

FCC Radio Test Report
FCC ID: RRK-WMCAC15
This report concerns (check one): ⊠Original Grant ⊡Class I Change ⊡Class II Change
Project No.: 1805H003AEquipment: Wifi CardTest Model: WMC-AC15Series Model: N/AApplicant: AlphaAddress: No. 8, Li-shing 7th Road, Science-based Industrial Park, Hsinchu, Taiwan, R.O.C.
Date of Receipt : Oct. 19, 2018   Date of Test : Oct. 19, 2018~Oct. 31, 2018   Issued Date : Jan. 02, 2019   Tested by : BTL Inc.
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The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and 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**

Report Version	Description	Issued Date
R00	Original Issue.	Jan. 02, 2019



## **1. GENERAL SUMMARY**

Equipment : Brand Name : Test Model : Series Model : Applicant :	Alpha WMC-AC15 N/A Alpha
	Alpha Oct. 19, 2018~Oct. 31, 2018
Test Sample :	Engineering Sample No.: B180800106 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-4-1805H003A) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of A2LA according to the ISO/IEC 17025 quality assessment standard and technical standard(s).

Test results included in this report is only for the WIFI 5GHz UNII-2A, UNII-2C part Beamforming part.

# 2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart E(15.407)					
Standard(s) Section	Test Item	Judgment	Remark		
15.207	AC Power Line Conducted Emissions	PASS			
15.407(a)	Spectrum Bandwidth	PASS			
15.407(a)	Maximum 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. 29, Jintang Road, Tangzhen Industry Park, Pudong New Area, Shanghai 201210, China BTL's Test Firm Registration Number for FCC: 476765 BTL's Designation Number for FCC: CN1241

#### 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)
SH-C01	CISPR	150 kHz ~ 30 MHz	2.70

B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)		
		9 kHz~30 MHz	V	3.79		
		9 kHz~30 MHz	Н	3.57		
		30 MHz~200 MHz	V	4.04		
		30 MHz~200 MHz	Н	3.76		
SH-CB01	CISPR	200 MHz~1,000 MHz	V	4.24		
30-0001	CIOPK	200 MHz~1,000 MHz	Н	3.84		
		1 GHz~18 GHz	V	4.46		
					1 GHz~18 GHz	Н
		18 GHz~40 GHz	V	3.95		
		18 GHz~40 GHz	Н	3.95		

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	Wifi Card			
Brand Name	Alpha			
Test Model	WMC-AC15			
Series Model	N/A			
Model Difference(s)	N/A			
	Operation Frequency	UNII-2A: 5250 MHz~5350 MHz UNII-2C: 5470 MHz~5725 MHz		
	Modulation Type	OFDM,BPSK,QPSK,16-QAM,64-QA M,256-QAM		
Product Description	Bit Rate of Transmitter	802.11a:54/48/36/24/18/12/9/6 Mbps 802.11n: up to 300 Mbps 802.11ac: up to 867 Mbps		
	Output Power (Max.)for UNII-2A Beamforming	802.11a: 22.40dBm 802.11n (20M): 22.89dBm 802.11n (40M): 22.47dBm 802.11ac (20M): 22.69dBm 802.11ac (40M): 22.68dBm 802.11ac (80M): 16.85dBm		
	Output Power (Max.)for UNII-2C Beamforming	802.11a: 22.79dBm 802.11n (20M): 22.71dBm 802.11n (40M): 22.62dBm 802.11ac (20M): 23.22dBm 802.11ac (40M): 22.51dBm 802.11ac (80M): 22.00dBm		
Power Source	DC voltage supplied from AC Adapter(Support unit).			
Power Rating	I/P: 100-240V~50/60Hz 0.5A O/P: 5 V2A			





#### 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 20 MHz 802.11ac 20 MHz		802.11n 40 MHz 802.11ac 40 MHz		802.11ac 80 MHz	
UNII	-2A	UNII-2A		UNII-2A	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	54	5270	58	5290
56	5280	62	5310		
60	5300				
64	5320				

802.11a 802.11n 20 MHz 802.11ac 20 MHz		802.11n 40 MHz 802.11ac 40 MHz		802.11ac 80 MHz	
UNII	UNII-2C		UNII-2C		I-2C
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	102	5510	106	5530
104	5520	110	5550	122	5610
108	5540	118	5590		
112	5560	126	5630		
116	5580	134	5670		
132	5660				
136	5680				
140	5700				





#### 3. Antenna Specification:

Ant.	Manufacturer	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	CIU ANTENNE WIFI DUAL A01	296242441	PCB	N/A	-2	N/A
2	CIU ANTENNE WIFI DUAL A01	296242441	РСВ	N/A	-2	N/A

#### Note:

This EUT supports MIMO 2X2, any transmit signals are correlated with each other and the Beamforming Gain is 3.0dBi,so Directional gain = 3+(-2)=1.

#### 4.

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

# 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 / CH52, CH60, CH64 (UNII-2A)
Mode 2	TX N20 Mode / CH52, CH60, CH64 (UNII-2A)
Mode 3	TX N40 Mode / CH54, CH62 (UNII-2A)
Mode 4	TX AC20 Mode / CH52, CH60, CH64 (UNII-2A)
Mode 5	TX AC40 Mode / CH54, CH62 (UNII-2A)
Mode 6	TX AC80 Mode / CH58 (UNII-2A)
Mode 7	TX A Mode / CH100, CH116, CH140 (UNII-2C)
Mode 8	TX N20 Mode / CH100, CH116, CH140 (UNII-2C)
Mode 9	TX N40 Mode / CH102, CH110, CH134 (UNII-2C)
Mode 10	TX AC20 Mode / CH100, CH116, CH140 (UNII-2C)
Mode 11	TX AC40 Mode / CH102, CH110, CH134 (UNII-2C)
Mode 12	TX AC80 Mode / CH106, CH122 (UNII-2C)
Mode 13	TX Mode
Mode 12 Mode 13	TX AC80 Mode / CH106, CH122 (UNII-2C)

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 / CH52, CH60, CH64 (UNII-2A)	
Mode 2	TX N20 Mode / CH52, CH60, CH64 (UNII-2A)	
Mode 3	TX N40 Mode / CH54, CH62 (UNII-2A)	
Mode 4	TX AC20 Mode / CH52, CH60, CH64 (UNII-2A)	
Mode 5	TX AC40 Mode / CH54, CH62 (UNII-2A)	
Mode 6	TX AC80 Mode / CH58 (UNII-2A)	
Mode 7	TX A Mode / CH100, CH116, CH140 (UNII-2C)	
Mode 8	TX N20 Mode / CH100, CH116, CH140 (UNII-2C)	
Mode 9	TX N40 Mode / CH102, CH110, CH134 (UNII-2C)	
Mode 10	TX AC20 Mode / CH100, CH116, CH140 (UNII-2C)	
Mode 11	TX AC40 Mode / CH102, CH110, CH134 (UNII-2C)	
Mode 12	TX AC80 Mode / CH106, CH122 (UNII-2C)	

Note:

(1) For radiated 30 MHz to 1000 MHz test, the 802.11a mode is found to be the worst case and recorded.

(2) The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%..



### 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-2A				
Test Software Version		MP_TEST		
Frequency (MHz)	5260 5300 5320			
A Mode	32/30	32/29	19/17	
Frequency (MHz)	5260	5300	5320	
N20 Mode	33/29	31/29	21/18	
Frequency (MHz)	5270	5310		
N40 Mode	31/28	18/15		

#### Beamforming

UNII-2C			
Test Software Version		MP_TEST	
Frequency (MHz)	5500	5500 5580 5700	
A Mode	21/18	28/23	18/13
Frequency (MHz)	5500	5580	5700
N20 Mode	20/18	27/25	13/8
Frequency (MHz)	5510	5550	5670
N40 Mode	17/13	27/25	21/16

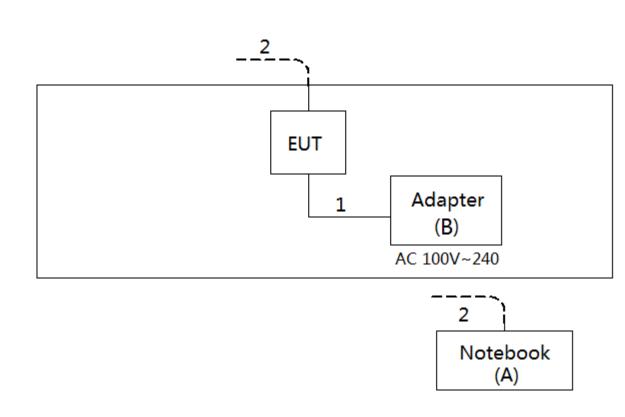


UNII-2A				
Test Software Version	MP_TEST			
Frequency (MHz)	5260	5300	5320	
AC20 Mode	33/29	31/29	22/19	
Frequency (MHz)	5270	5310		
AC40 Mode	33/30	19/16		
Frequency (MHz)	5290			
AC80 Mode	18/16			

UNII-2C				
Test Software Version	MP_TEST			
Frequency (MHz)	5500 5580 5700			
AC20 Mode	23/21	27/25	16/11	
Frequency (MHz)	5510	5550	5670	
AC40 Mode	18/15	27/25	22/17	
Frequency (MHz)	5530	5610		
AC80 Mode	15/12	26/22		



### 3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



#### 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	ThinkPad	20H3-A00VCD	DOC	PF-0S8287
В	Adapter	D-Link	AMS135-0502000FU	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	0.4m	DC Cable
2	NO	NO	10m	RJ45 Cable



## 4. EMC EMISSION TEST

### 4.1 CONDUCTED EMISSION MEASUREMENT

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

Frequency of Emission (MHz)	Conducted Limit (dBµV)		
Frequency of Emission (MHz)	Quasi-peak	Average	
0.15 -0.50	66to 56*	56 to 46*	
0.50 -5.0	56	46	
5.0 -30.0	60	50	

Note:

- (1) The tighter limit applies at the band edges.
- (2) The test result calculated as following:
  - Measurement Value = Reading Level + Correct Factor Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
  - Margin Level = Measurement Value Limit Value

#### The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

#### 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 equipment 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.

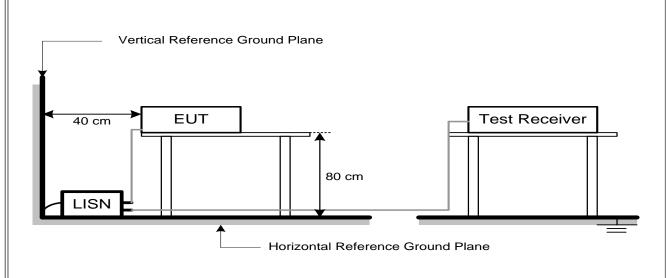
#### 4.1.3 DEVIATION FROM TEST STANDARD

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: 23°C Relative Humidity: 50% 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 <sup>ℂ</sup>Note<sub>□</sub>. 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 150 kHz to 30 MHz  $\circ$



## 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)
5250-5350	-27	68.3
5470-5725	-27	68.3

Note:

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

field strength:  $E = \frac{1000000\sqrt{30P}}{3} \mu V/m$ , 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

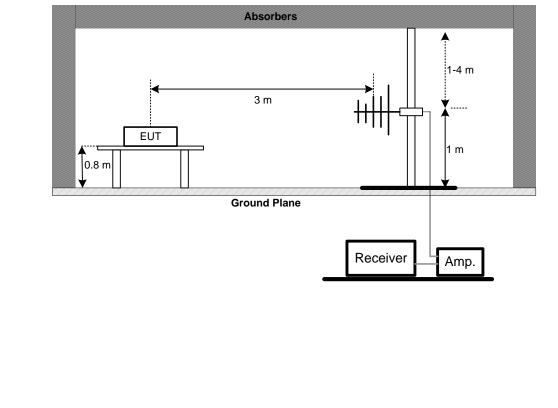
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance 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 1 GHz.
- 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 1 GHz)
- 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 1 GHz)
- i. For the actual test configuration, please refer to the related Item -EUT Test Photos.

