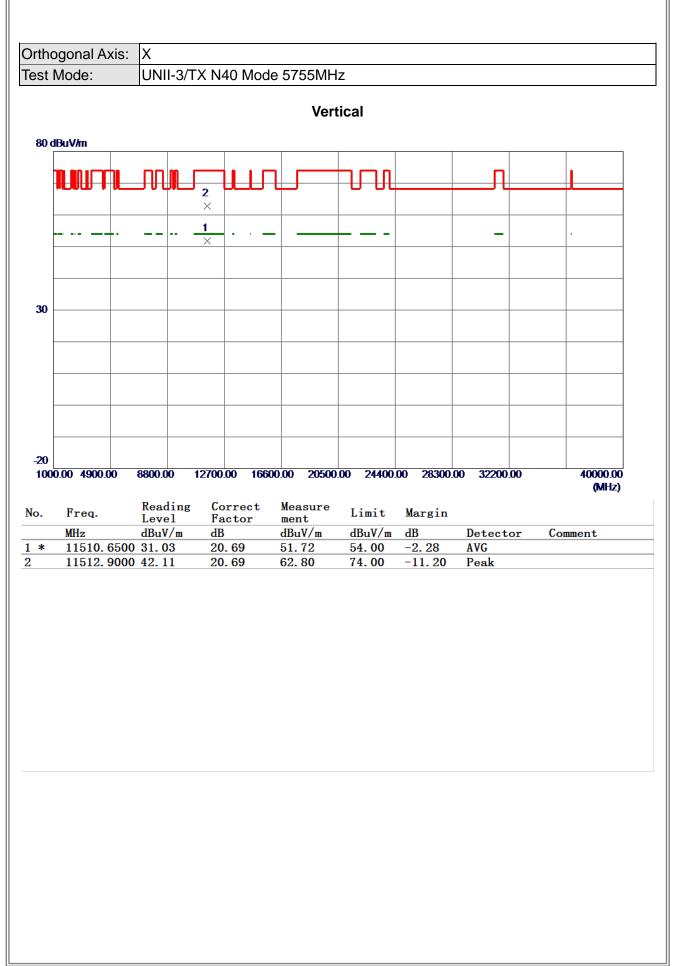






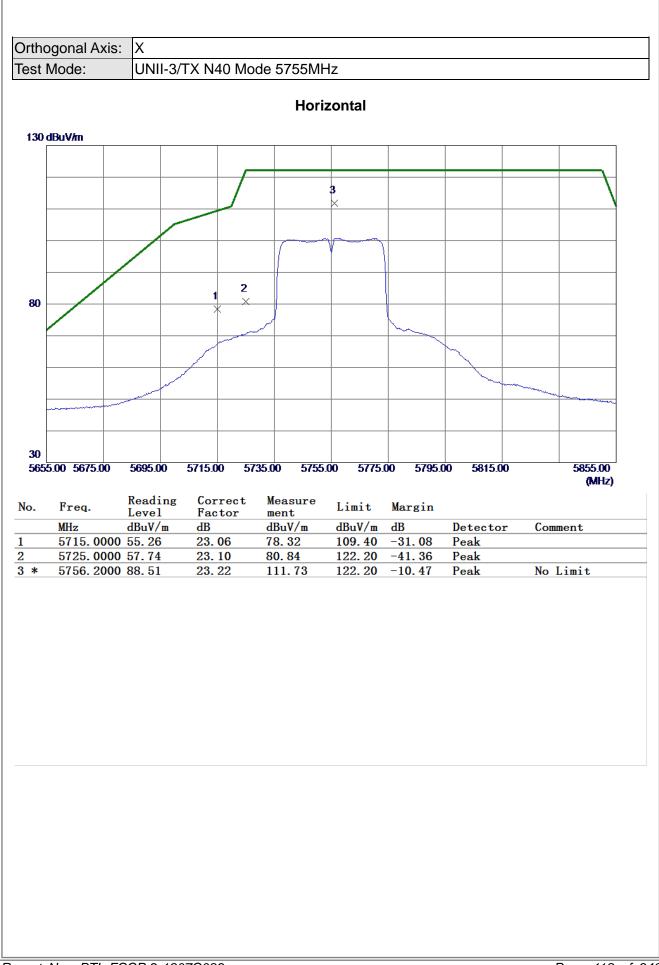






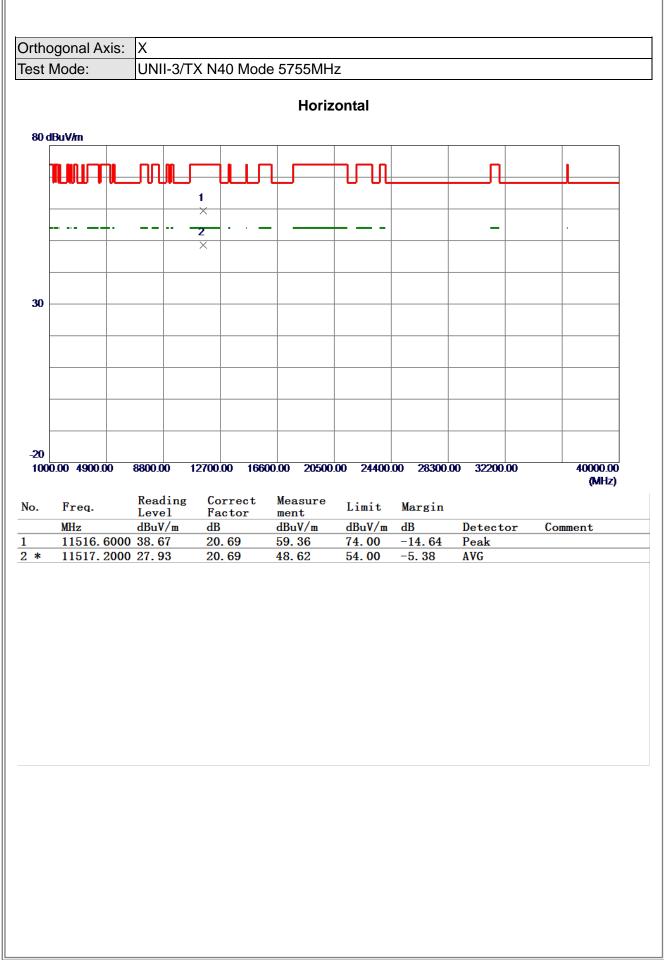






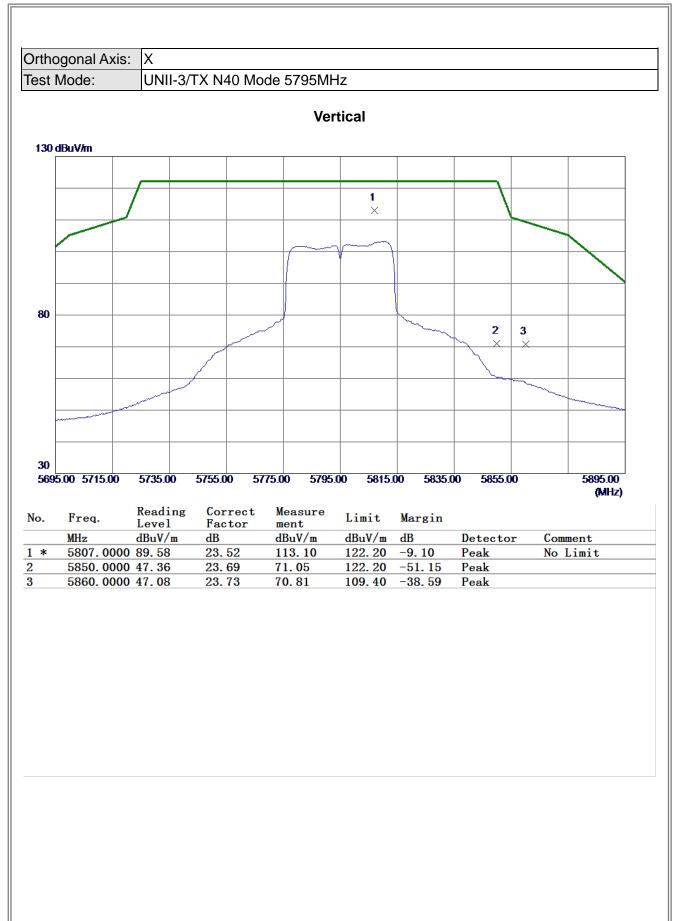






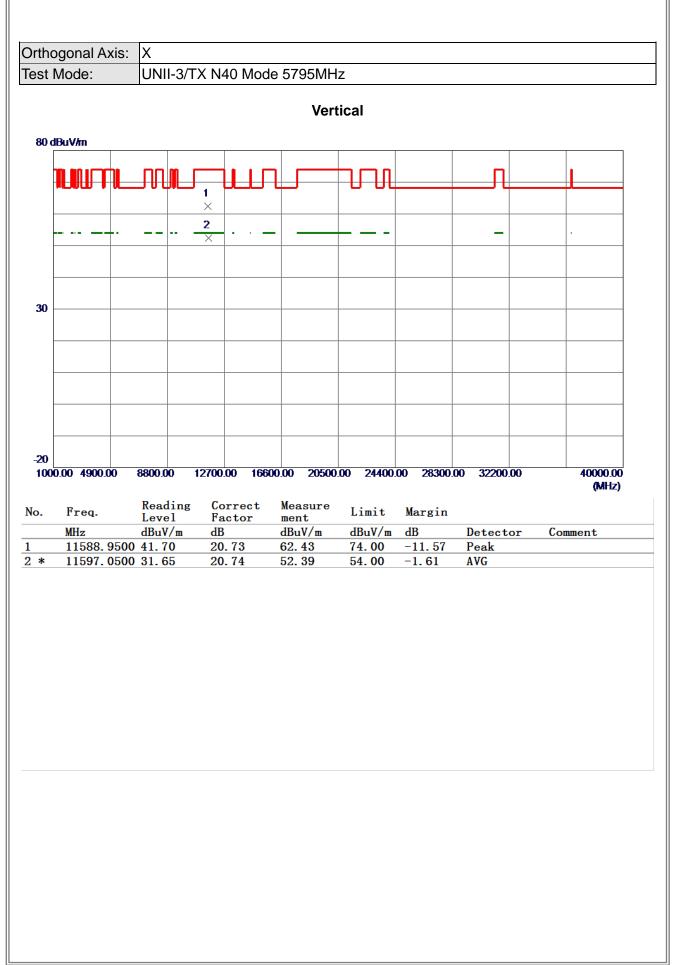






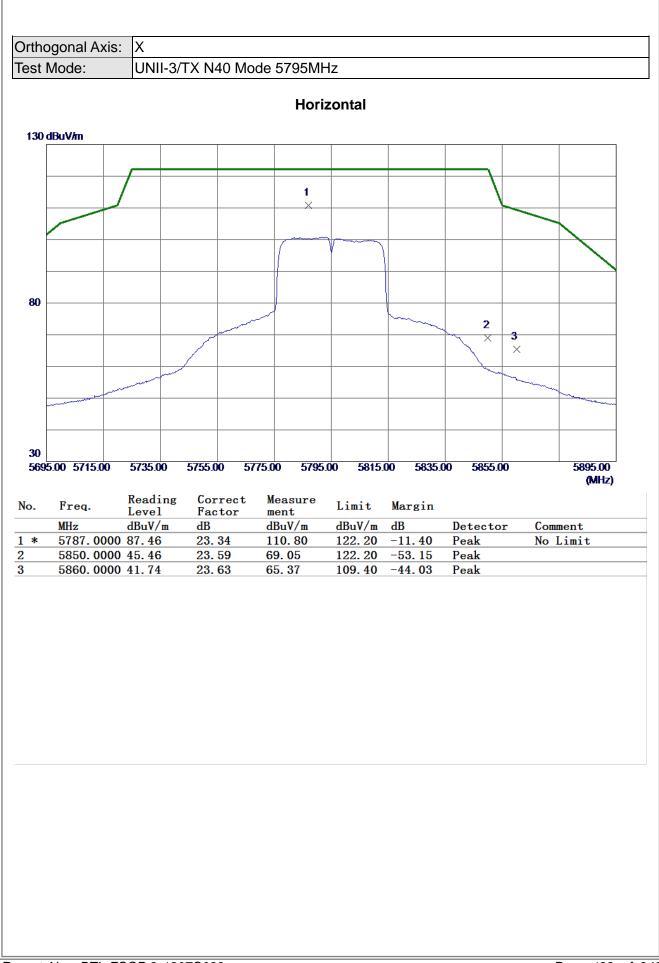






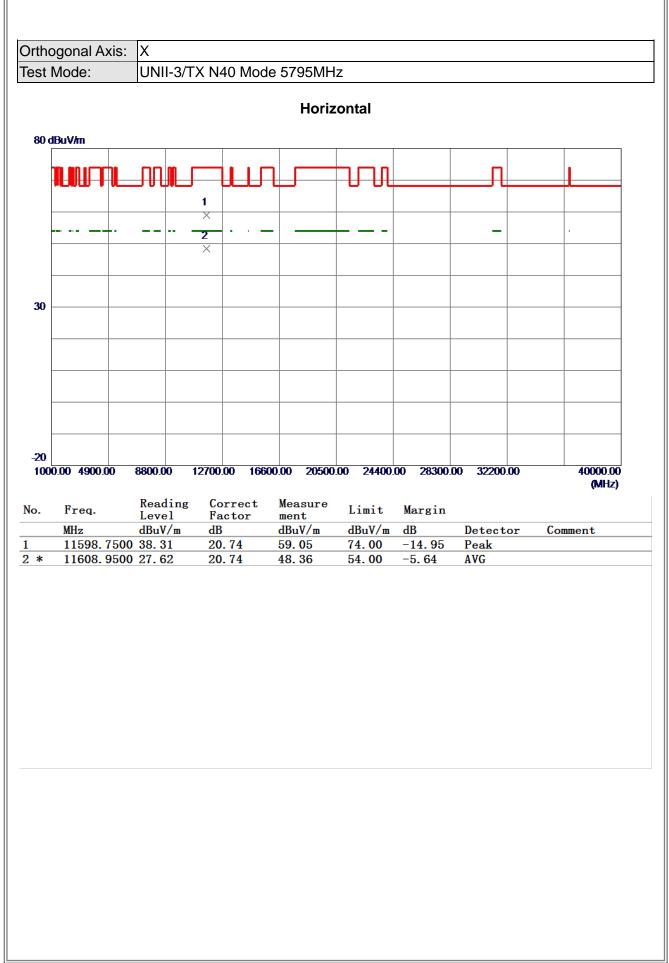






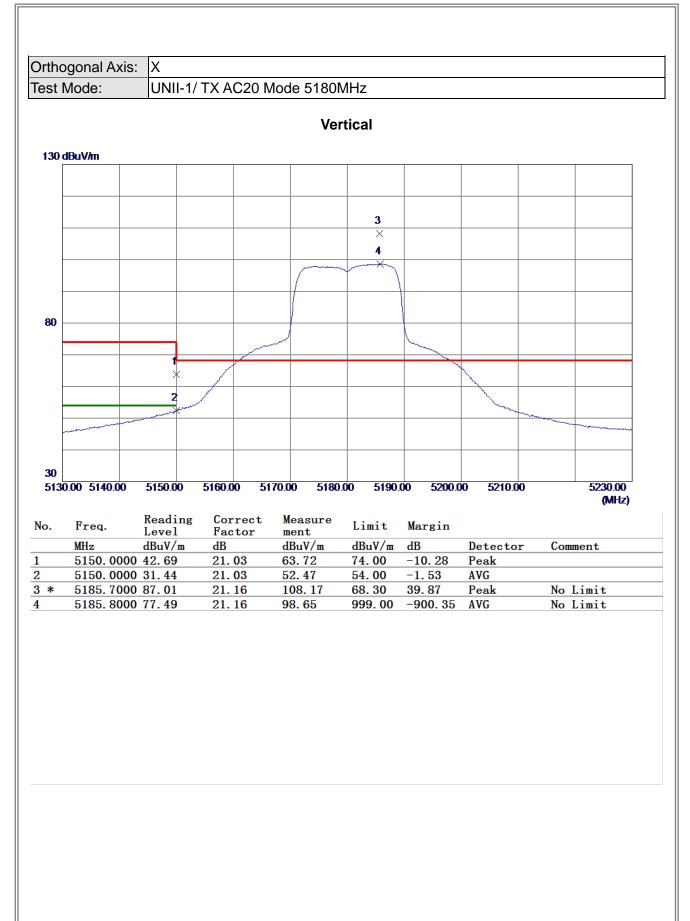






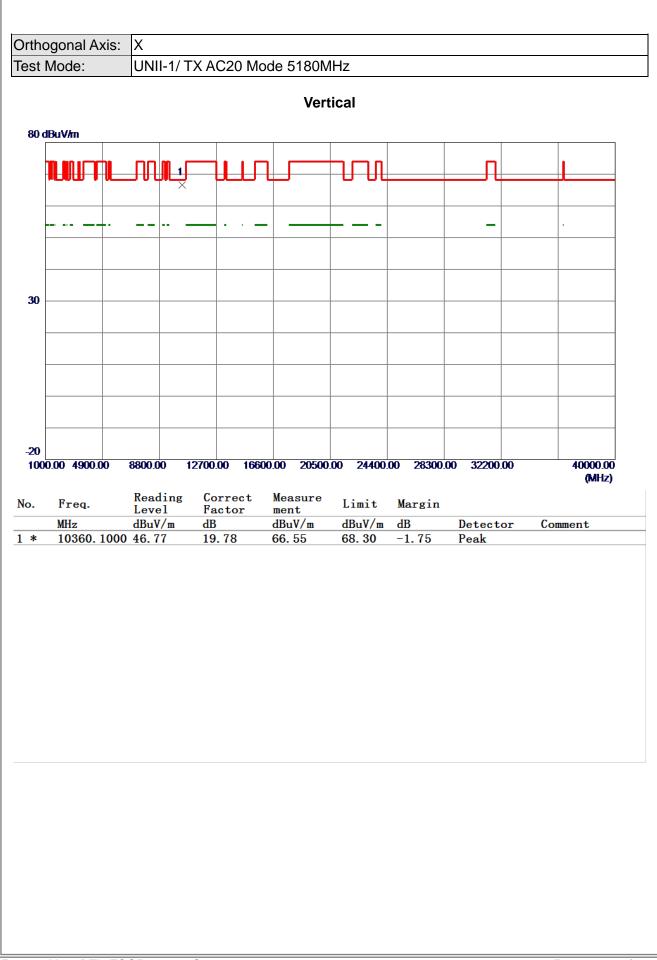






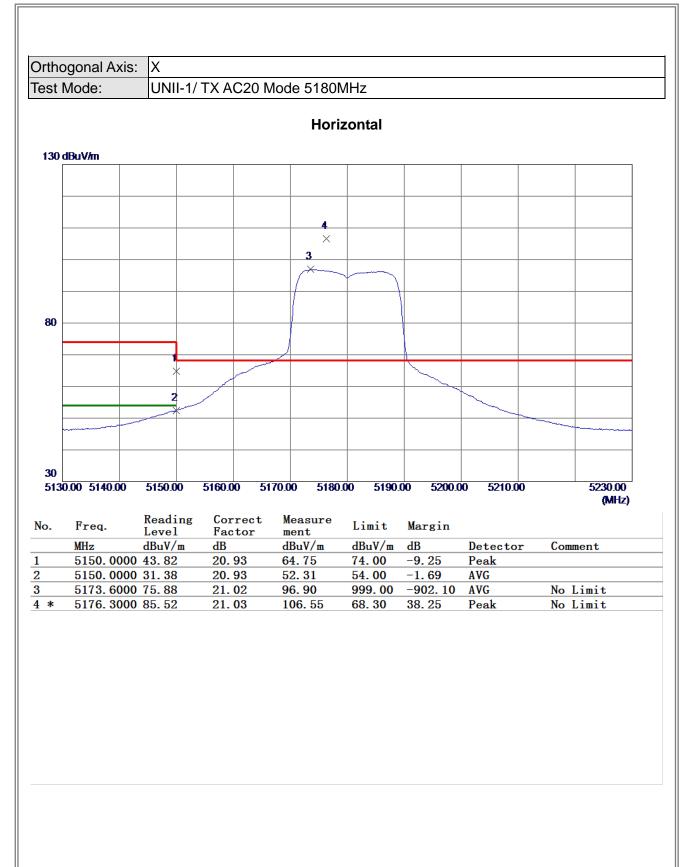






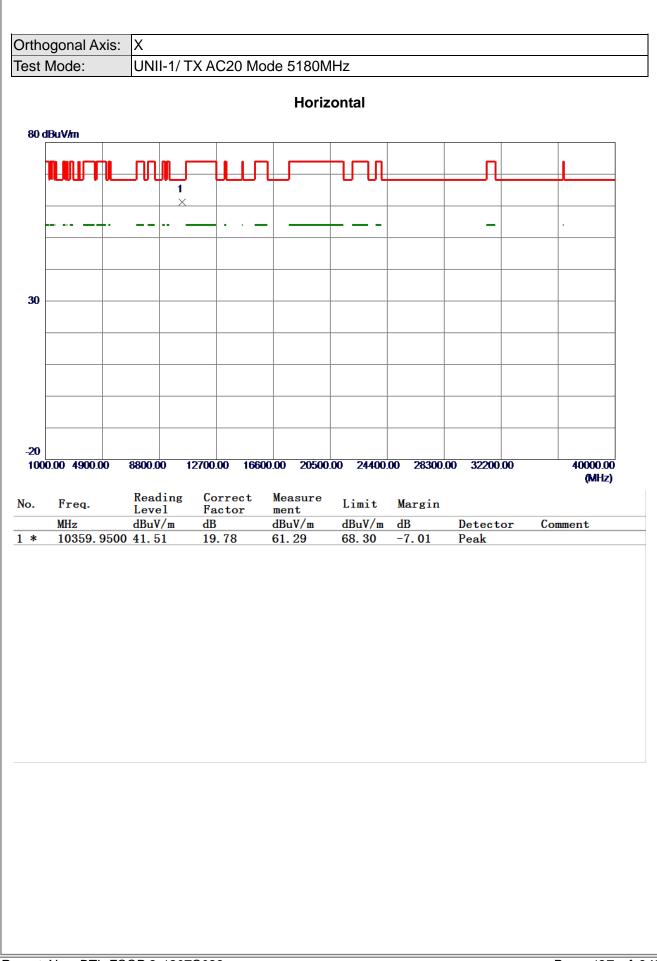