### 4.2.3 DEVIATION FROM TEST STANDARD

No deviation

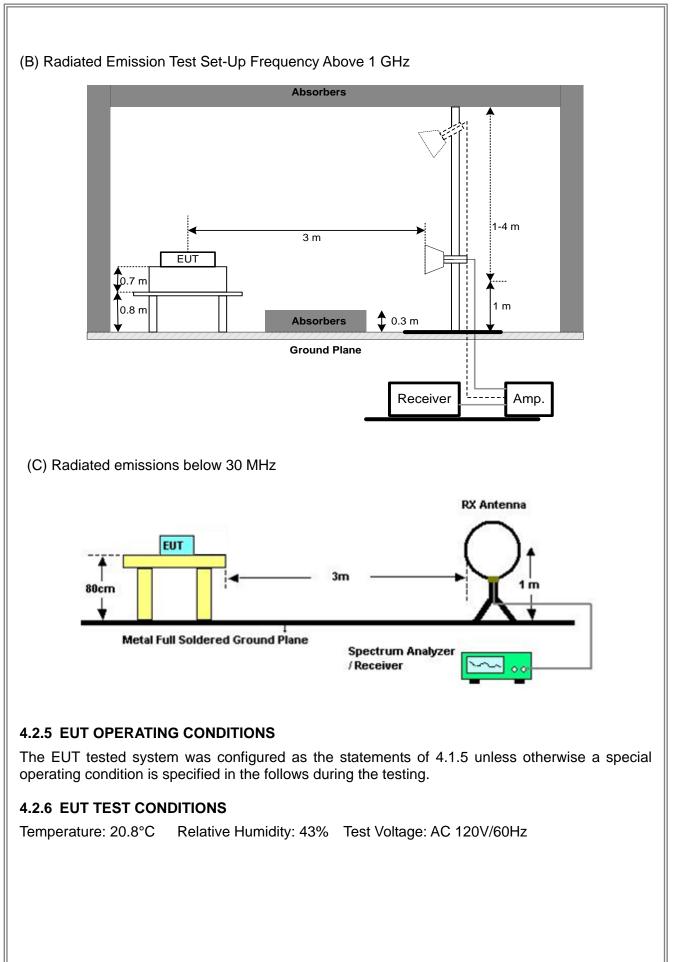
## 4.2.4 TEST SETUP

(A)Radiated Emission Test Set-Up Frequency 30 MHz-1000 MHz











## 4.2.7 TEST RESULTS (9 kHz TO 30 MHz)

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 (30 MHz 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. SPECTRUM BANDWIDTH

### 5.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E			
Test Item	Limit	Frequency Range (MHz)	Result
Bandwidth	26 dB Bandwidth	5250-5350	PASS
Danuwium	26 dB Bandwidth	5470-5725	PASS

#### 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	> 26 dB Bandwidth
	300 kHz(Bandwidth 20 MHz)
RBW	1 MHz(Bandwidth 40 MHz and 80 MHz)
	1 MHz(Bandwidth 20 MHz)
VBW	3 MHz(Bandwidth 40 MHz and 80 MHz)
Span Frequency	6 dB Bandwidth
RBW	100 kHz
VBW	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

c. Measured the spectrum width with power higher than 26 dB 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: 22°C Relative Humidity: 43.5% Test Voltage: AC 120V/60Hz

#### 5.1.6 TEST RESULTS

Please refer to the Appendix E.

# 6. MAXIMUM OUTPUT POWER

### 6.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E			
Test Item Limit Frequency Range Result (MHz)			
Maximum Output	250mW (24 dBm)	5250-5350	PASS
Power	250mW (24 dBm)	5470-5725	PASS
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over			

the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B,

where B is the 26dB Bandwidth in megahertz.

### 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.

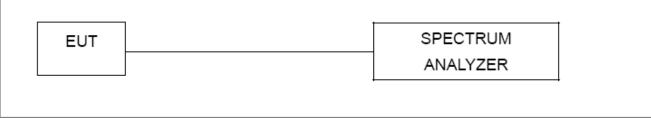
Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	= 1 MHz.
VBW	≥ 3 MHz.
Sweep points	≥ 2 x span / RBW
Detector	RMS
Trace	Trace average at least 100 traces in power averaging(rms) mode.
Sweep Time	auto

c. Test test was performed in accordance with method of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

## 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: 22.5°C Relative Humidity: 46% 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	11 dBm/MHz	5250-5350	PASS
Density	11 dBm/MHz	5470-5725	PASS

#### 7.1.1 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
Span Fraguanay	Encompass the entire emissions bandwidth (EBW) of the
Span Frequency	signal
RBW	= 1 MHz.
VBW	≥ 3 MHz.
Detector	RMS
Trace average	100 trace
Sweep Time	Auto

Note:

The value measured with RBW=1 MHz is to be added with  $10\log(500 \text{ kHz/1 MHz})$  which is -3 dB. For example, if the measured value is +10dBm using RBW=1 MHz (that is +10 dBm/MHz), then the converted value will be +7dBm/500kHz.



### 7.1.2 DEVIATION FROM STANDARD

No deviation.

### 7.1.3 TEST SETUP

EUT	SPECTRUM
	ANALYZER

### 7.1.4 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.

#### 7.1.5 EUT TEST CONDITIONS

Temperature: 23.6°C Relative Humidity: 44.5% Test Voltage: AC 120V/60Hz

#### 7.1.6 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 (MHz)	Result
Frequency Stability Specified in the user's manual		5250-5350	PASS
		5470-5725	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
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 -10°C~50°C.

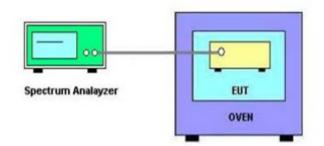
### 8.1.2 DEVIATION FROM STANDARD

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: 23.7°C Relative Humidity: 53.2% Test Voltage: AC 120V/60Hz

#### 8.1.6 TEST RESULTS

Please refer to the Appendix I.



## 9. MEASUREMENT INSTRUMENTS LIST

	Conducted Emission Measurement						
lte	em	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
	1	Line Impedance Stabilisation Network	Schwarzbeck	NNLK 8121	8121-822	Mar. 30, 2019	
	2	TWO-LINE V-NETWORK	R&S	ENV216	101340	Jan. 17, 2019	
	3	EMI Test Receiver	R&S	ESCI	100082	Mar. 30, 2019	
	4	$50\Omega$ coaxial switch	Anritsu	MP59B	6201750902	Jul. 17, 2019	
	5	Cable	10m	EMCRG400-BM-N M-10000	170628	Jun. 10, 2019	
	6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A	

	Radiated Emission Measurement - 9KHZ TO 30MHZ							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until			
1	Loop Antenna EMCI		EMCI LPA600	275	Mar. 31, 2019			
2	Cable			170628	Jun. 10, 2019			
3	MXE EMI Receiver			MY57150106	Mar. 30, 2019			
4	Measurement Software	Farad	EZ-EMC Ver.BTL-2ANT-1	N/A	N/A			

Radiated Emission Measurement - 30MHZ TO 1000MHZ						
Item	n Kind of Equipment Manufacturer		Type No.	Serial No.	Calibrated until	
1	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	719	Mar. 30, 2019	
2	Pre-Amplifier emci		EMC9135	980400	Mar. 30, 2019	
3	MXE EMI Receiver	Keysight	N9038A	MY57150106	Mar. 30, 2019	
4	Attenuator	emci	EMCI-N-6-06	AT-N0644	Mar. 30, 2019	
5	Cable	7m	EMC104-SM-SM-7 000	170330	Jun. 10, 2019	
6	Cable	1m	EMC104-SM-SM-1 000	170331	Jun. 10, 2019	
7	Cable	3.5m	EMC104-SM-NM-3 500	170621	Jun. 10, 2019	
8	Measurement Software	Farad	EZ-EMC Ver.BTL-2ANT-1	N/A	N/A	



	Radiated Emission Measurement - Above 1GHz							
Item	Kind of Equipment	Serial No.	Calibrated until					
1	Double-Ridged Waveguide Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-1787	Mar. 30, 2019			
2	Double-Ridged Waveguide Horn Antenna	ETS-Lindgren	3116C	00203919	Mar. 30, 2019			
3	Pre-Amplifier emci		EMC012645SE	980421	Mar. 30, 2019			
4	Pre-Amplifier	emci	EMC184045SE	980409	Mar. 30, 2019			
5	EXA Spectrum Analyzer	Keysight	N9010A	MY56480559	Mar. 30, 2019			
6	MXE EMI Receiver	Keysight	N9038A	MY56400088	Mar. 30, 2019			
7	Cable	7m	EMC104-SM-SM-7 000	170330	Jun. 10, 2019			
8	Cable	1m	EMC104-SM-SM-1 000	170331	Jun. 10, 2019			
9	Cable	3.5m	EMC104-SM-NM-3 500	170621	Jun. 10, 2019			
10	Cable	0.8m	EMC102-SM-SM-8 00	170335	Jun. 10, 2019			
11	Cable	6m	EMC102-SM-SM-6 000	170336	Jun. 10, 2019			
12	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	100626	Mar. 31, 2019		

Maximum Output Power Measurement						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Spectrum Analyzer	R&S	FSP40	100626	Mar. 31, 2019	

Power Spectral Density Measurement						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Spectrum Analyzer	R&S	FSP40	100626	Mar. 31, 2019	

	Frequency Stability Measurement						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until		
1	Spectrum Analyzer	R&S	FSP40	100626	Mar. 31, 2019		
2 Temperature And Humidity Box Blue pand		BPHS-120B	170616454	Nov. 10, 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**

9 kHz to 30 MHz





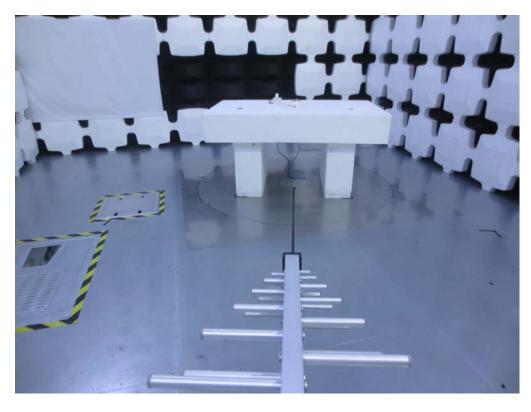
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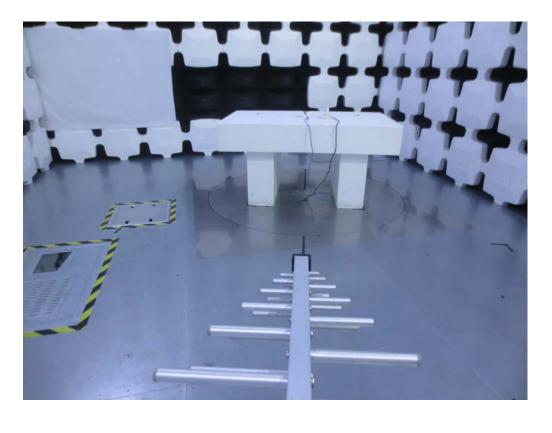
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### **Radiated Measurement Photos**

30 MHz to 1000 MHz





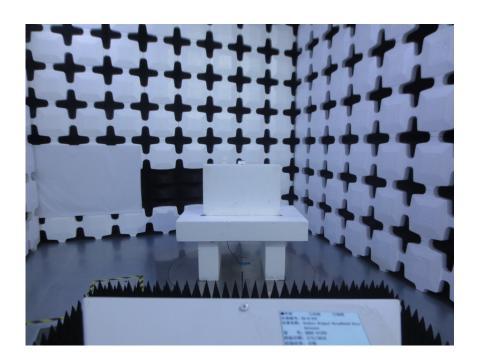
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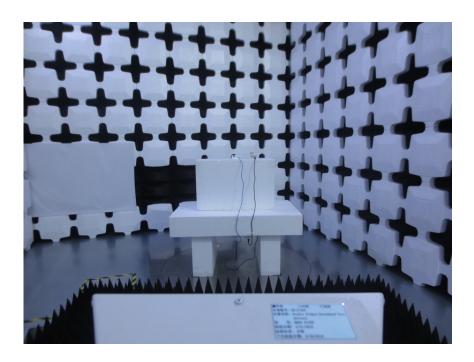
Page 35 of 287 Report Version: R00



### **Radiated Measurement Photos**

Above 1000 MHz



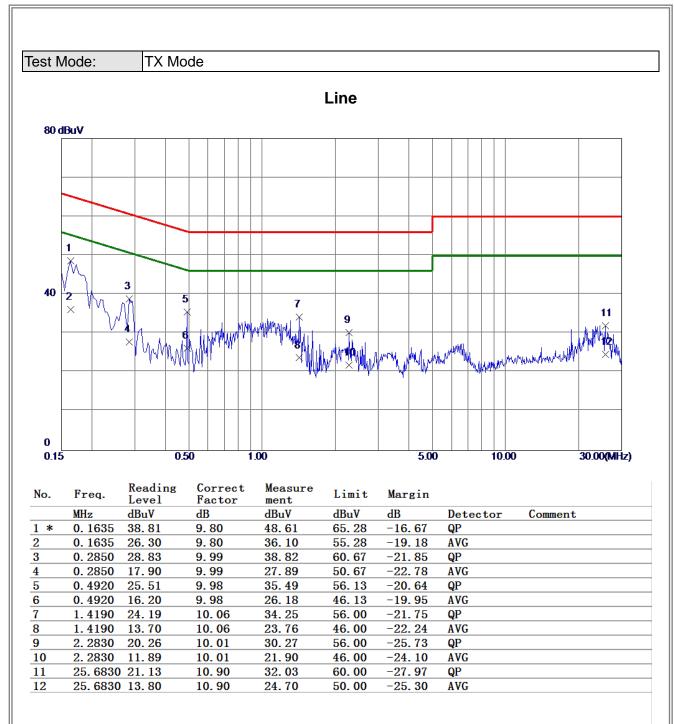




# **APPENDIX A - CONDUCTED EMISSION**

# **3**TL

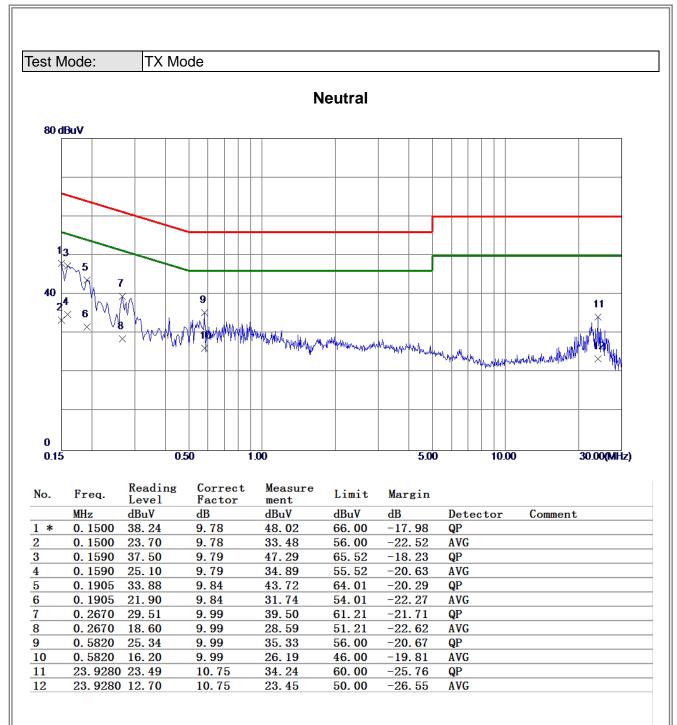




Note:The test result has included the cable loss.

# **3**TL





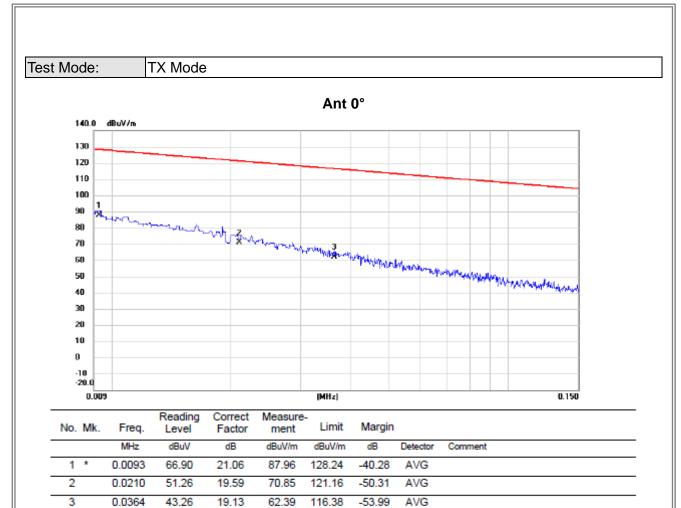
Note: The test result has included the cable loss.



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

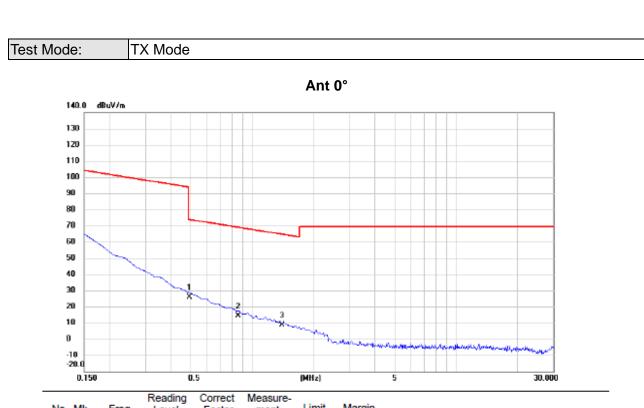








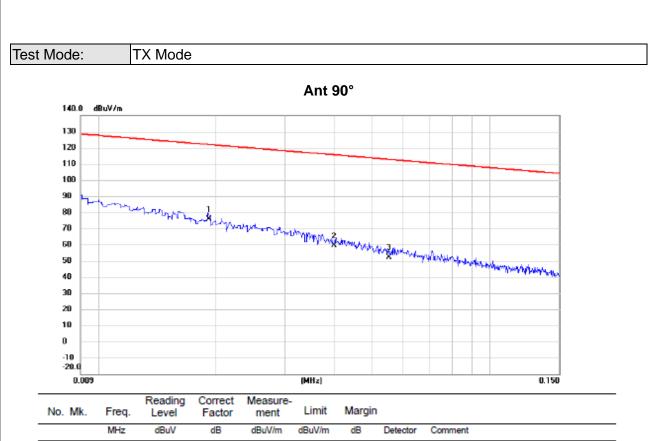




No. Mk.	Freq.		Factor	Measure- ment	Limit	Margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	0.4941	9.34	16.47	25.81	73.73	-47.92	QP	
2	0.8573	-1.65	16.05	14.40	68.94	-54.54	QP	
3	1.4037	-7.07	15.74	8.67	64.66	-55.99	QP	



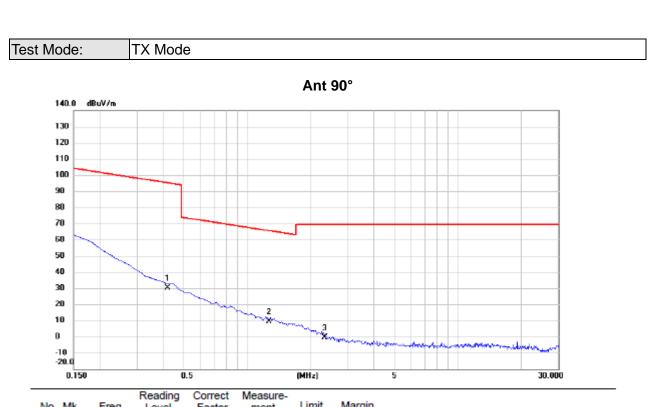




	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	0.019	2 55.91	19.72	75.63	121.94	-46.31	AVG	
2	0.040	0 40.57	19.02	59.59	115.56	-55.97	AVG	
3	0.055	2 33.51	18.63	52.14	112.77	-60.63	AVG	







No. Mł	. Freq.	Level	Factor	ment	Limit	Margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	0.4187	13.52	16.54	30.06	95.17	-65.11	AVG	
2 *	1.2694	-6.56	15.79	9.23	65.53	-56.30	QP	
3	2.3291	-16.10	15.42	-0.68	69.54	-70.22	QP	