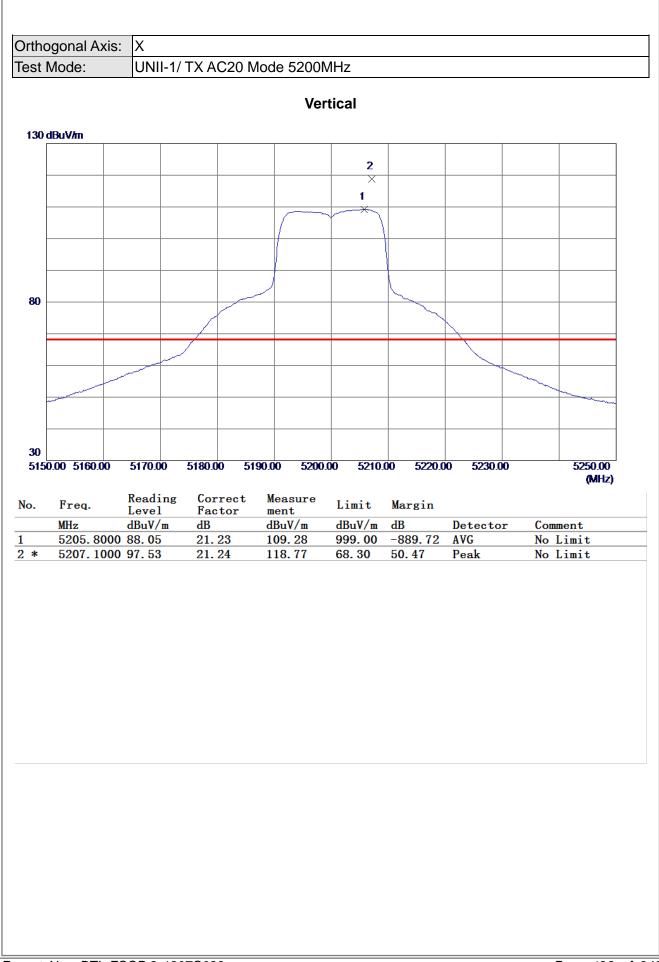






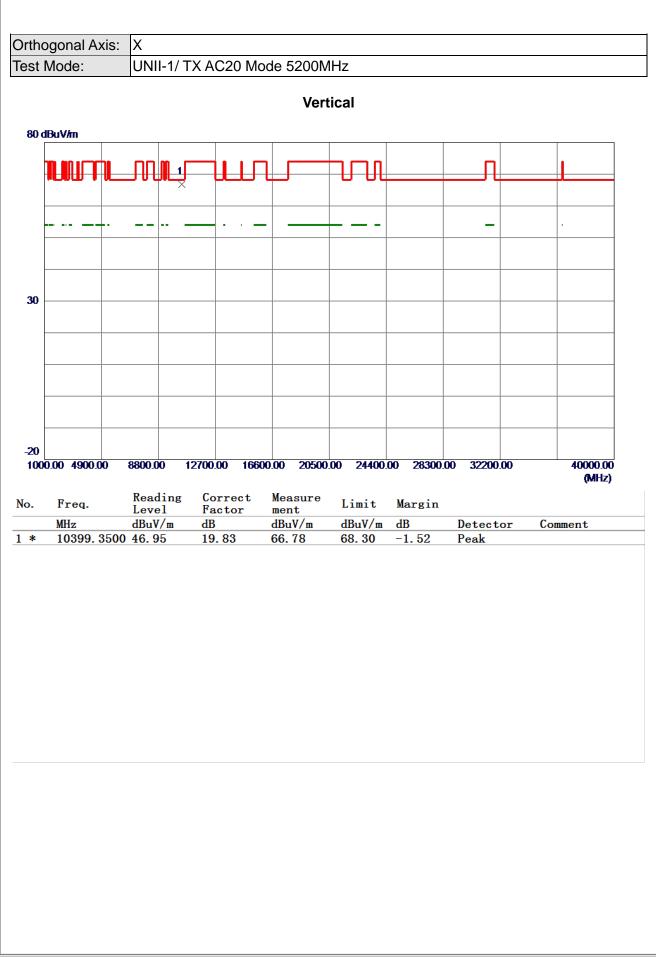






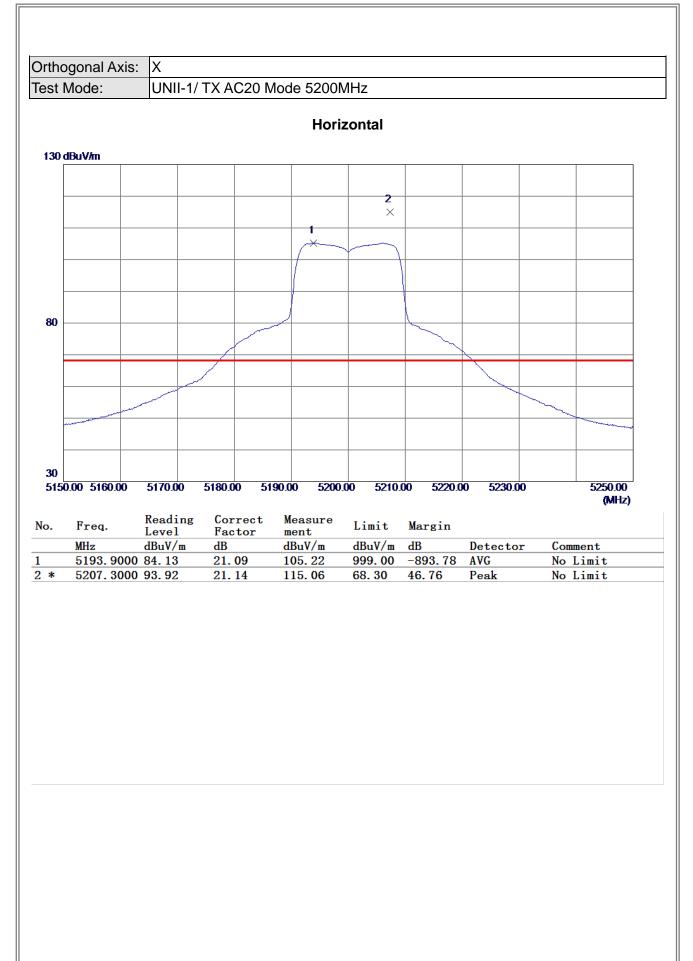






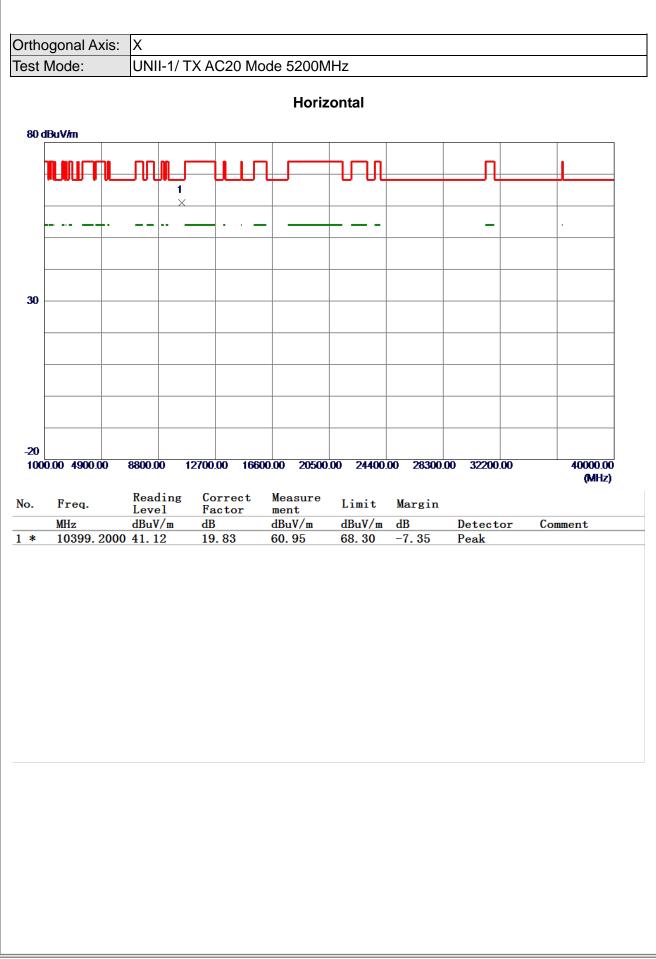






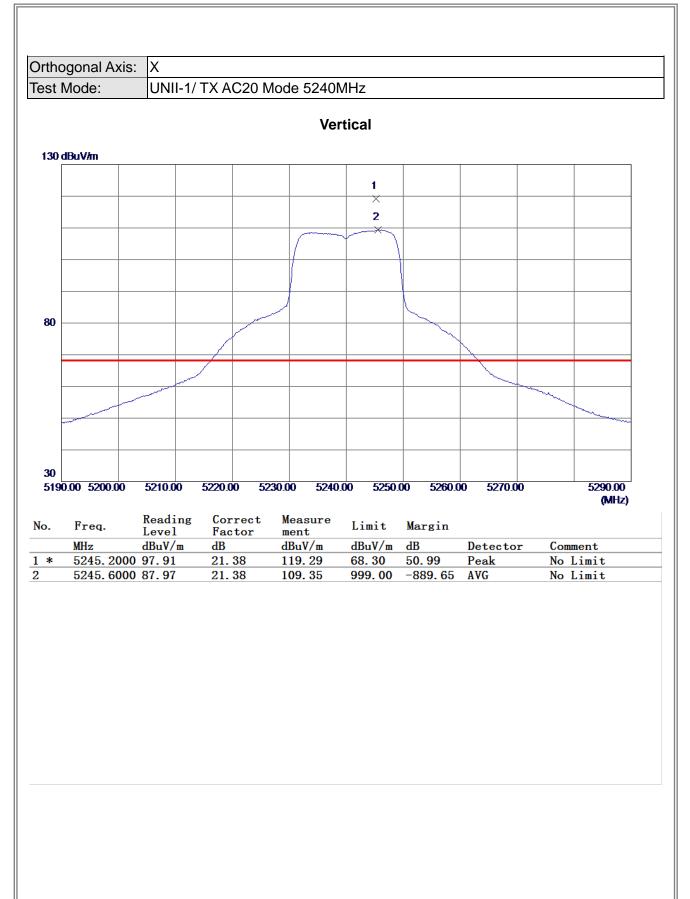






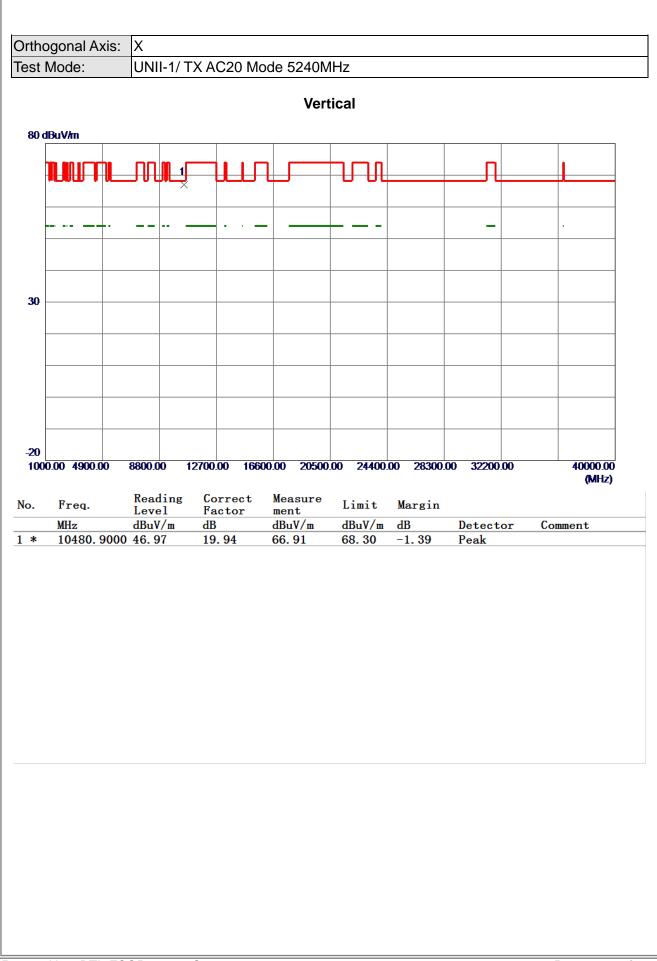






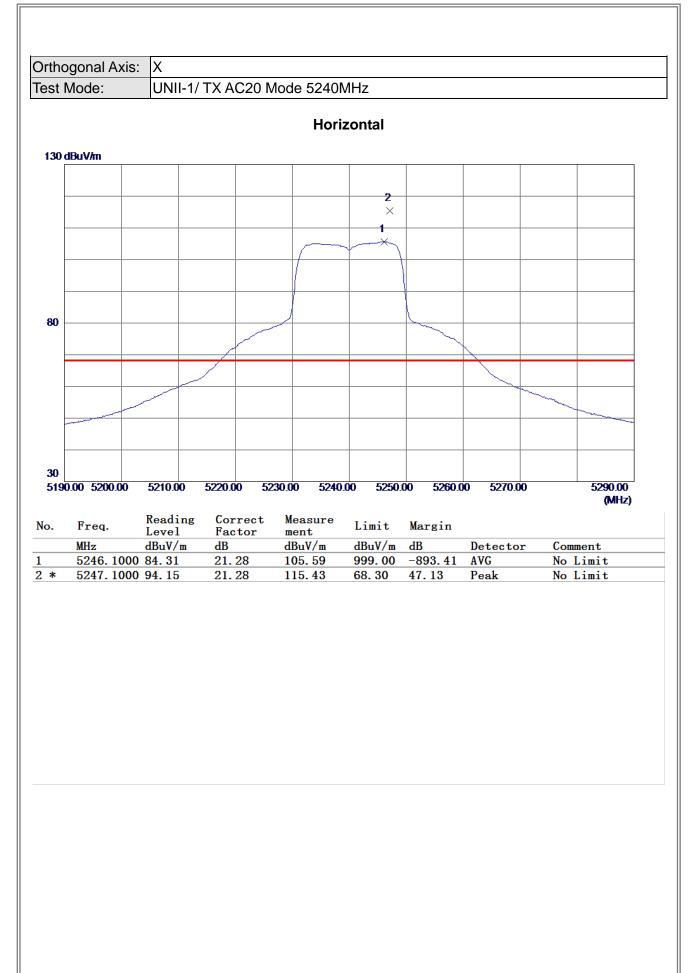






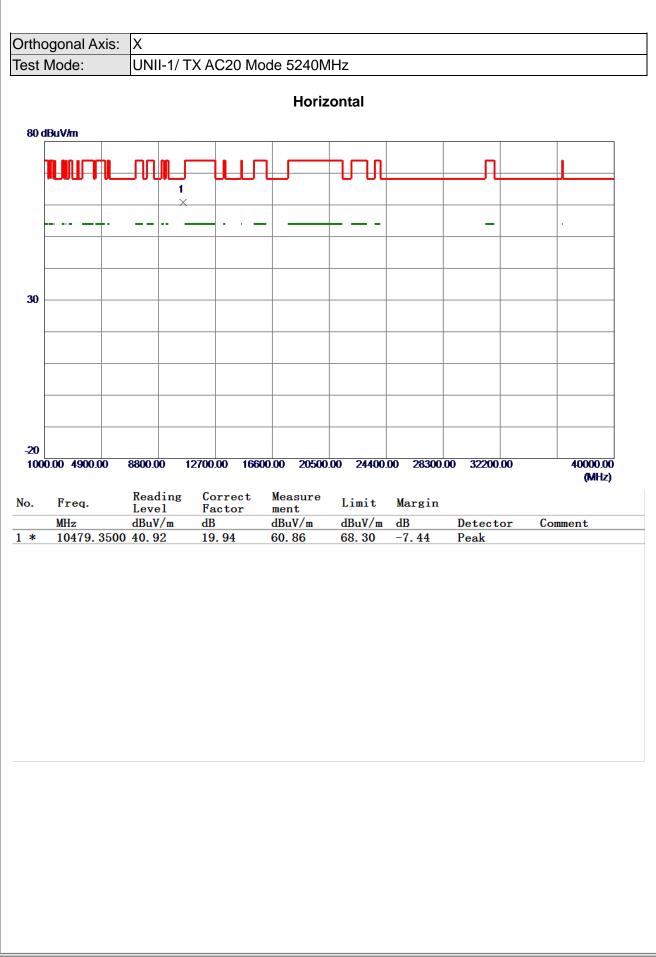






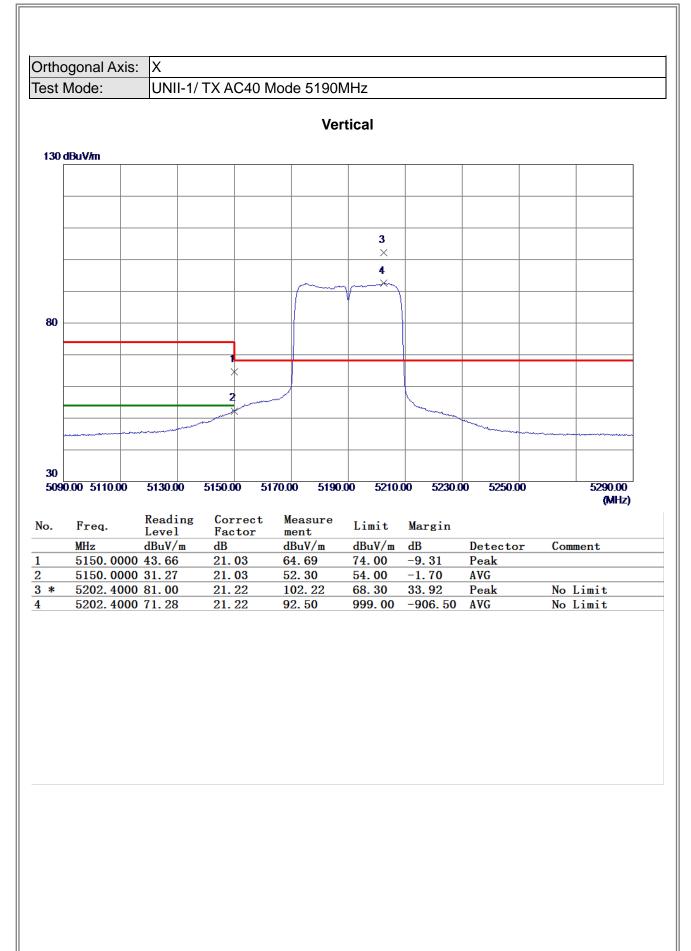






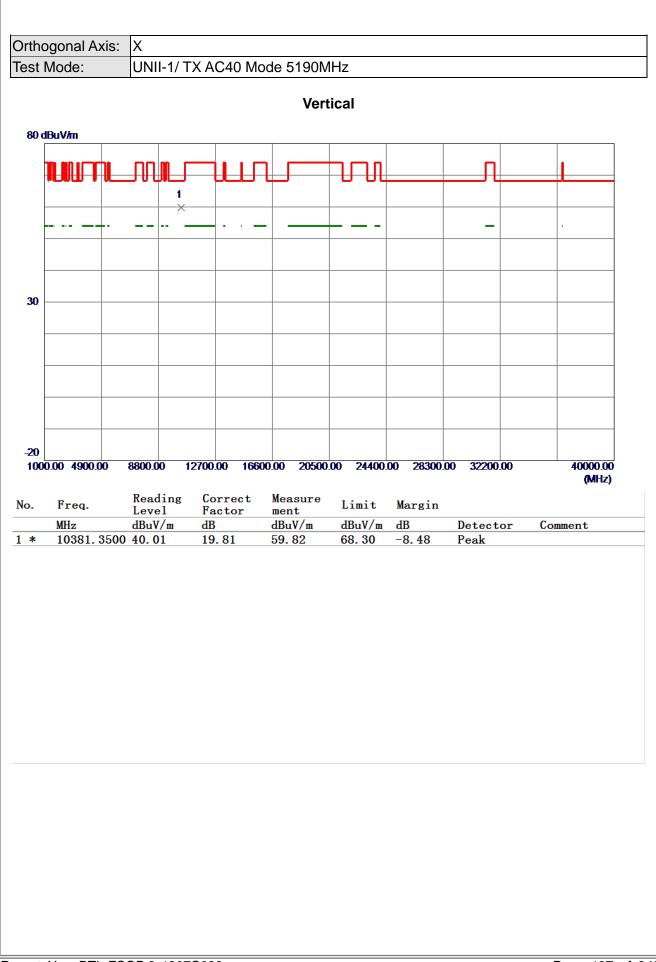






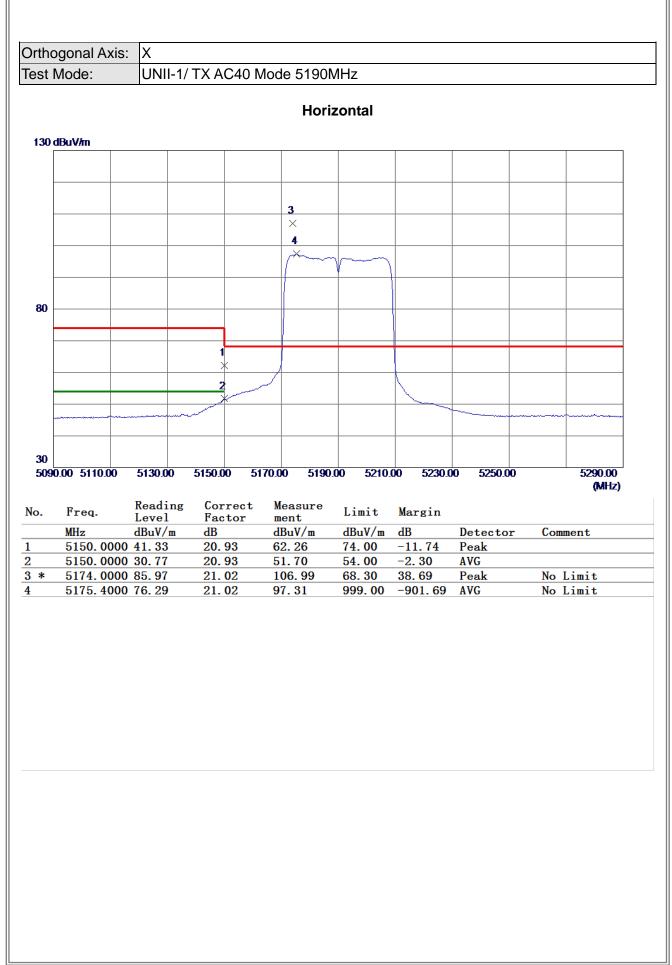






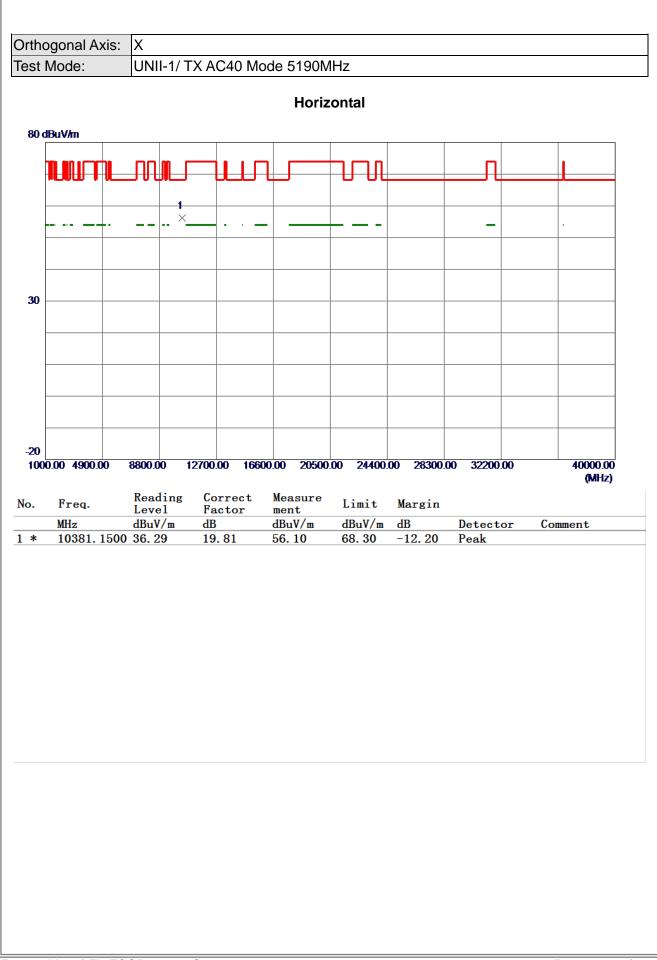






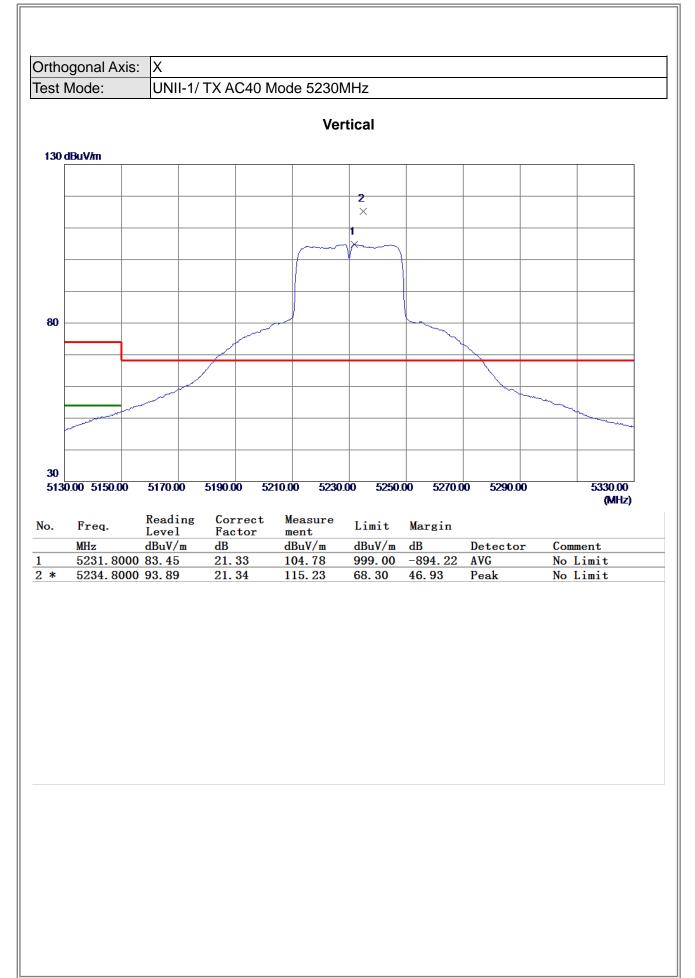






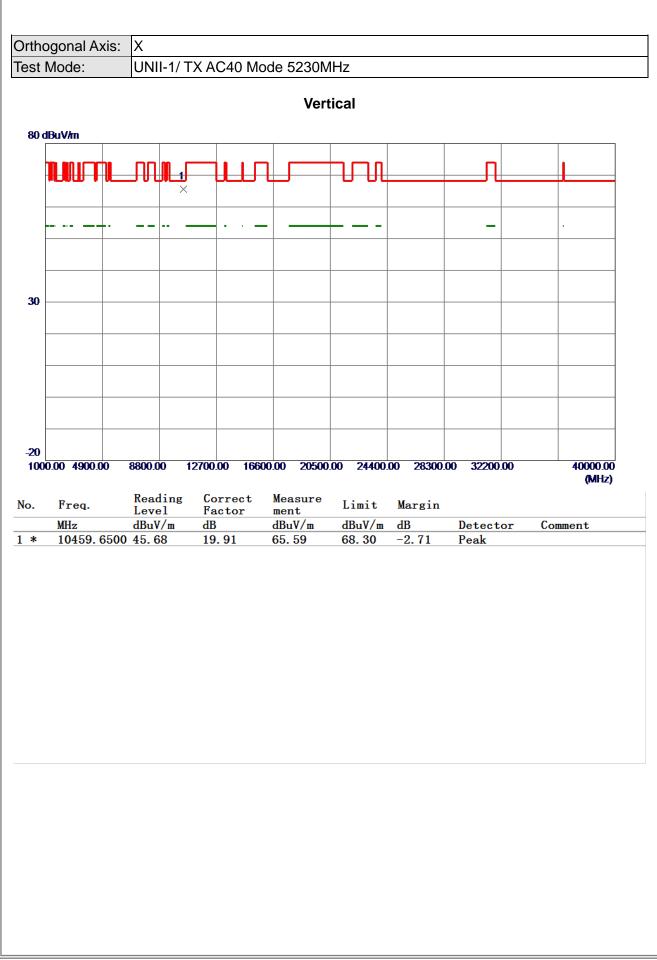






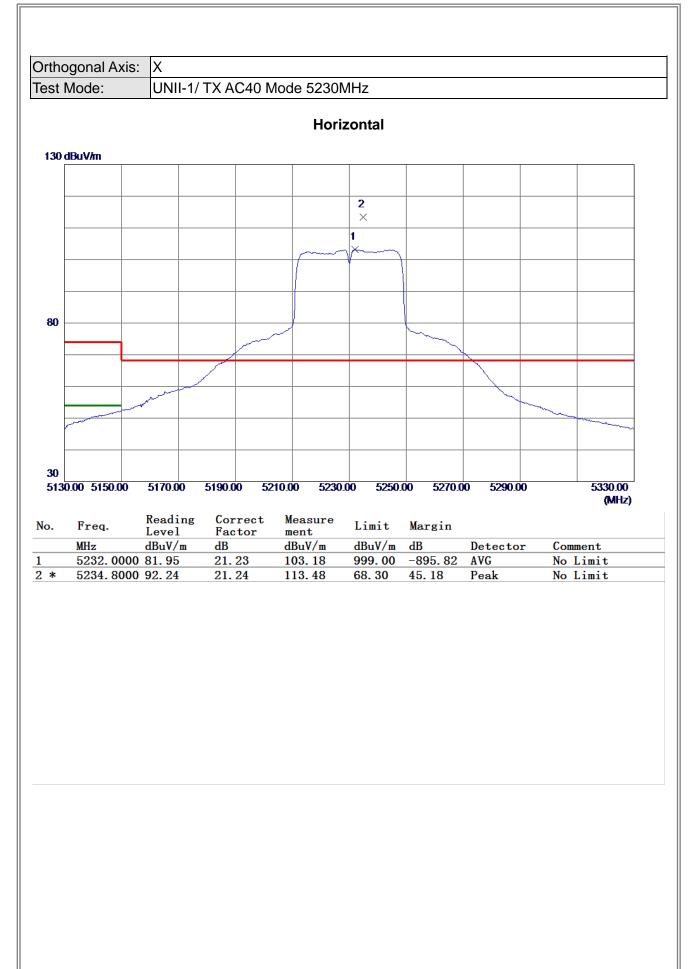






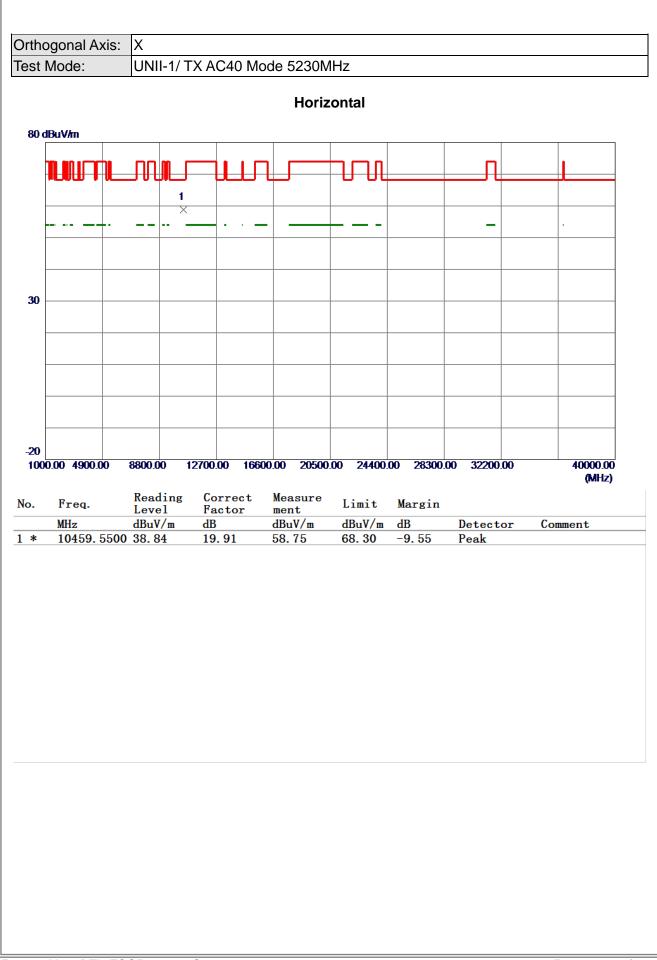






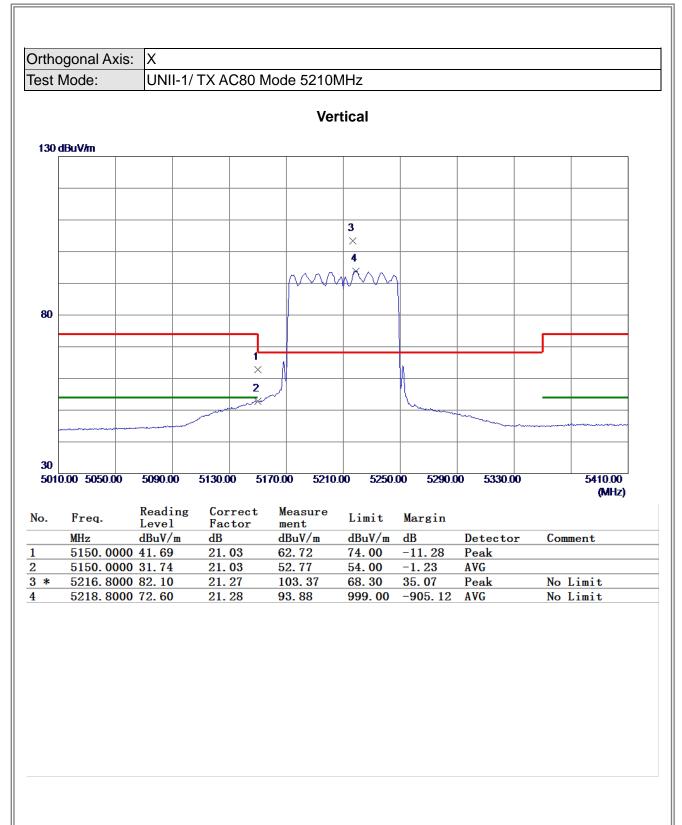






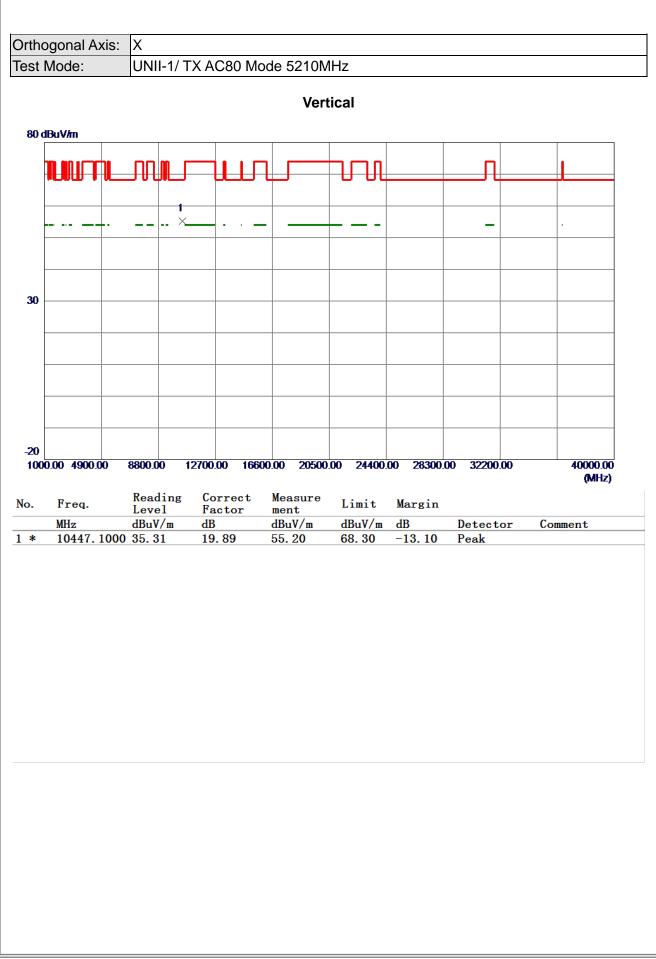






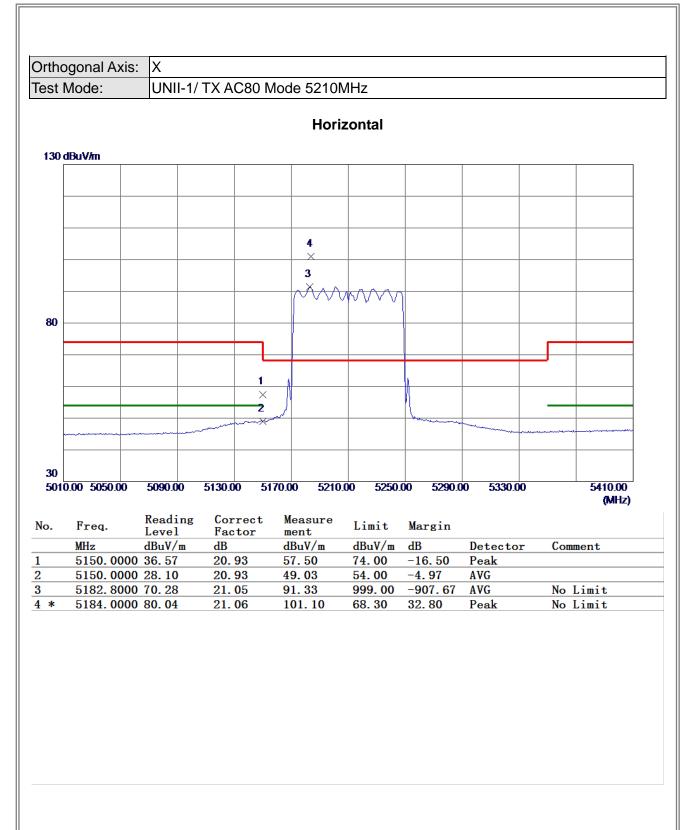






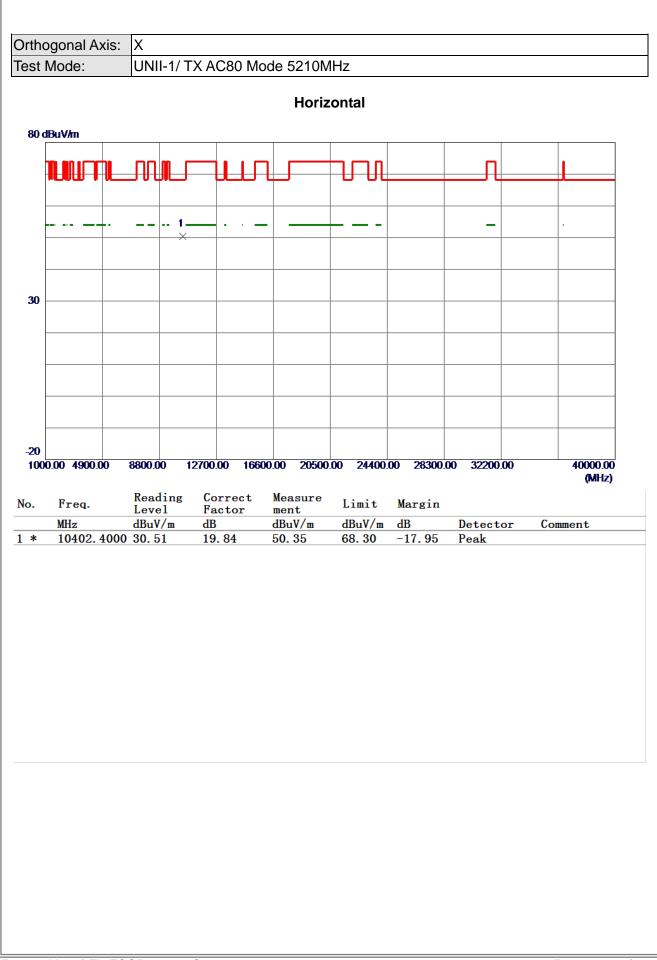






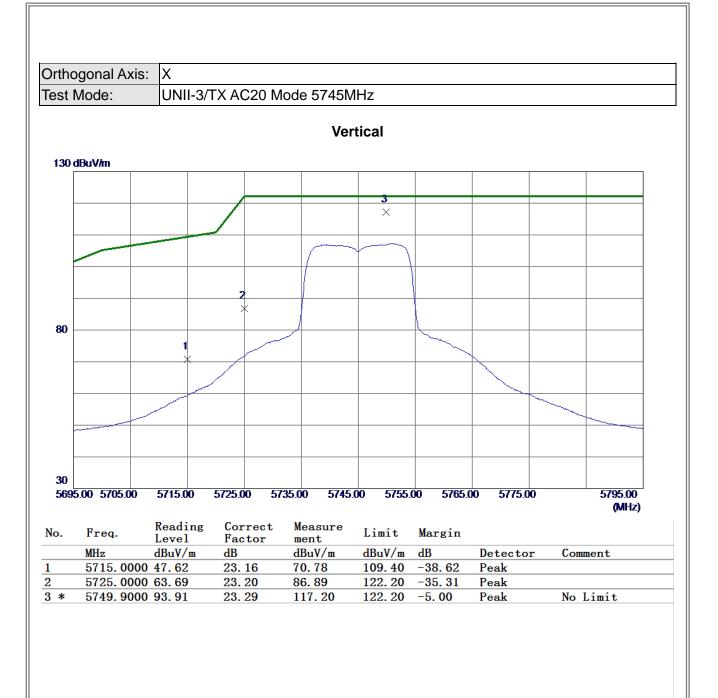