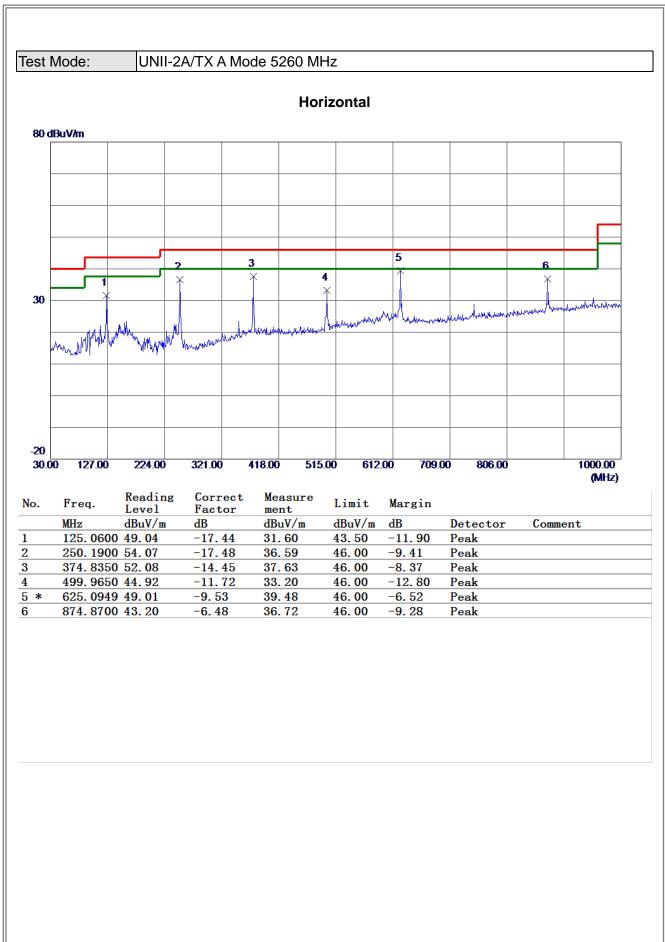
### APPENDIX C - RADIATED EMISSION (30 MHZ TO 1000 MHZ)