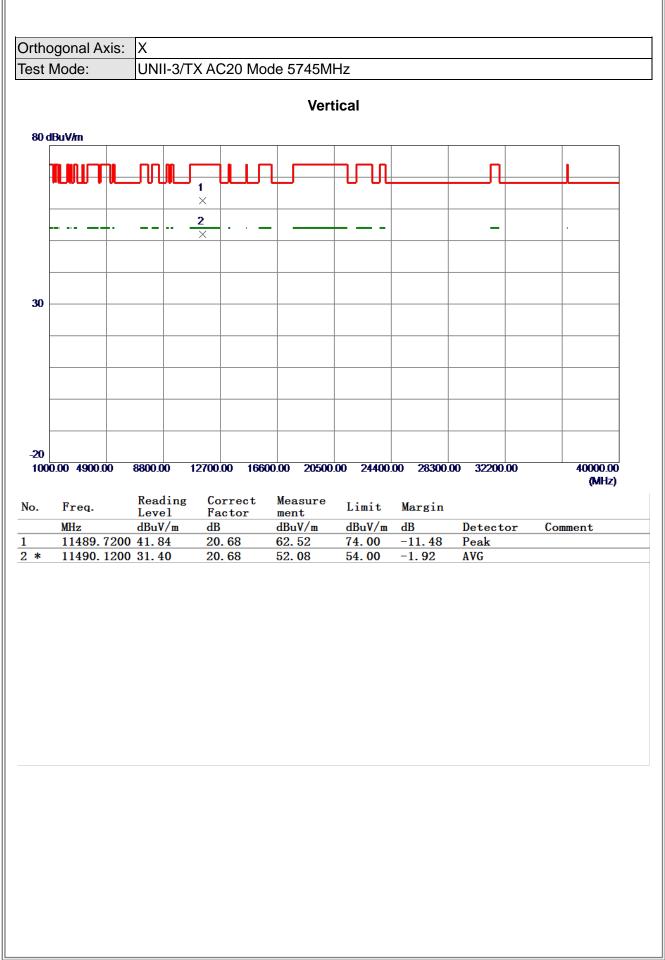






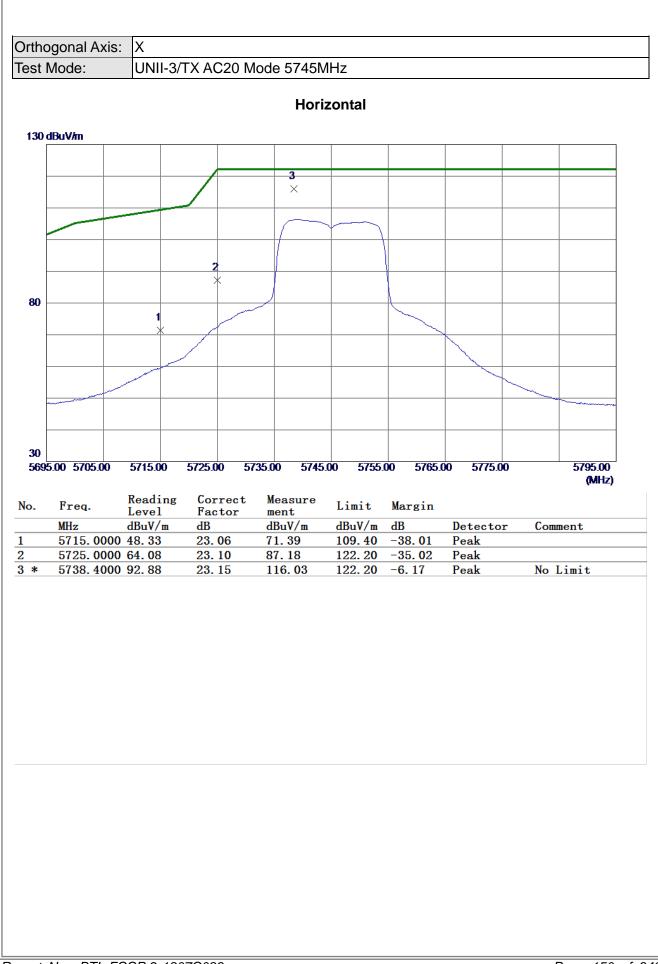






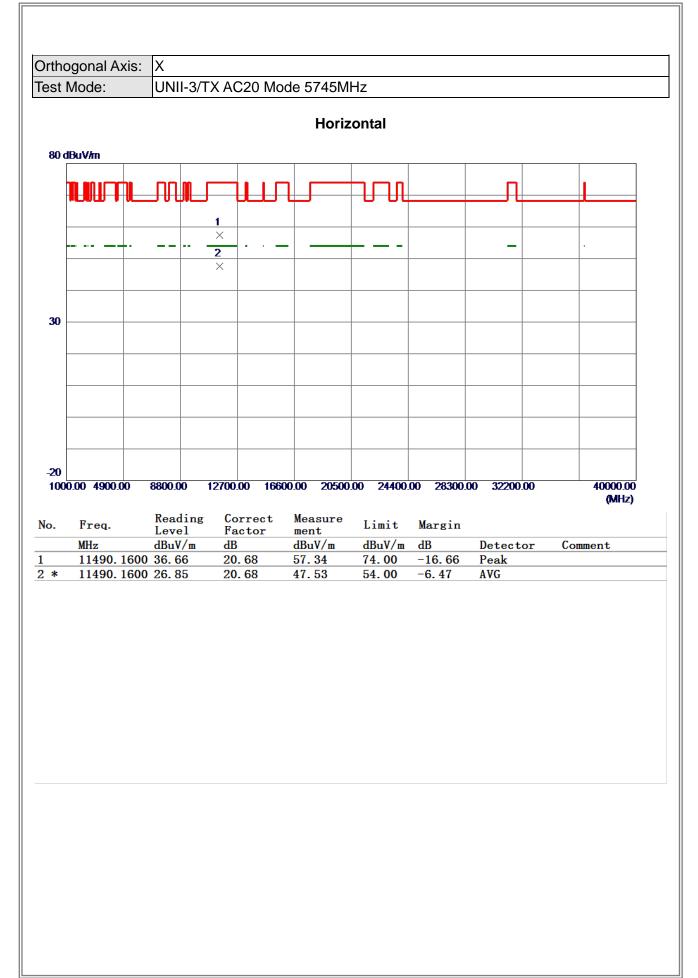






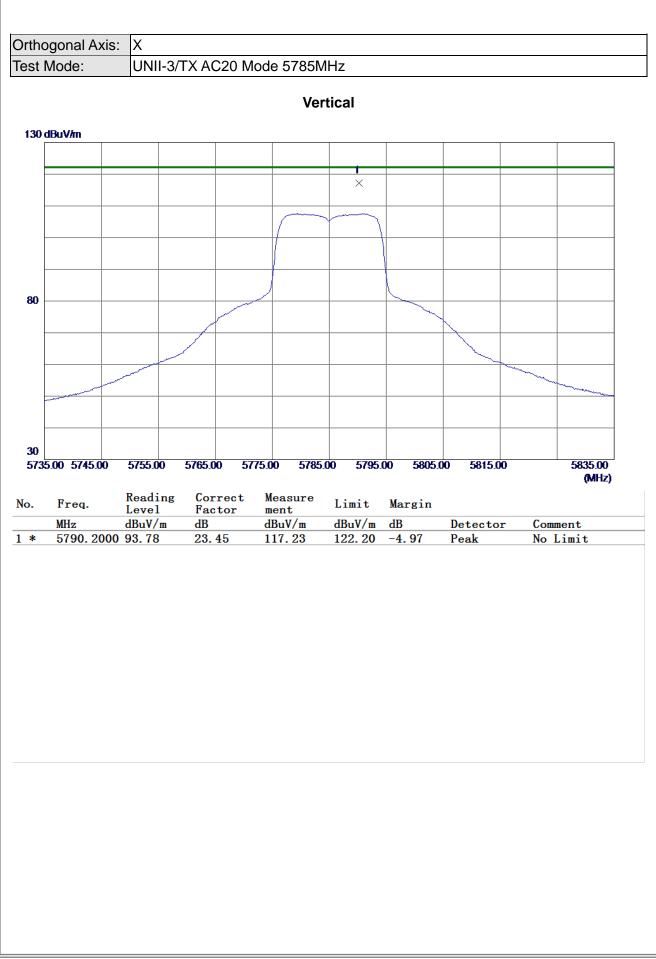






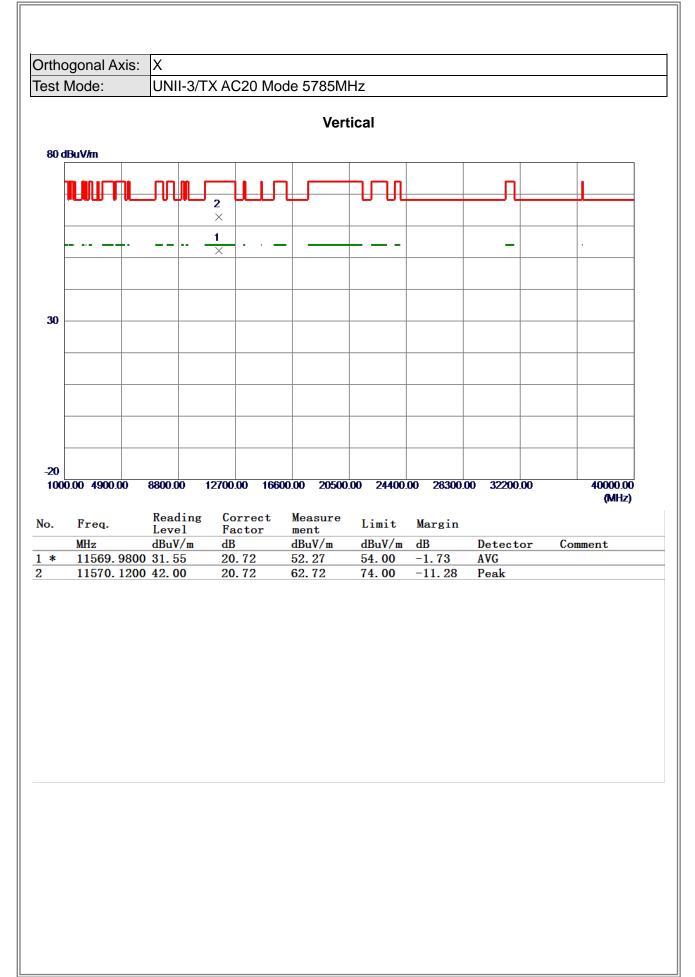






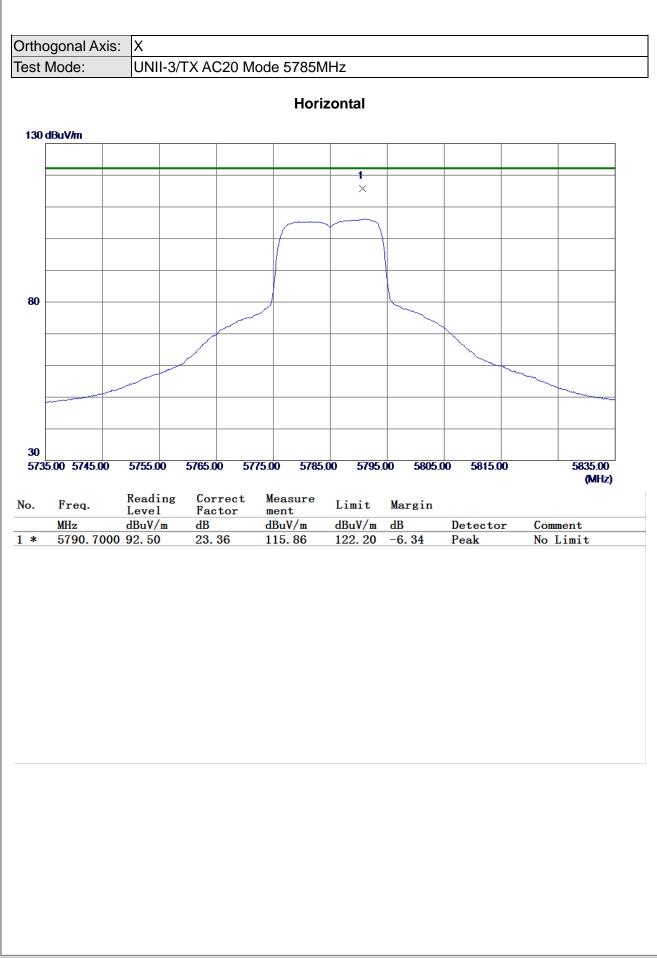






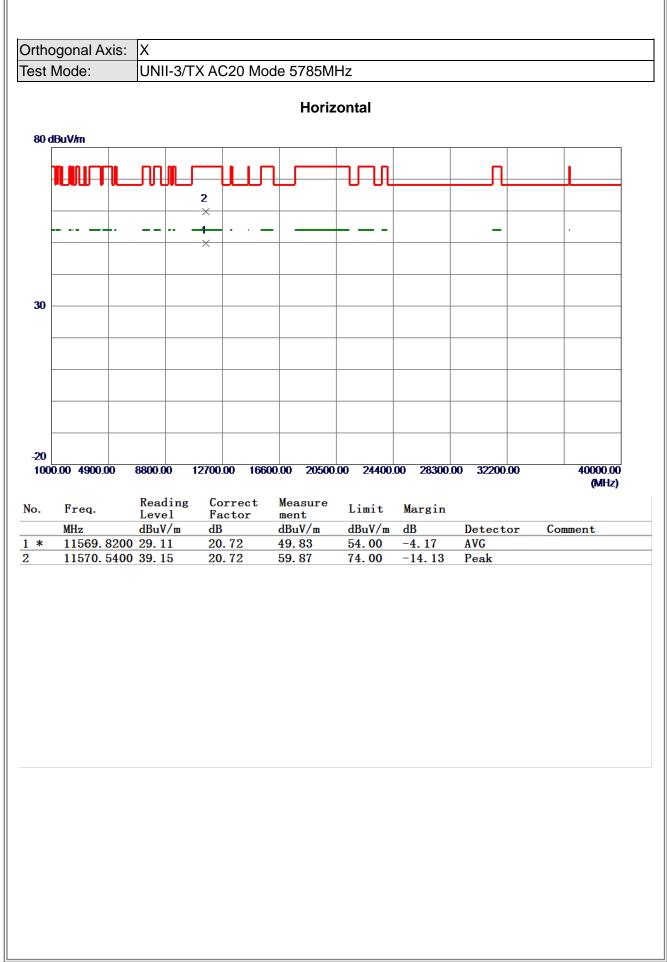






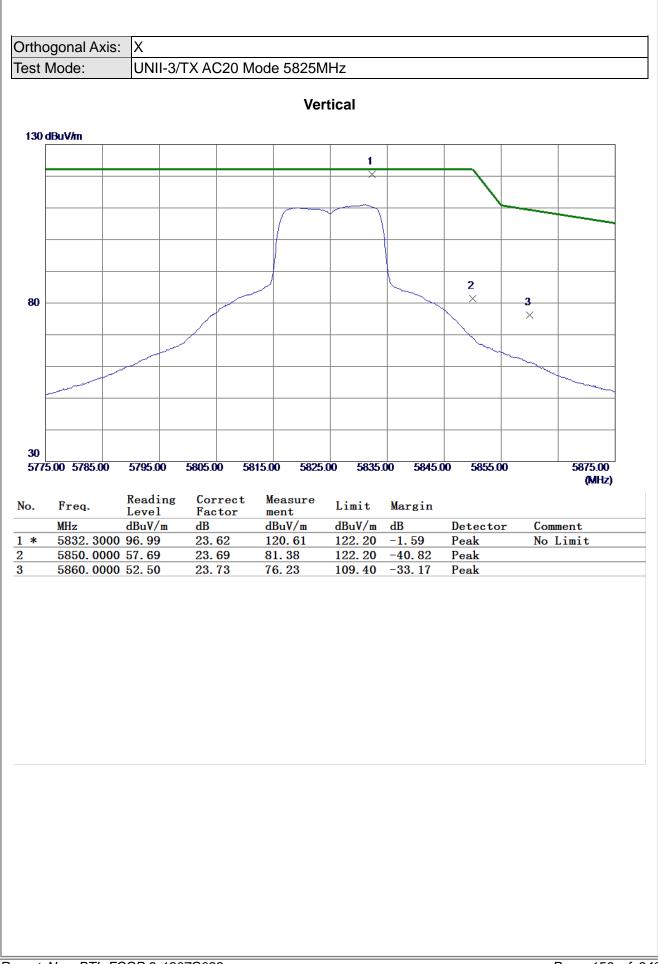






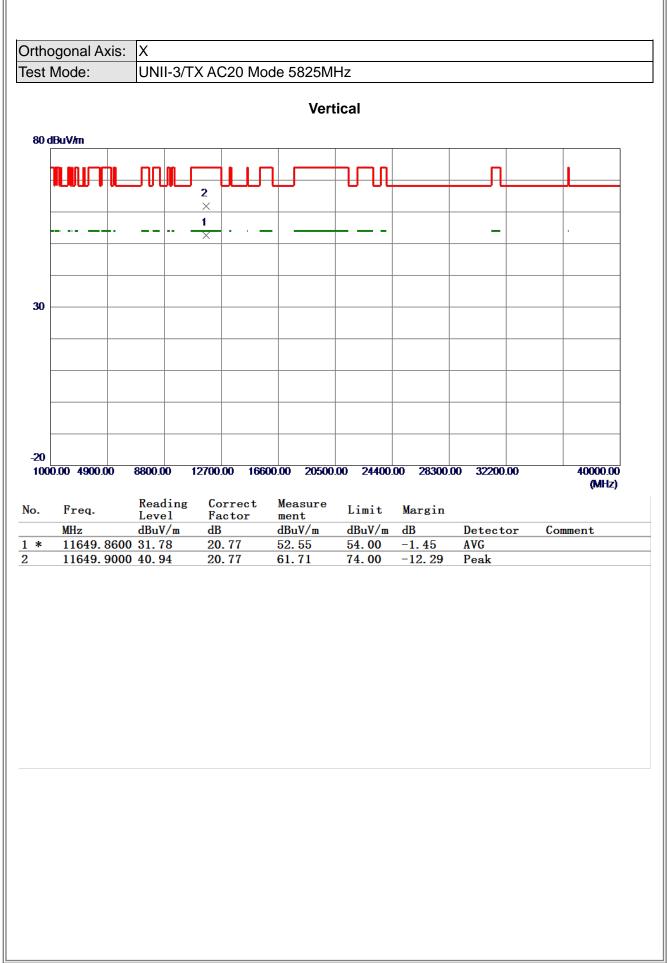






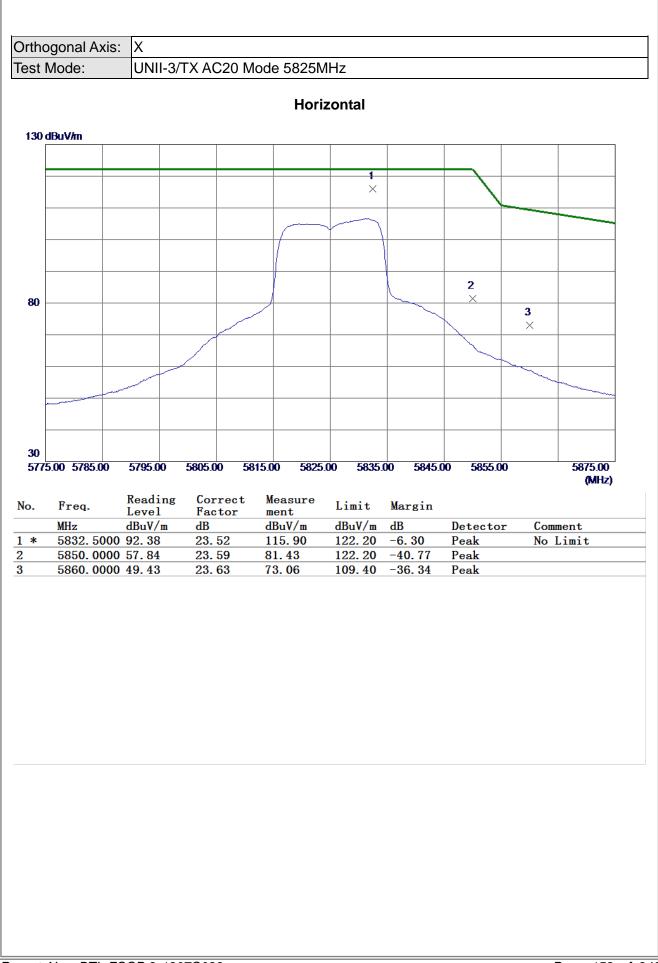






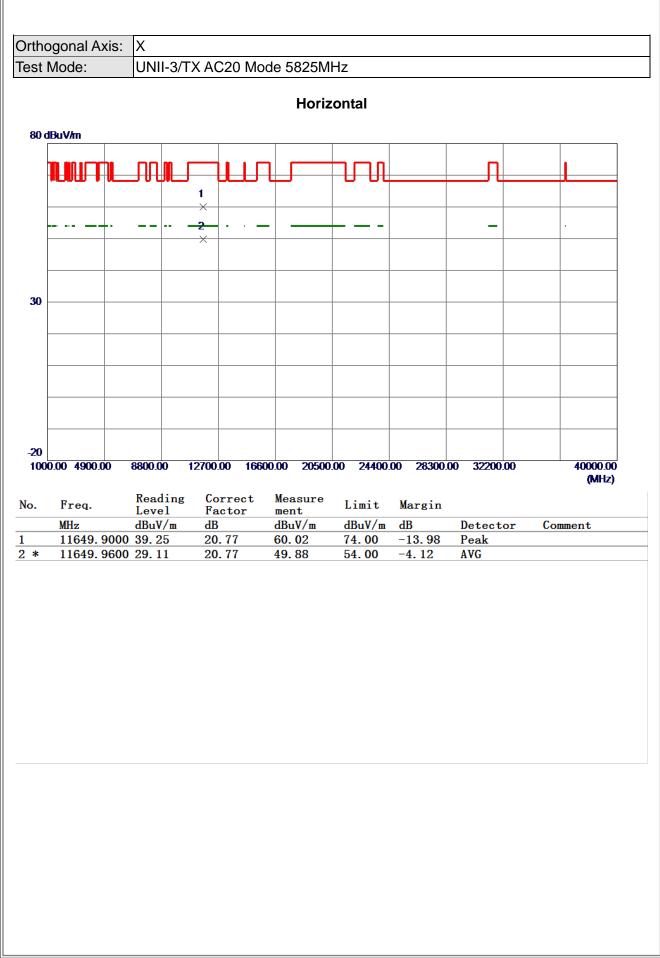






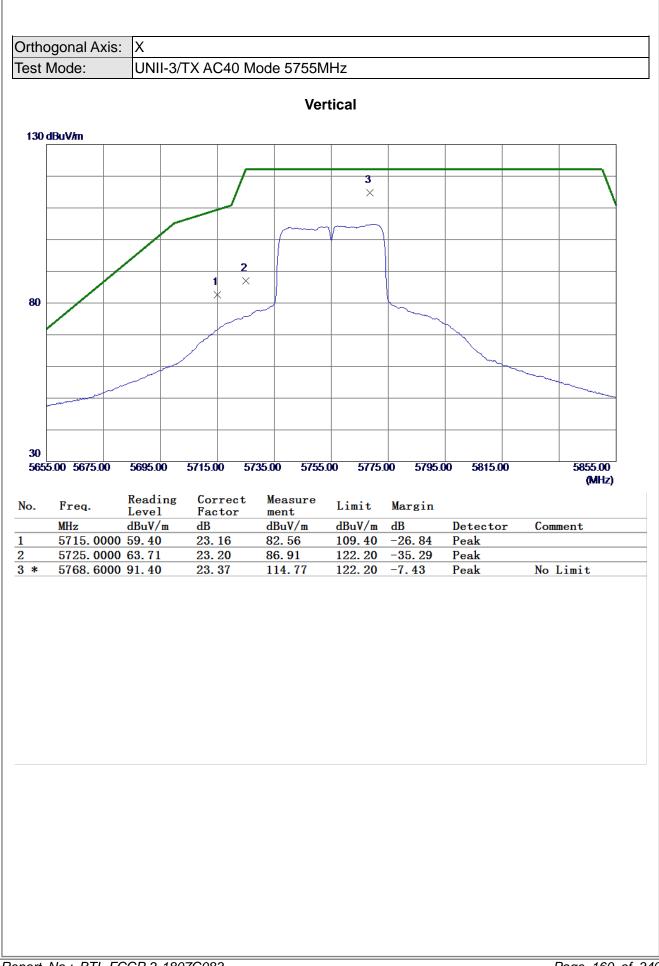






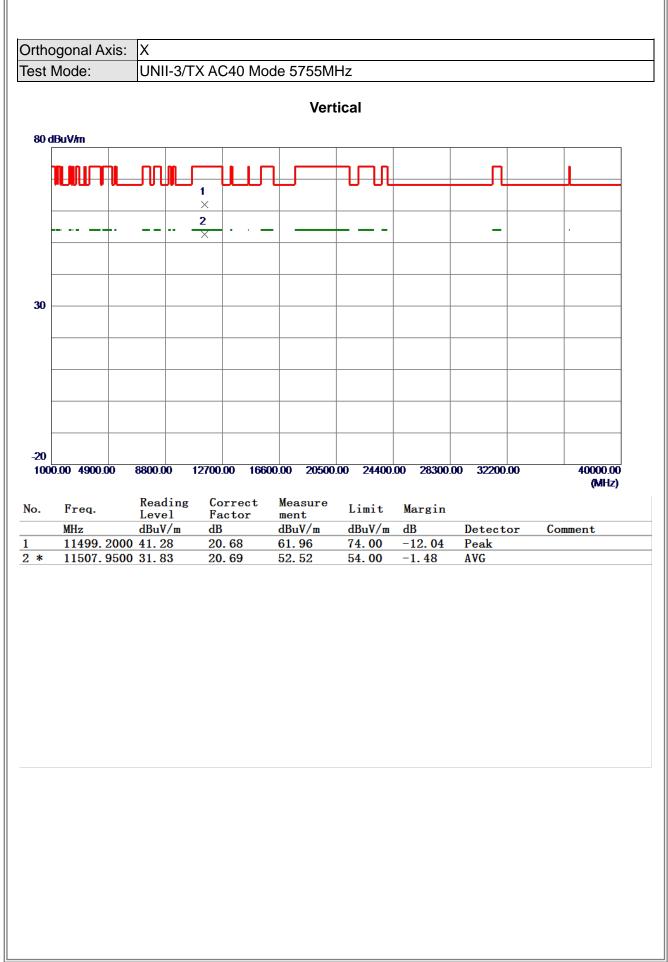






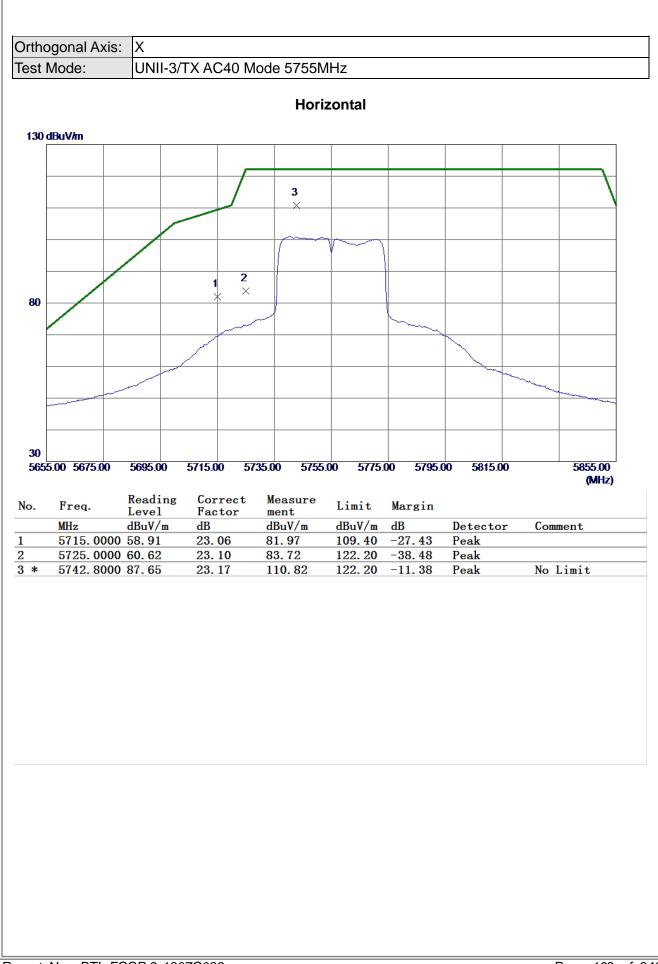






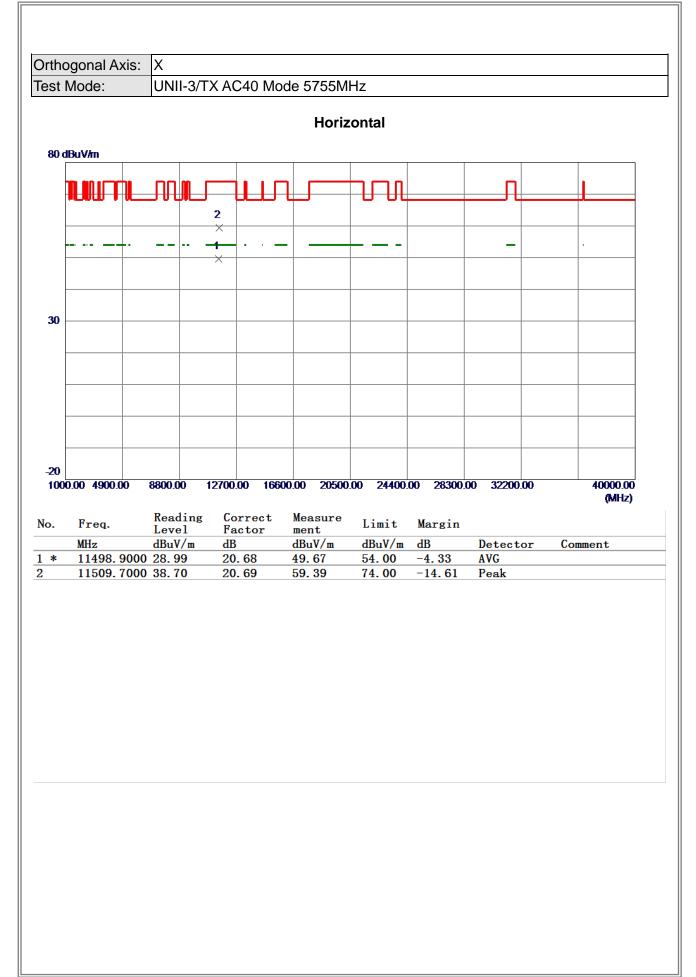






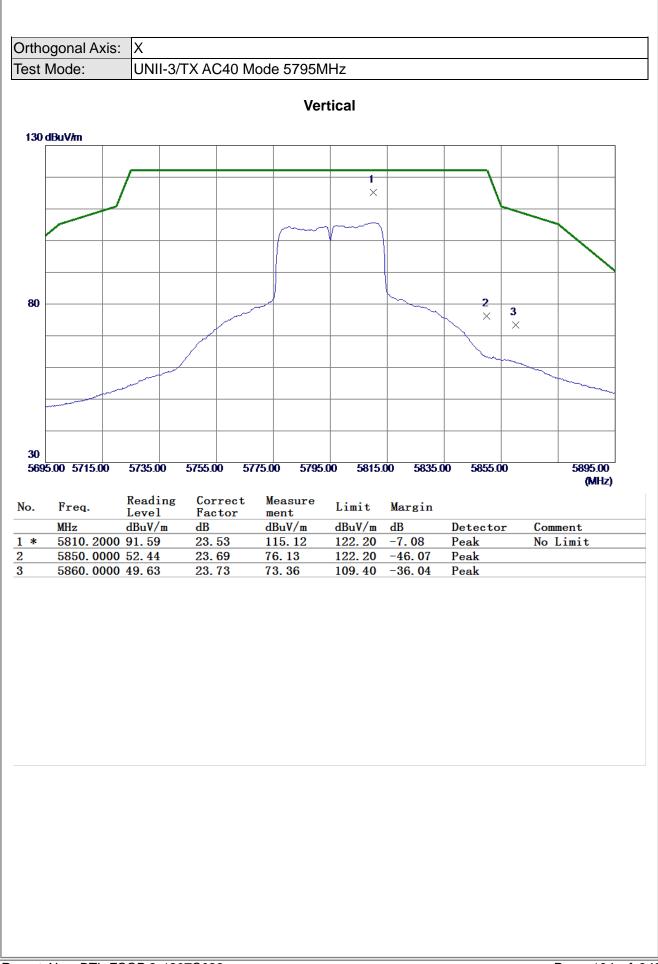






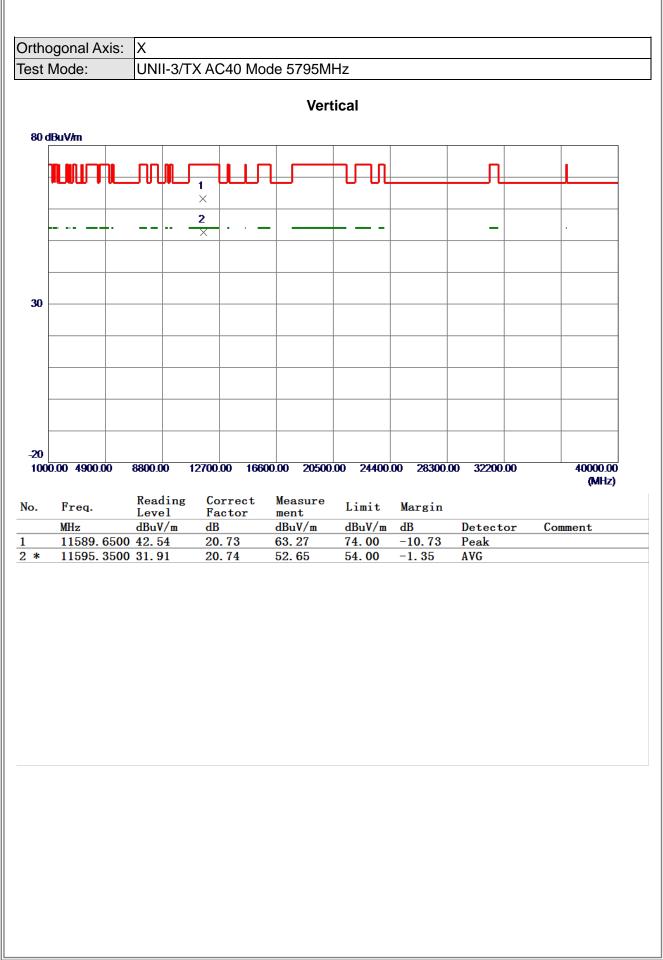






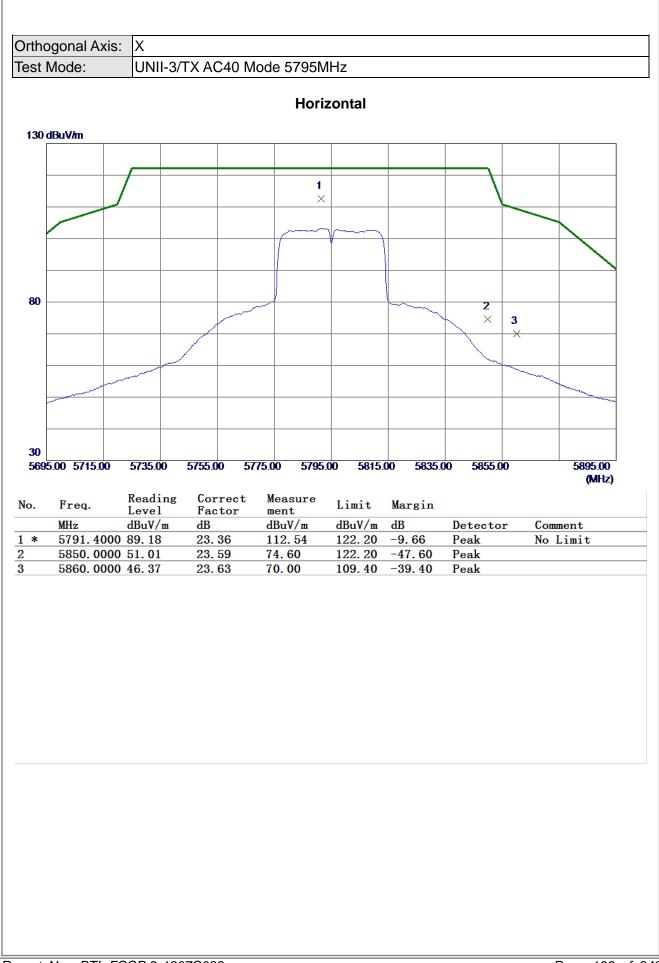






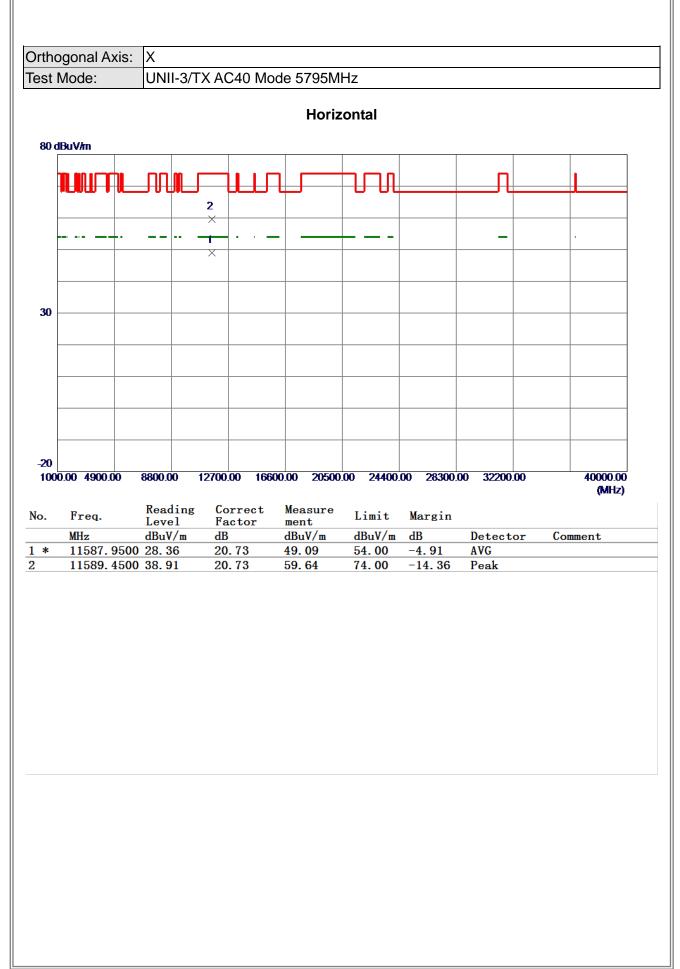






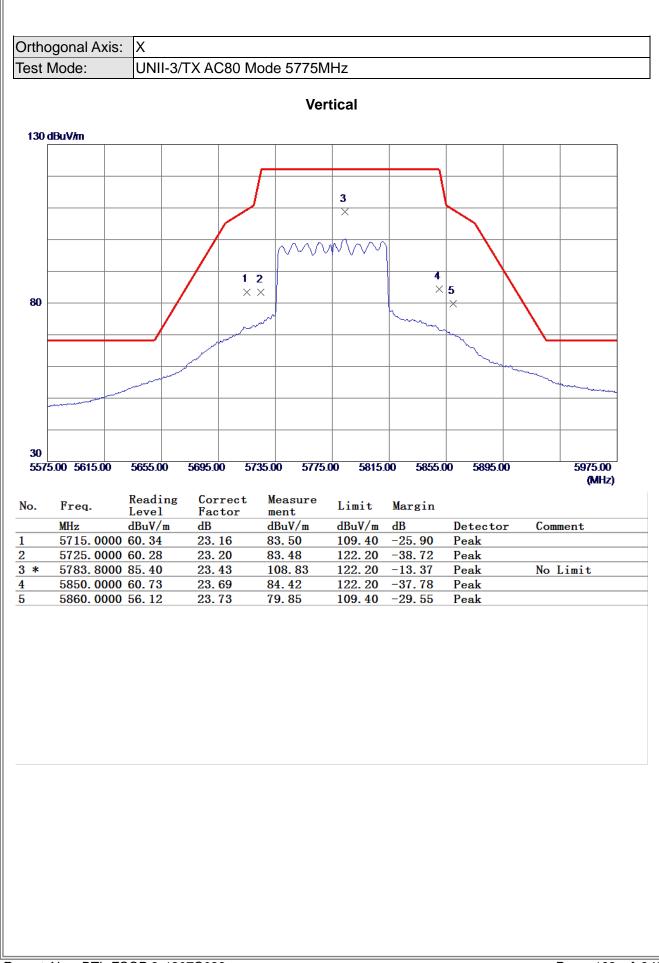






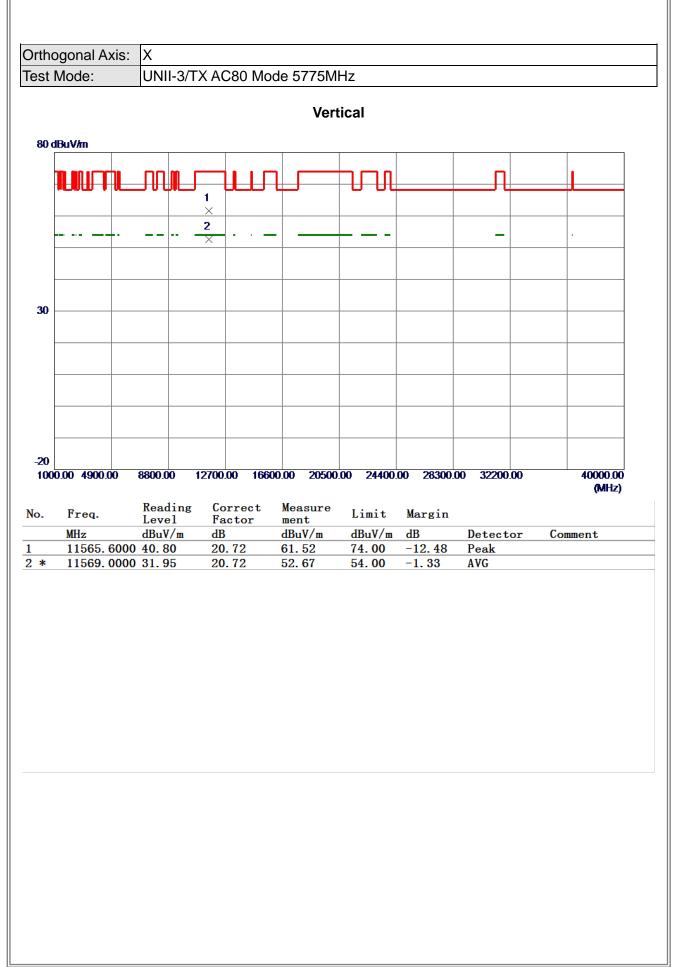






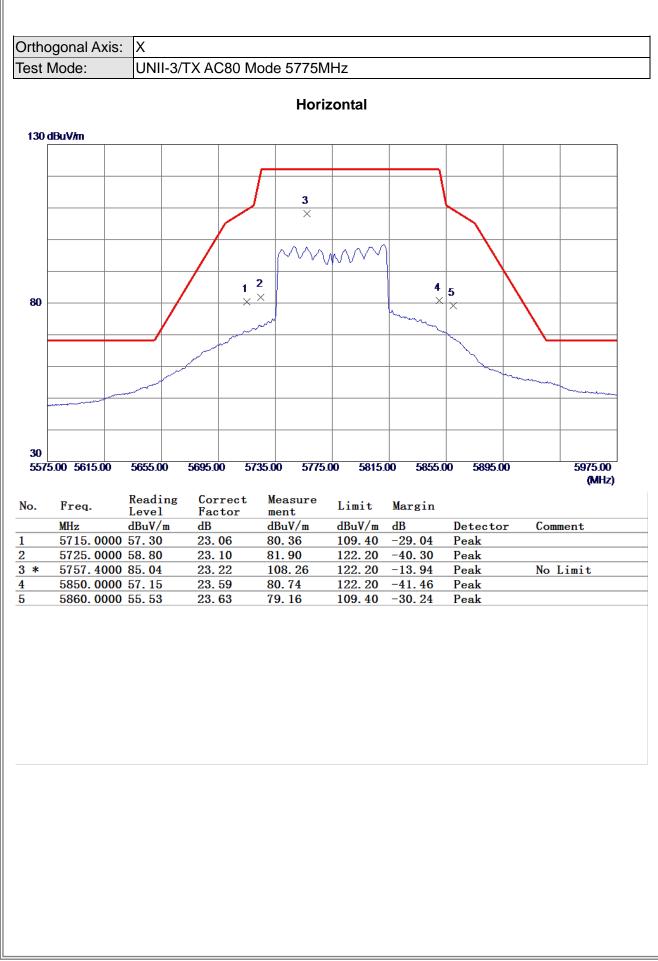