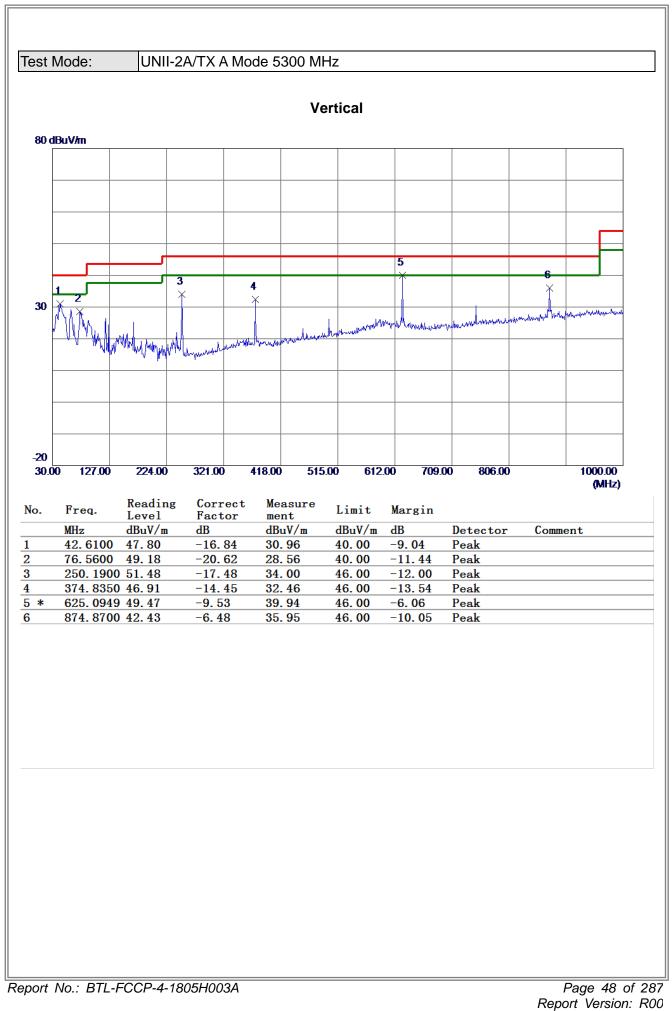






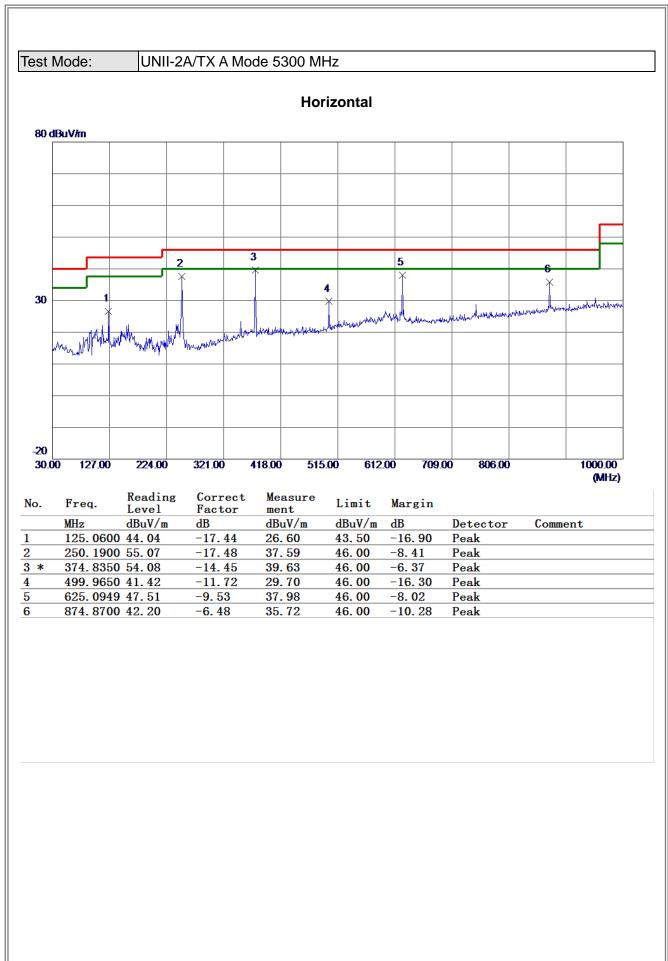






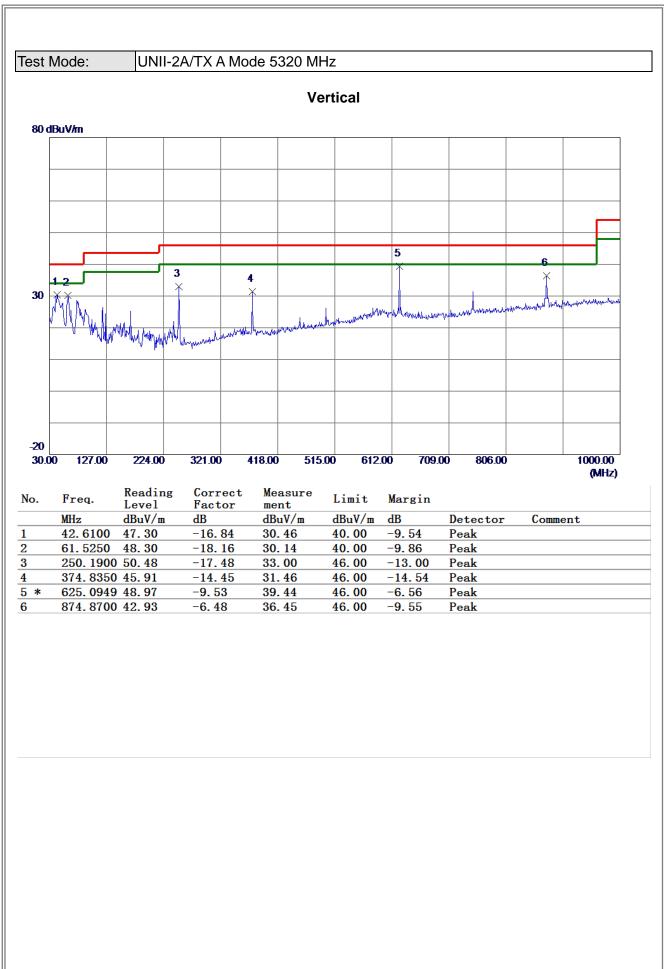






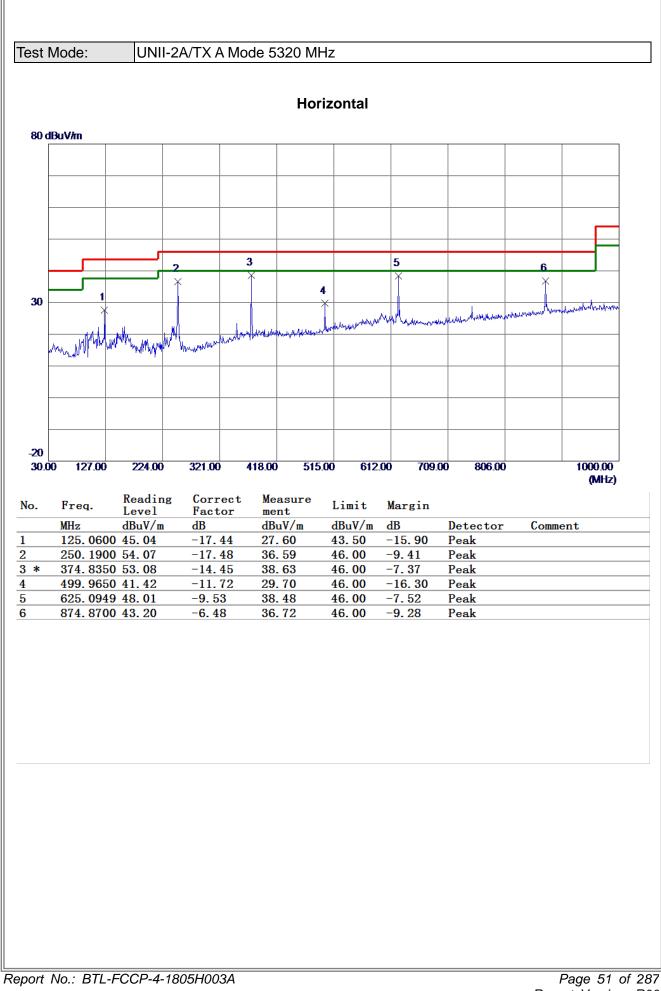






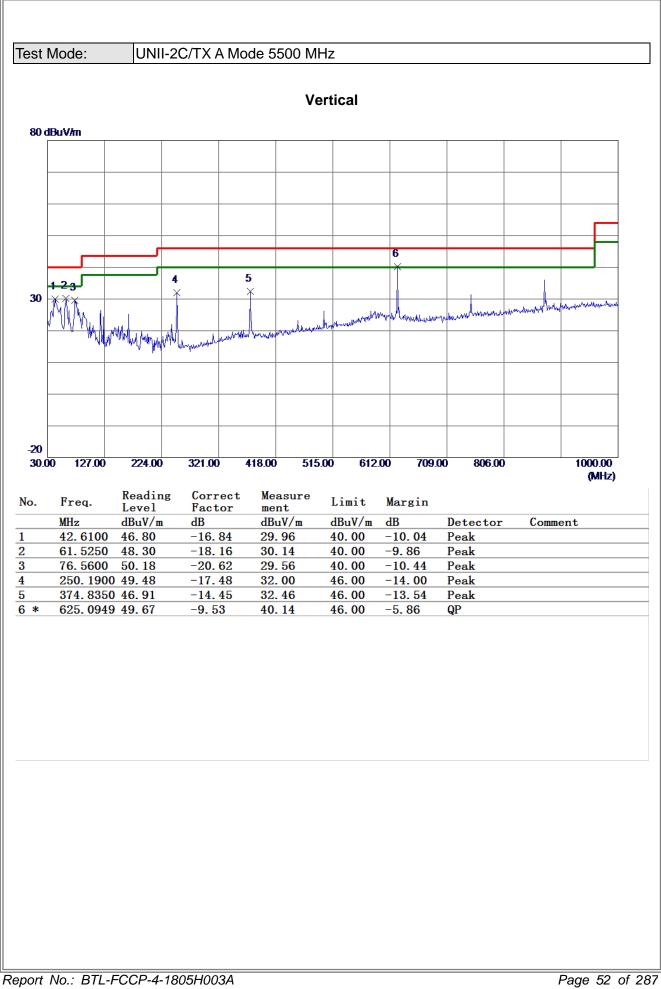






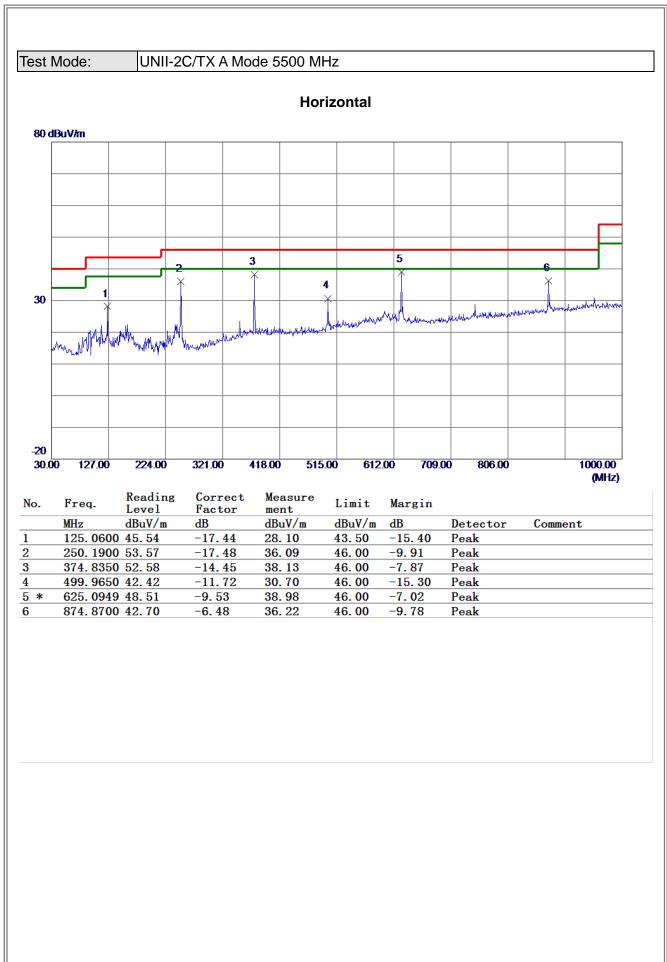






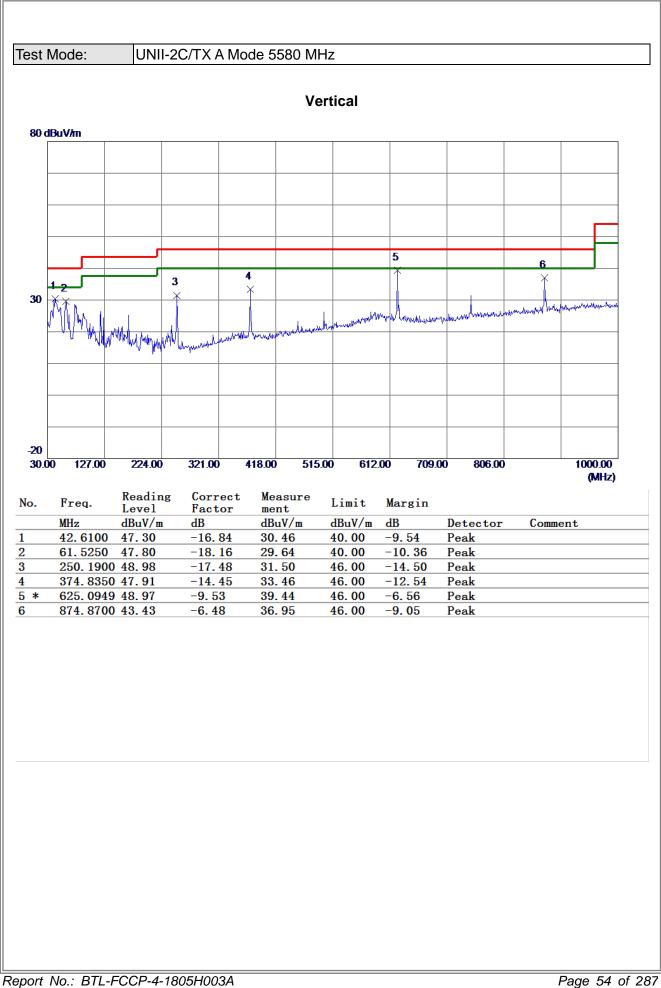






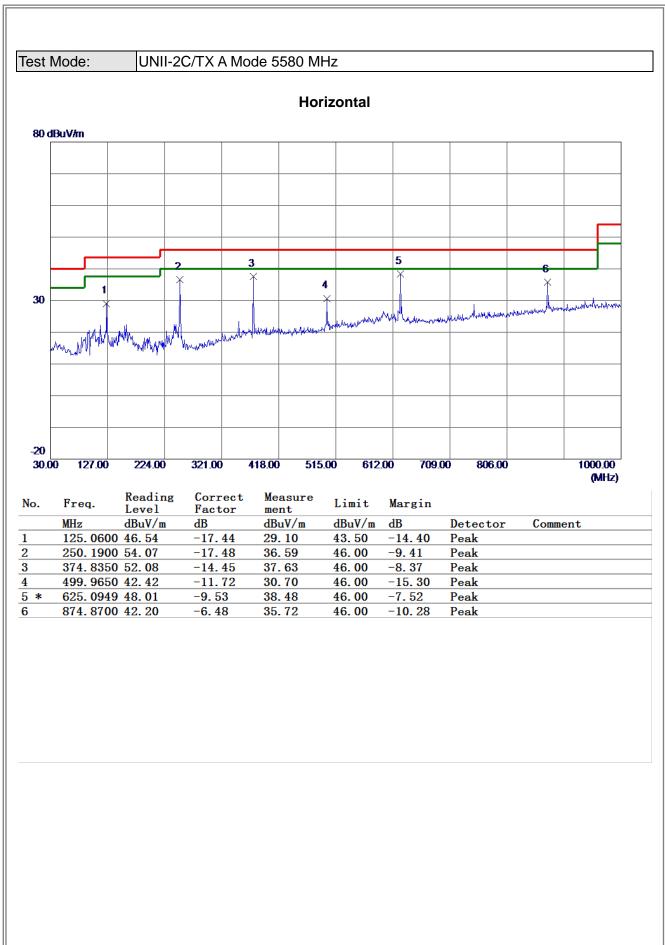






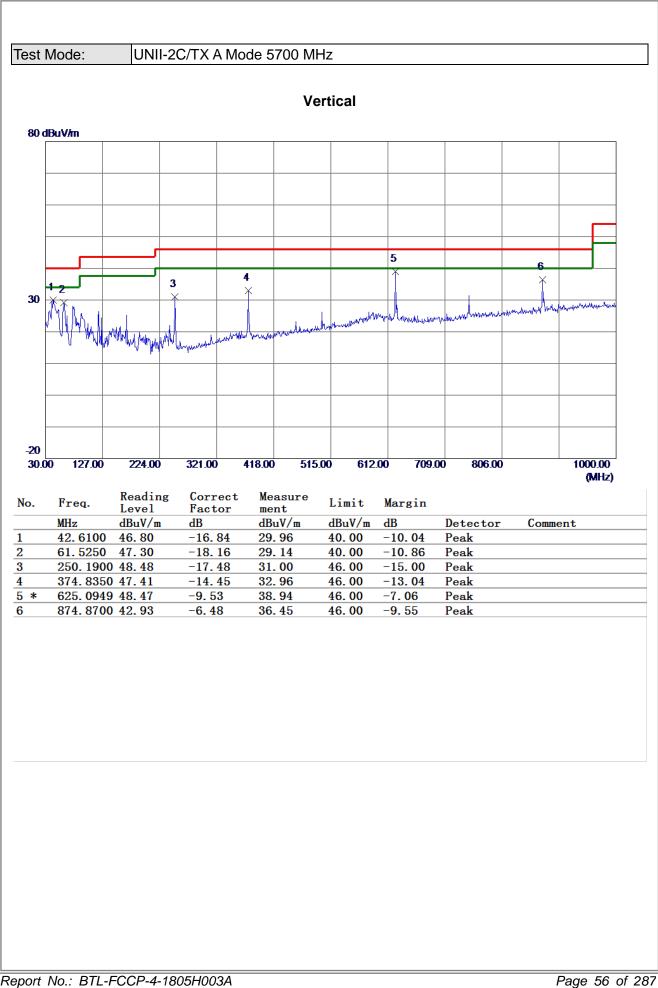






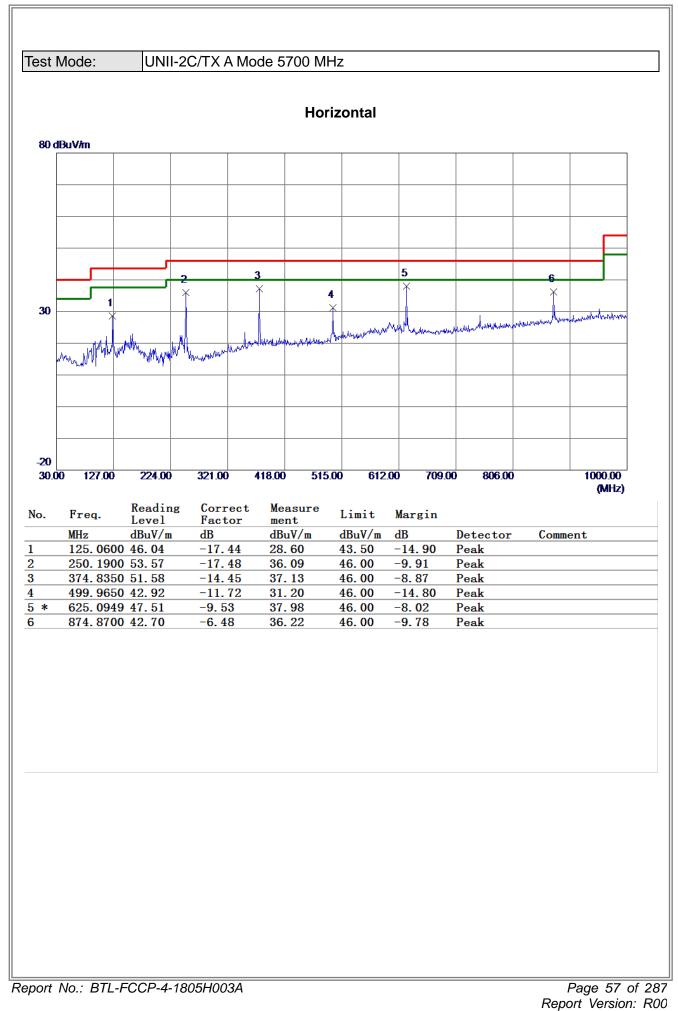










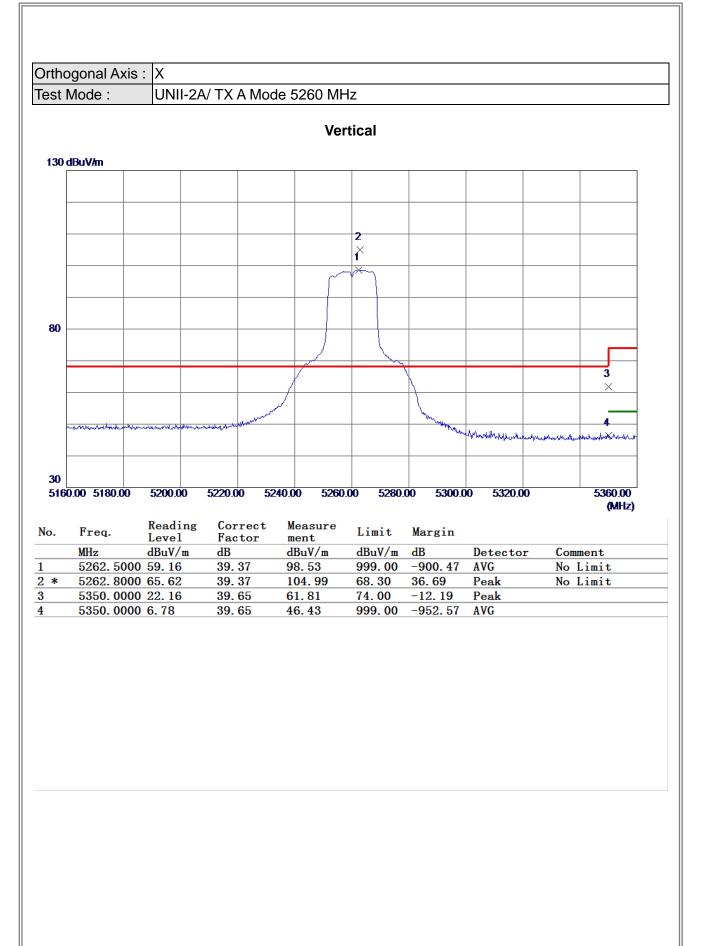




### APPENDIX D - RADIATED EMISSION (ABOVE 1000 MHZ)

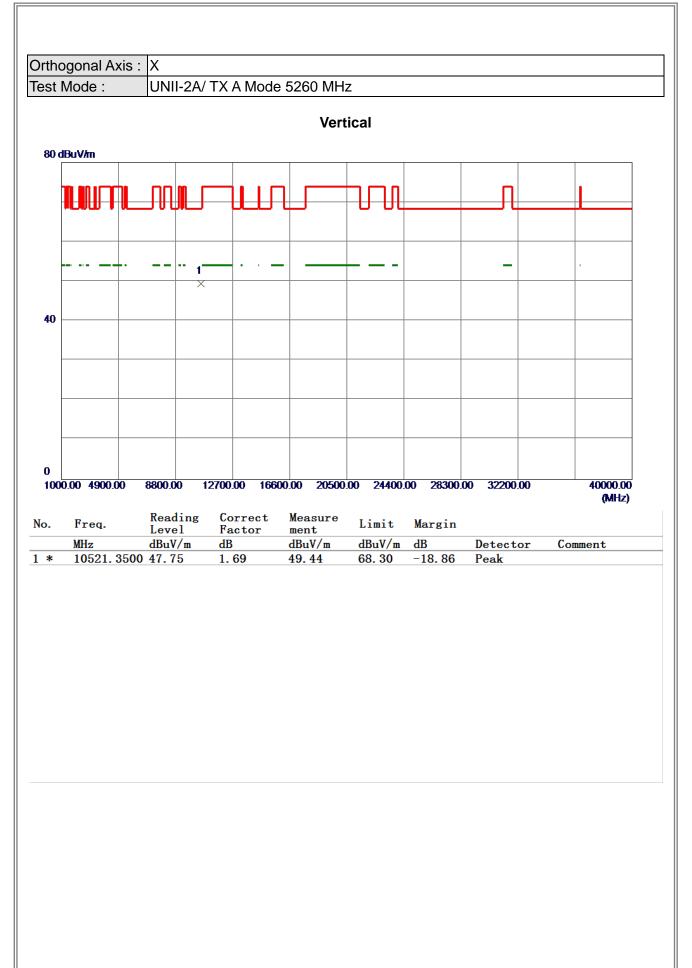






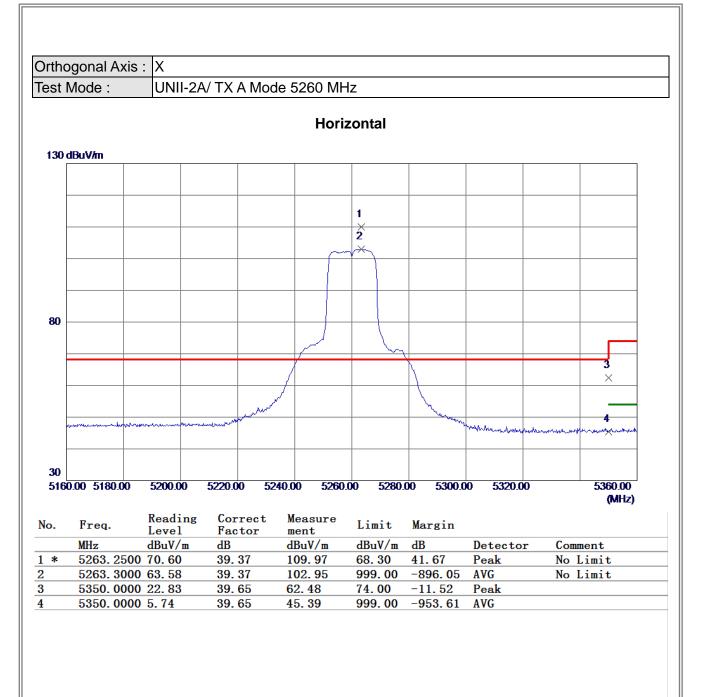