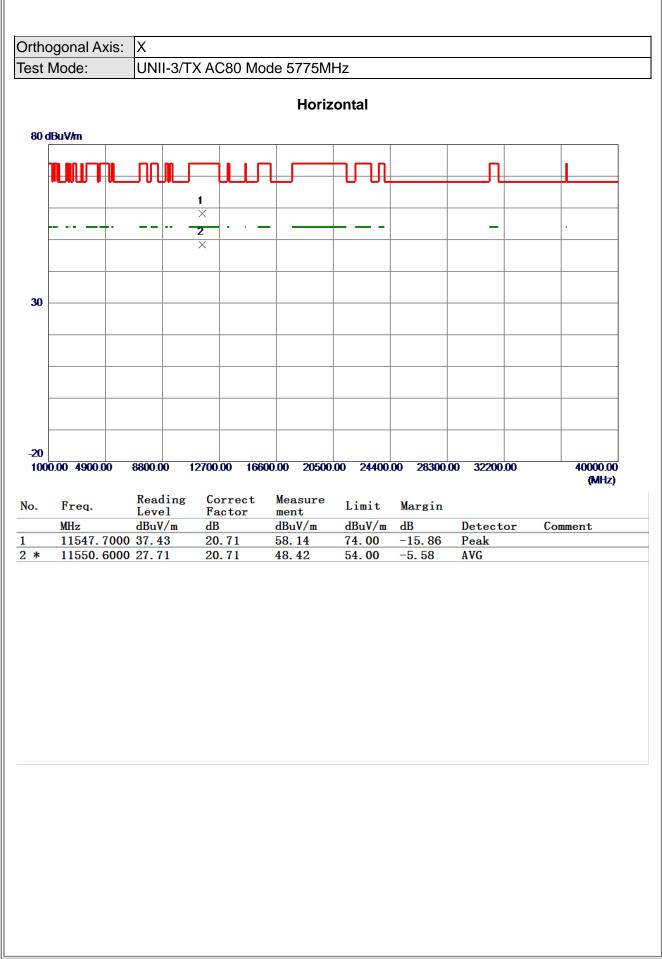




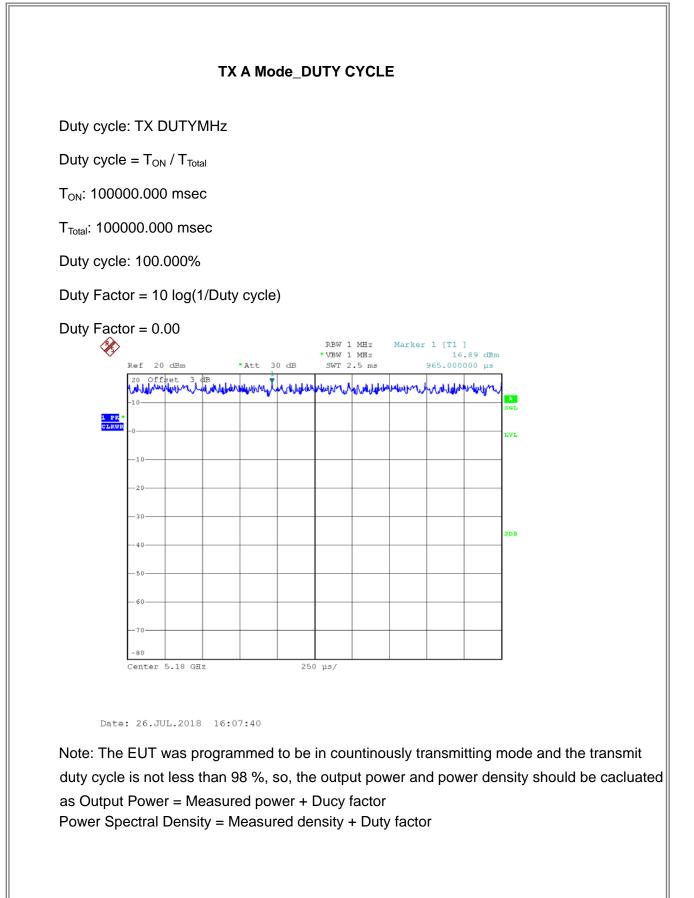




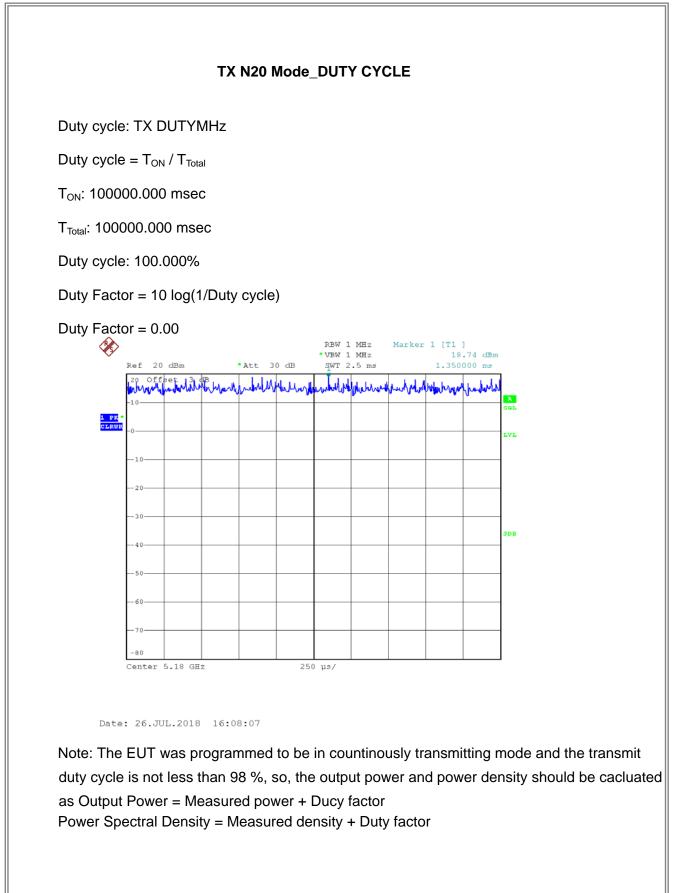




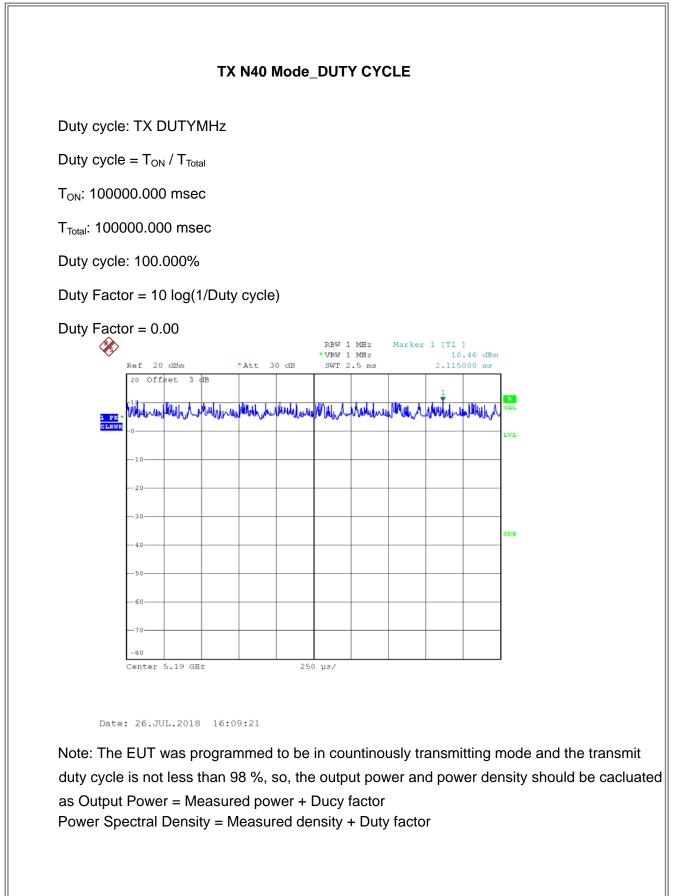




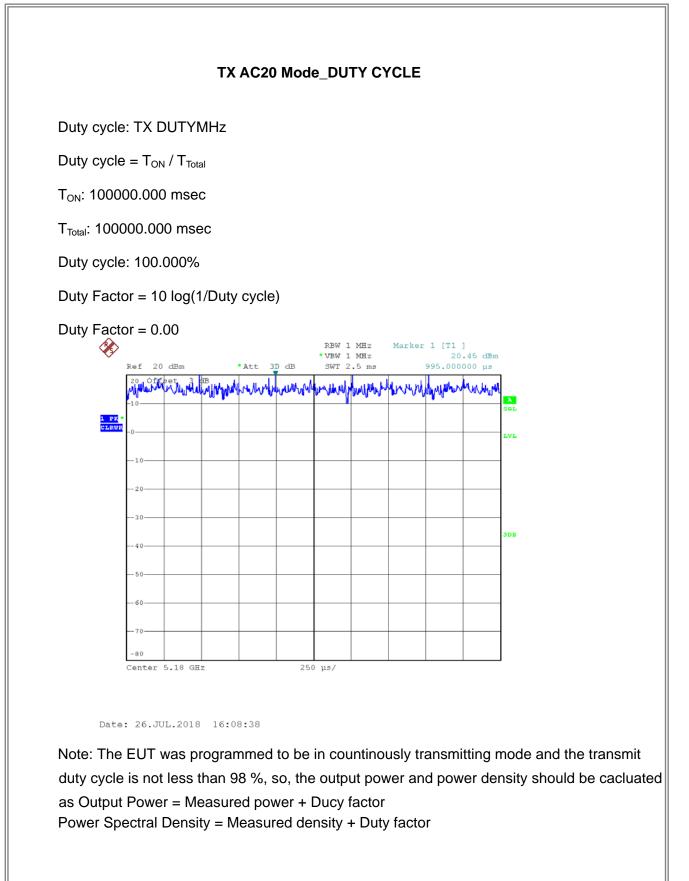




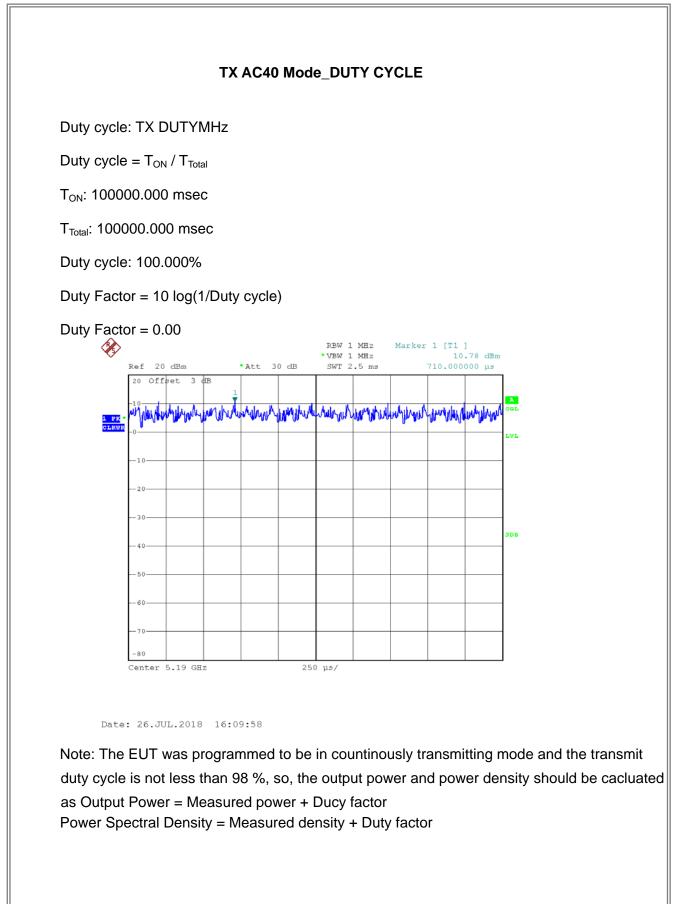




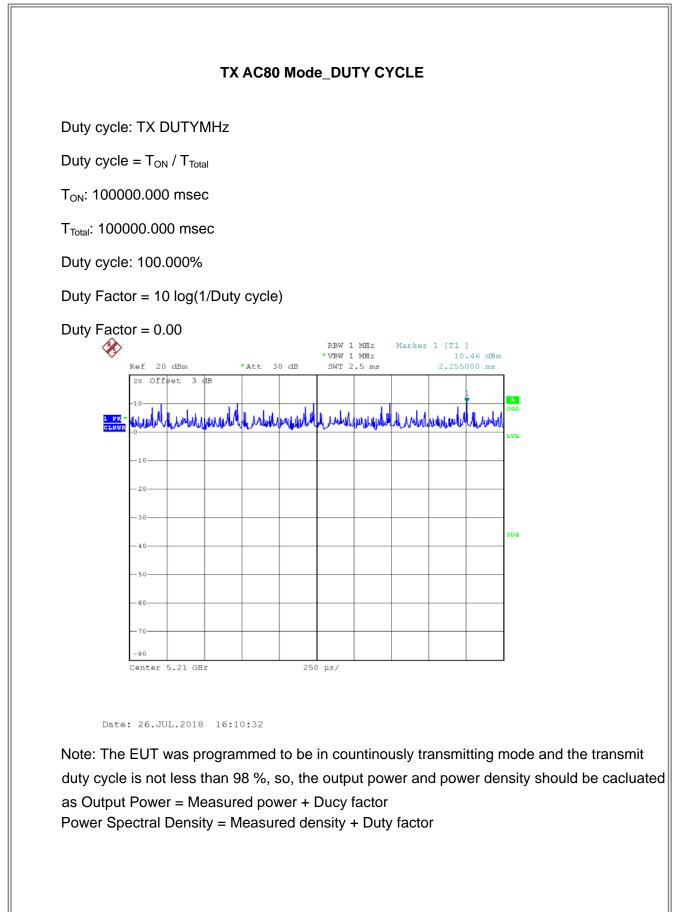














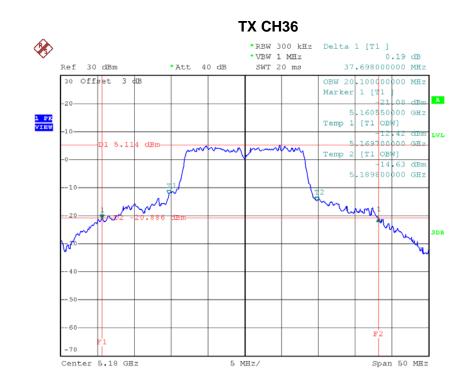
## **APPENDIX E - BANDWIDTH**



#### Non Beamforming

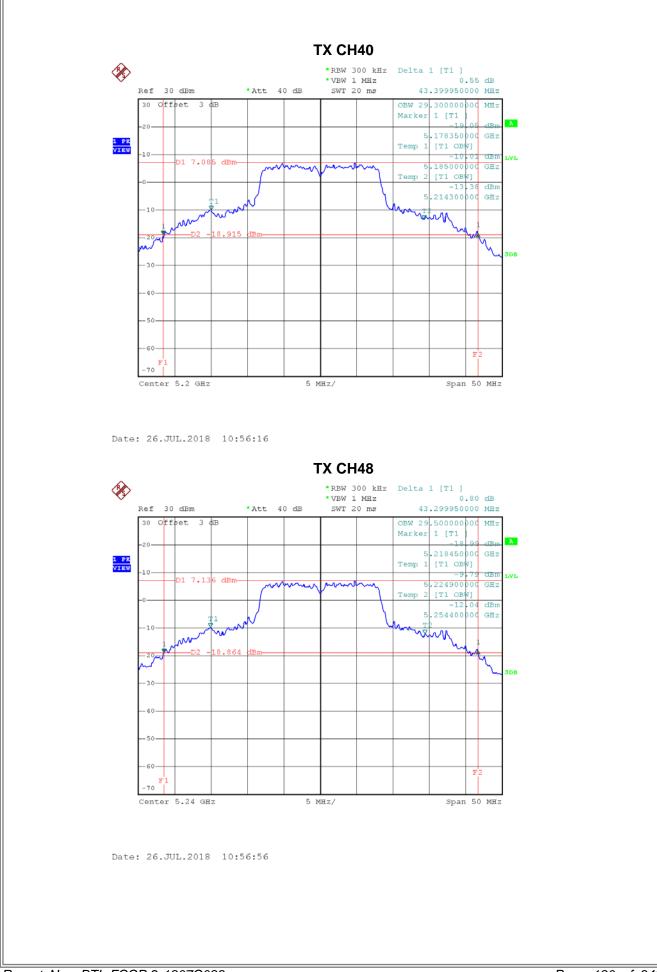