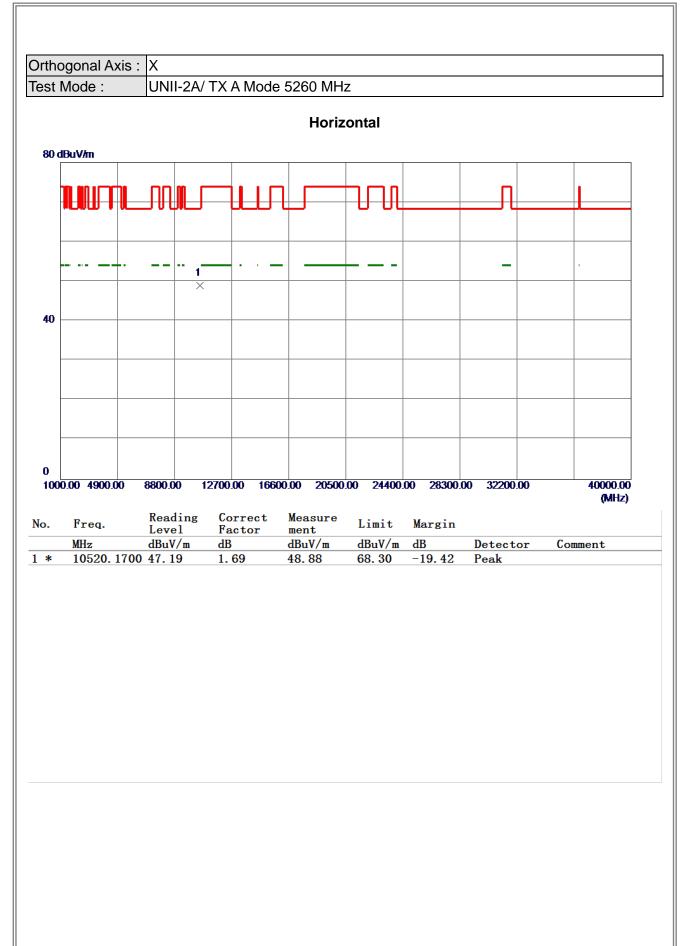






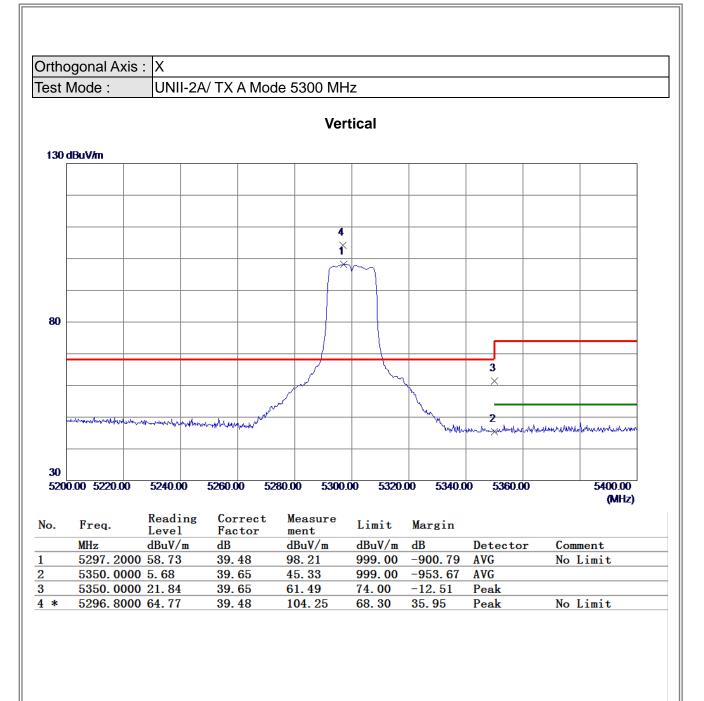






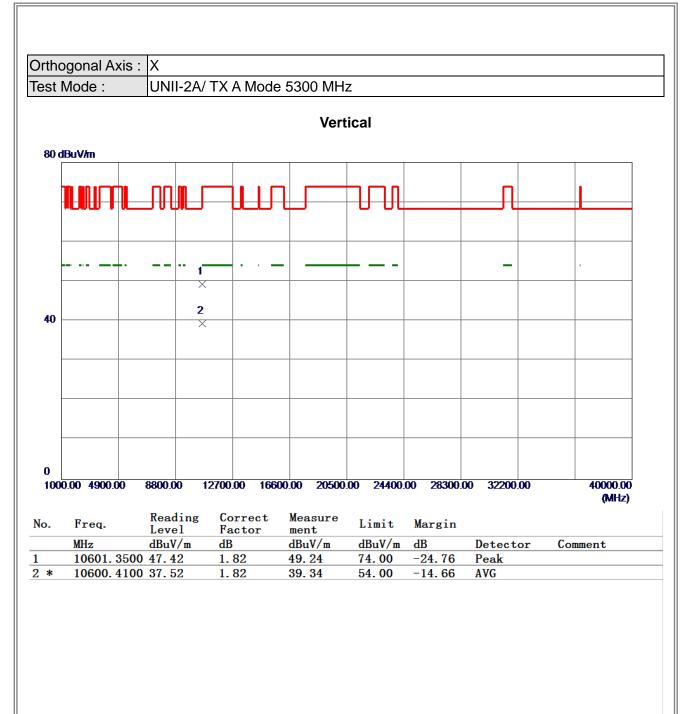






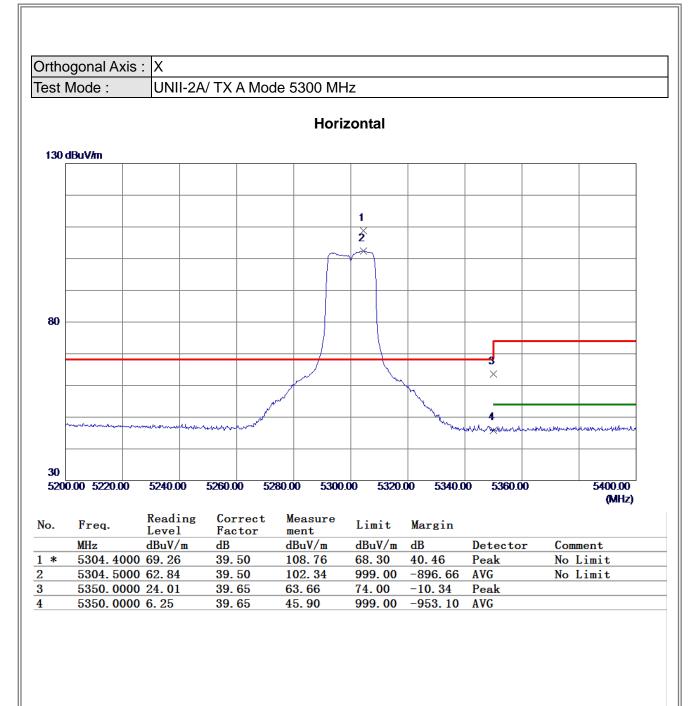






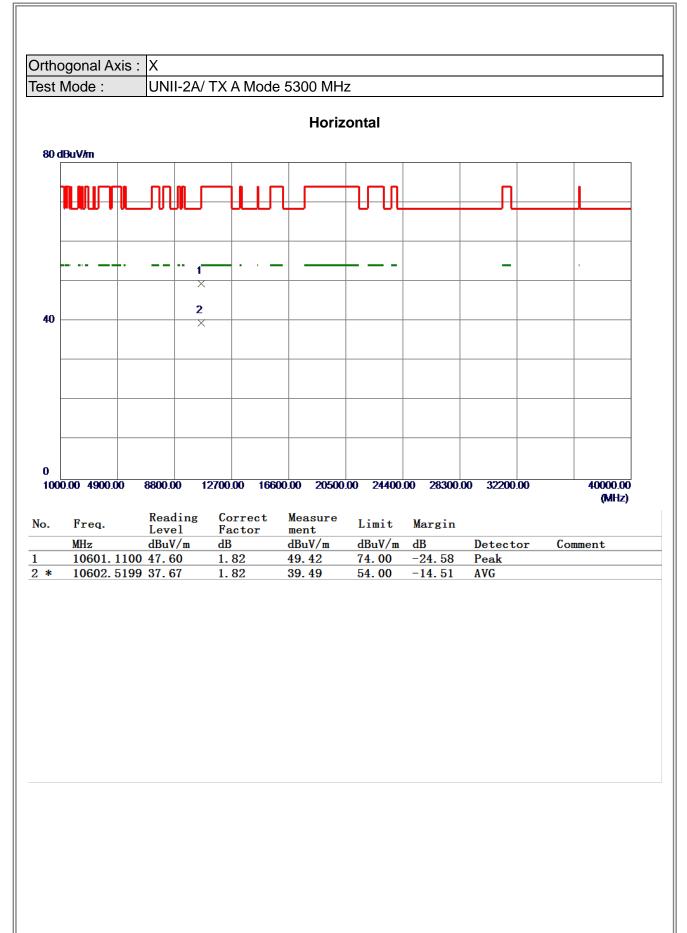






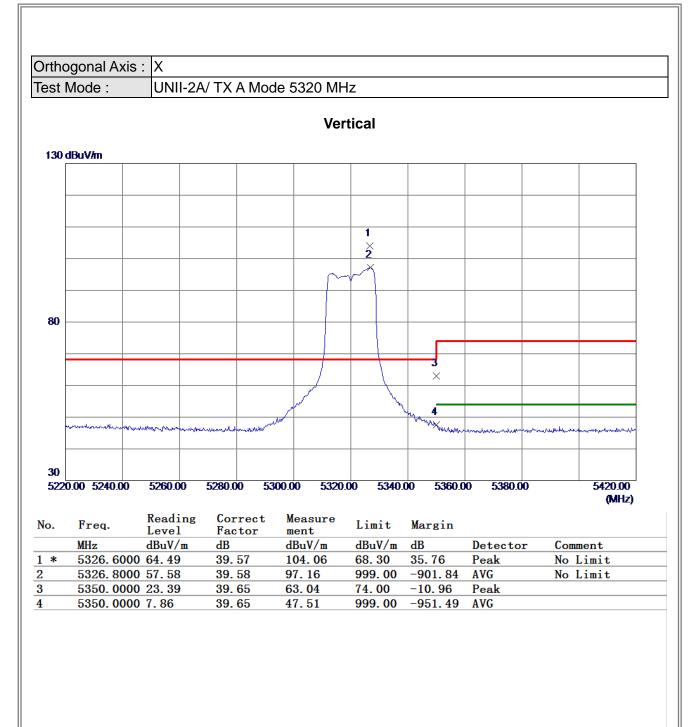






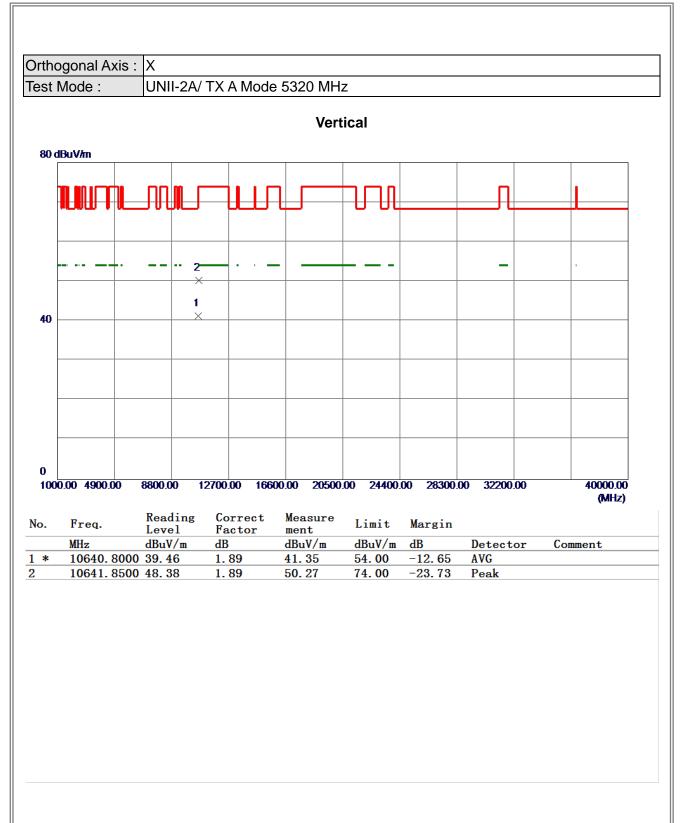






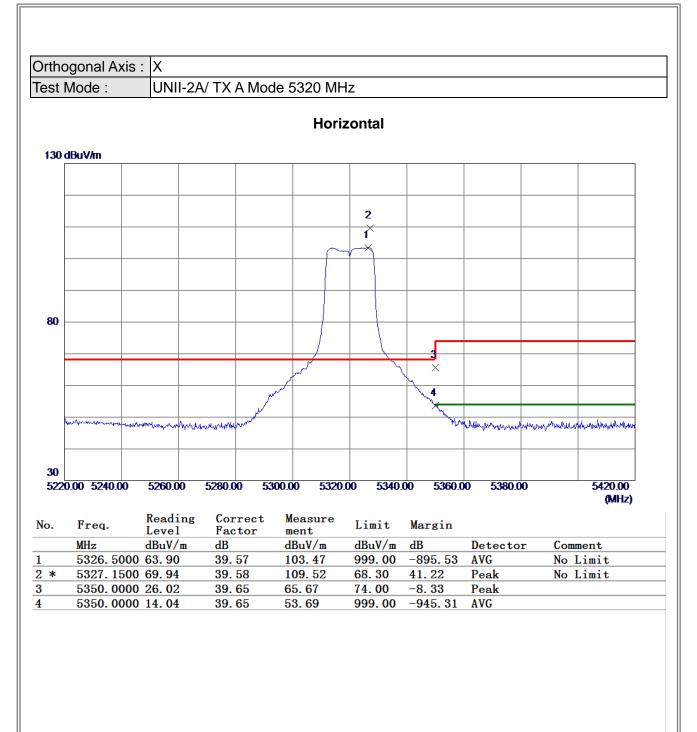