#### Test Mode: UNII-1/TX A Mode\_CH36/CH40/CH48

Channel	Frequency	26dB Bandwidth	99% Occupied Bandwidth	
	(MHz)	(MHz)	(MHz)	
CH36	5180	) 37.70 20.10		
CH40	5200	43.40	29.30	
CH48	5240	43.30 29.50		



Date: 26.JUL.2018 10:55:10

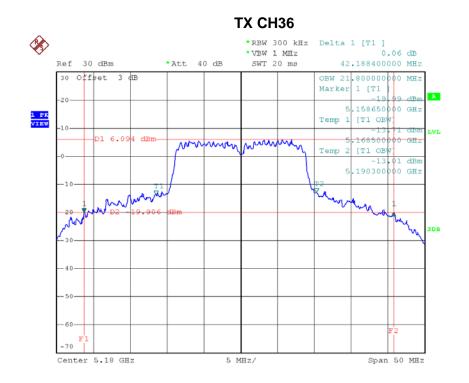






#### Test Mode: UNII-1/TX N20 Mode\_CH36/CH40/CH48

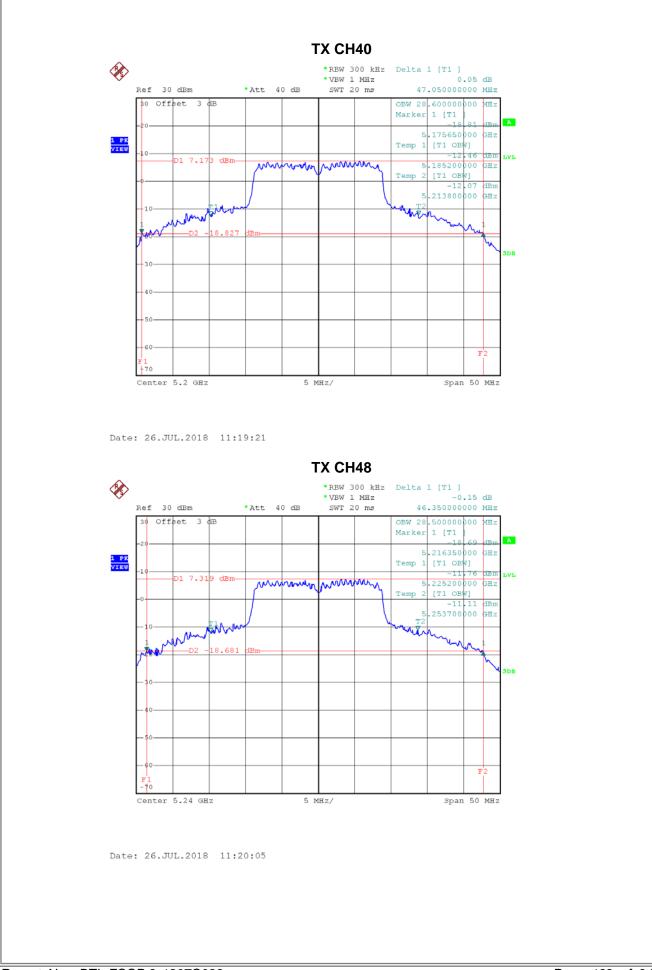
Channel	Frequency	26dB Bandwidth	99% Occupied Bandwidth	
	(MHz)	(MHz)	(MHz)	
CH36	5180	42.19	21.80	
CH40	5200	47.05	28.60	
CH48	5240	46.35	28.50	



Date: 26.JUL.2018 11:18:35

# **3**TL

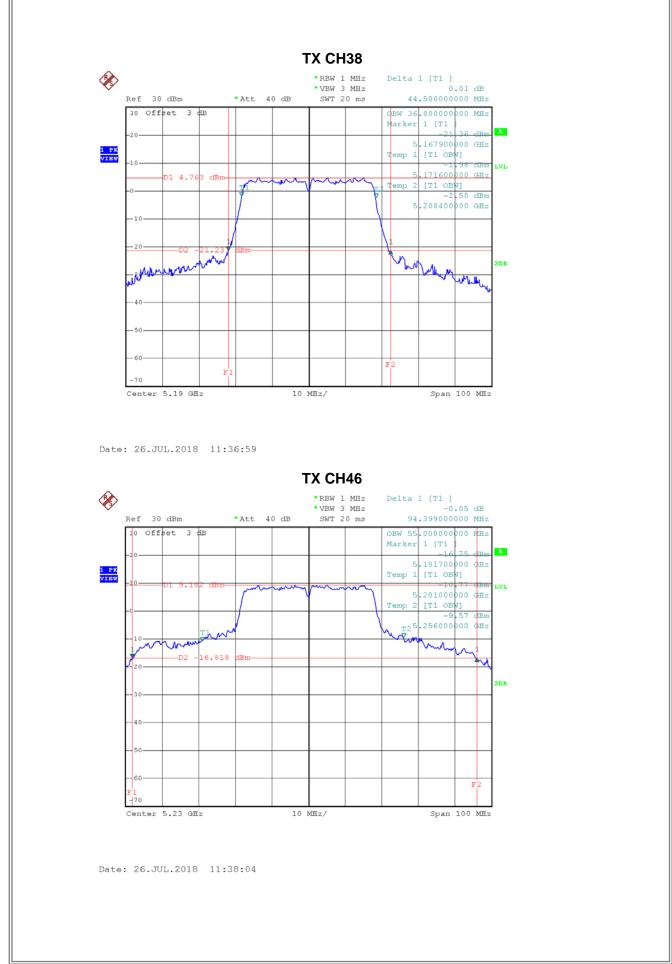




### Test Mode: UNII-1/TX N40 Mode\_CH38/CH46

Channel	Frequency	26dB Bandwidth	99% Occupied Bandwidth
	(MHz)	(MHz)	(MHz)
CH38	5190	44.50	36.80
CH46	5230 94.40		55.00

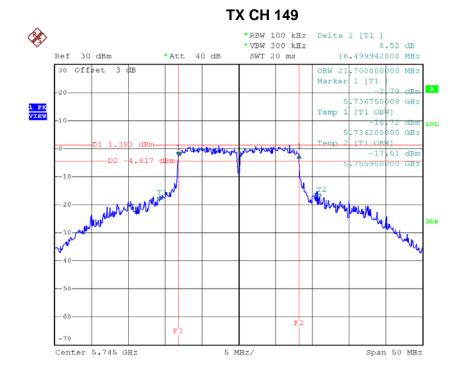






#### Test Mode: UNII-3/ TX A Mode\_CH149/CH157/CH165

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (kHz)
CH149	5745	16.50	21.70	>=500
CH157	5785	16.65	19.10	>=500
CH165	5825	16.50	21.10	>=500



Date: 26.JUL.2018 10:59:06