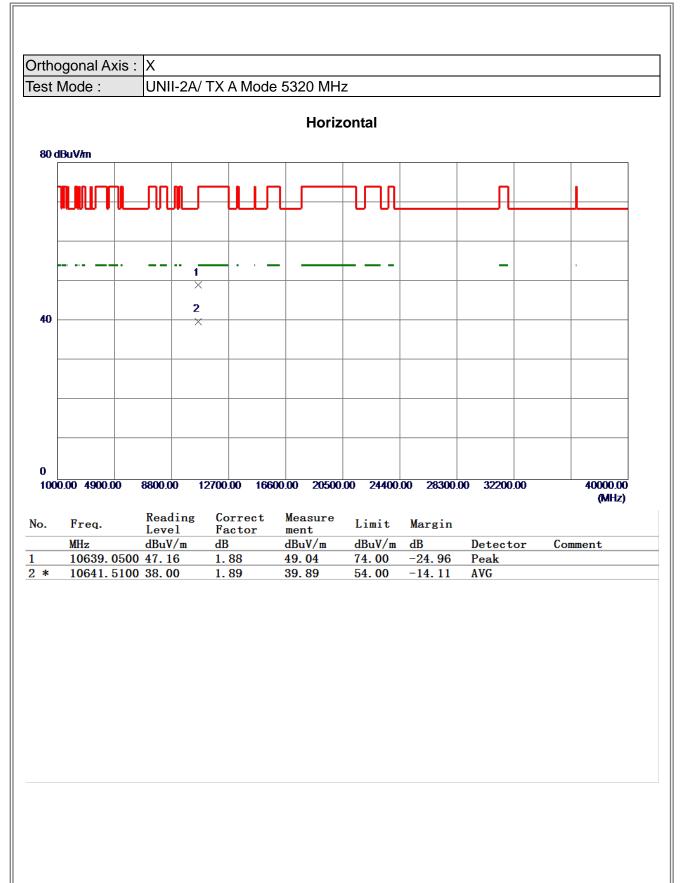






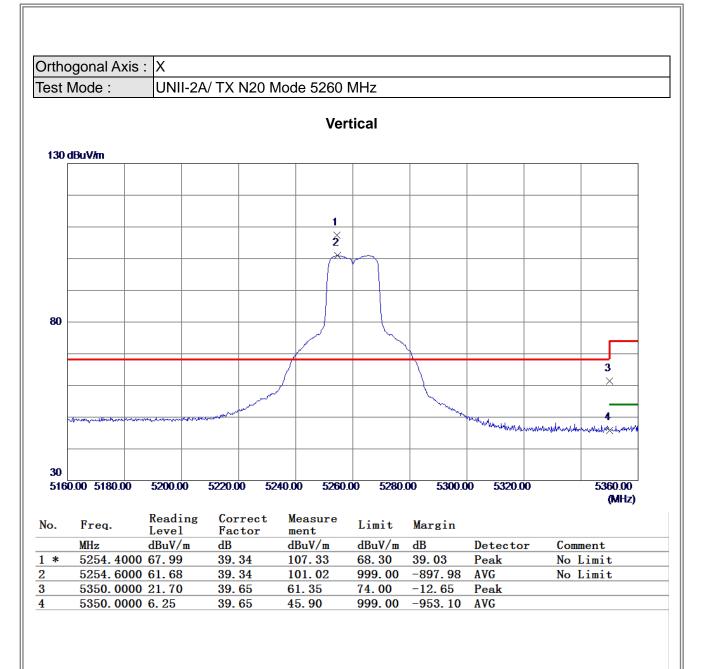






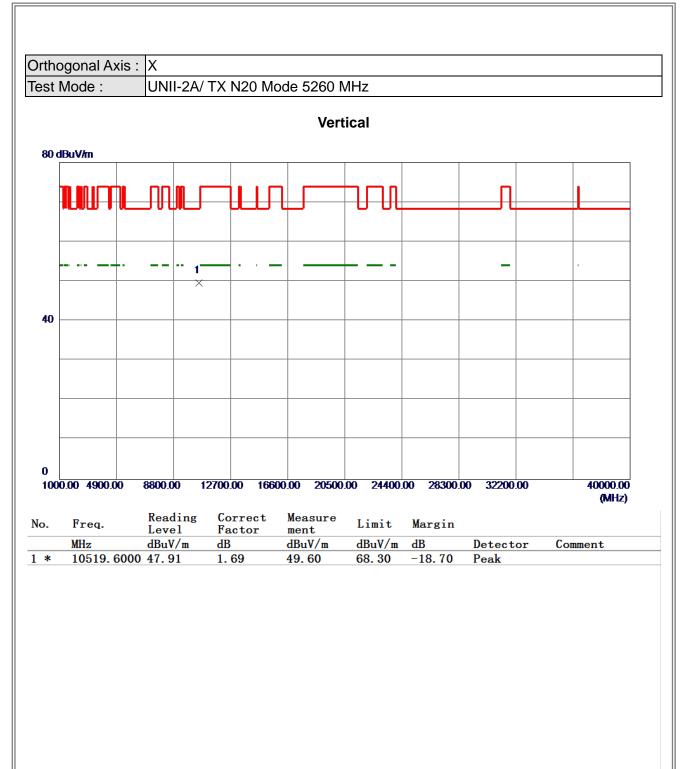






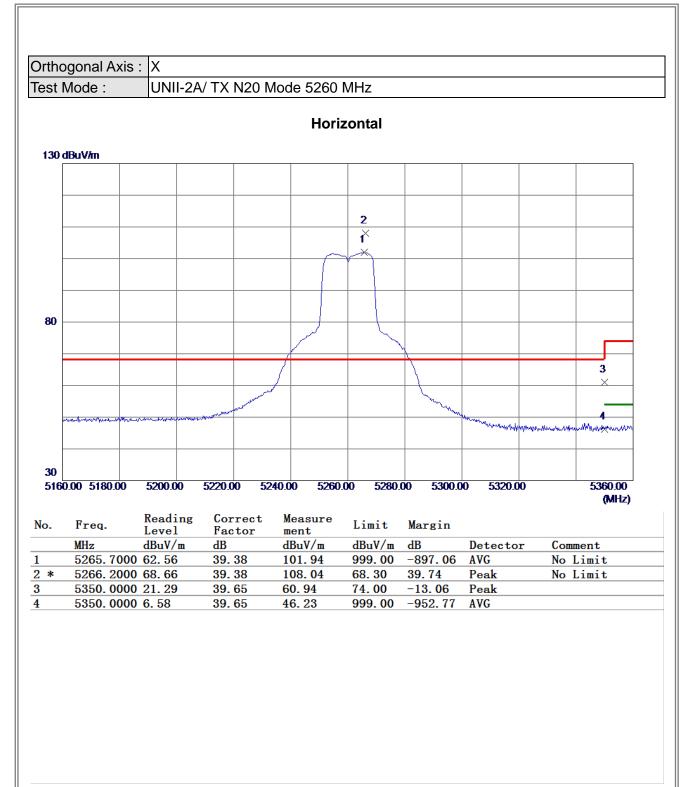












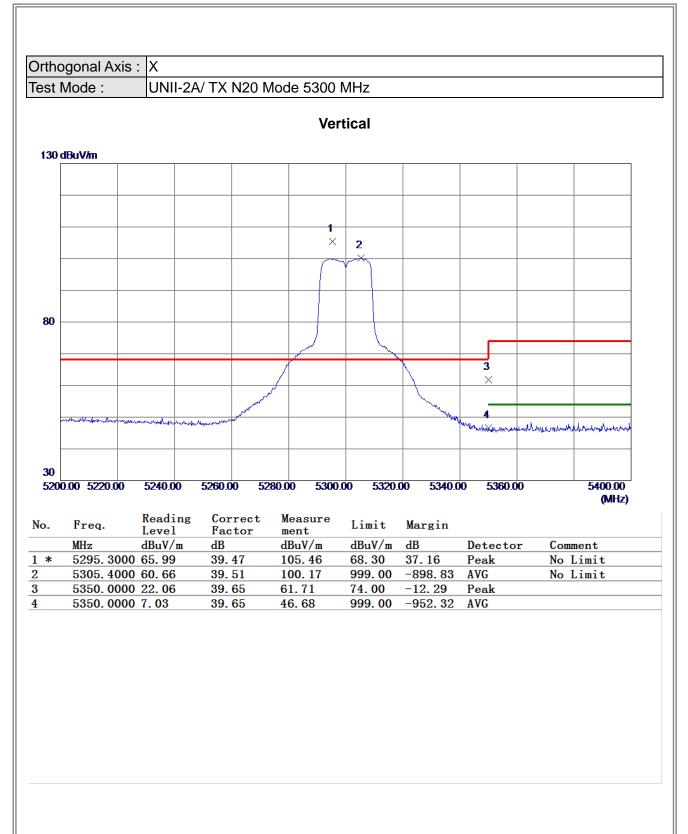






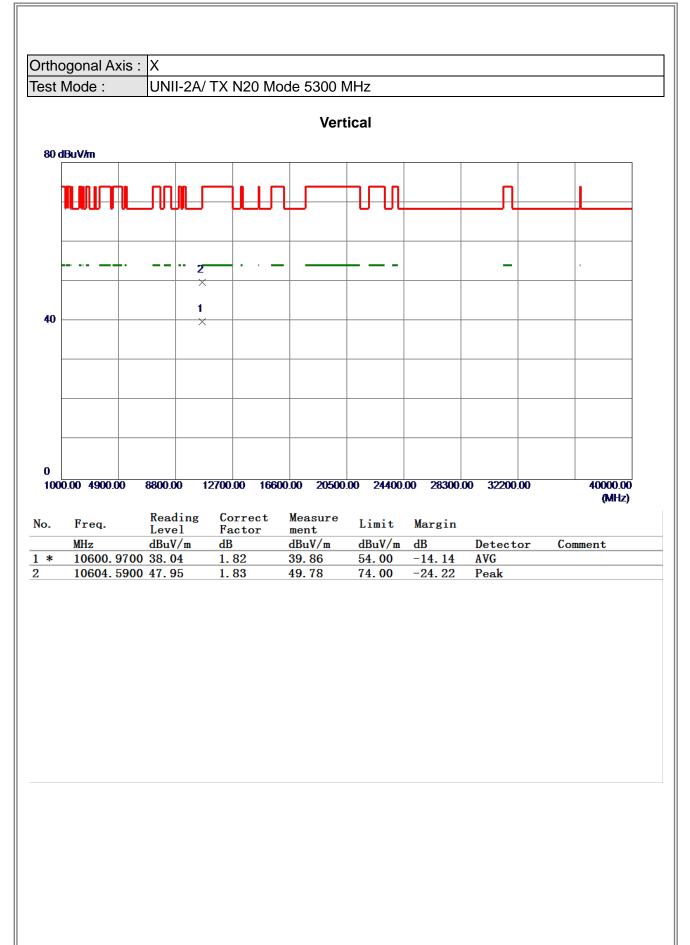






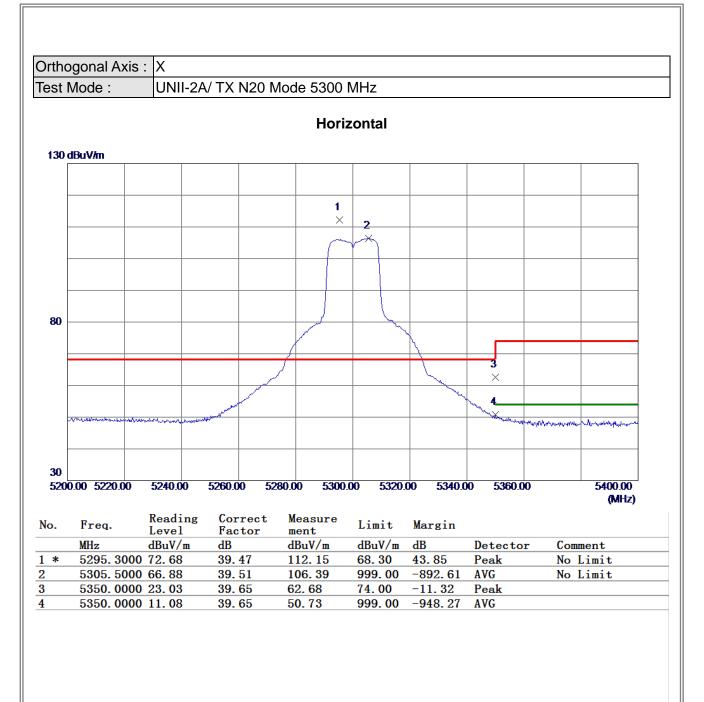






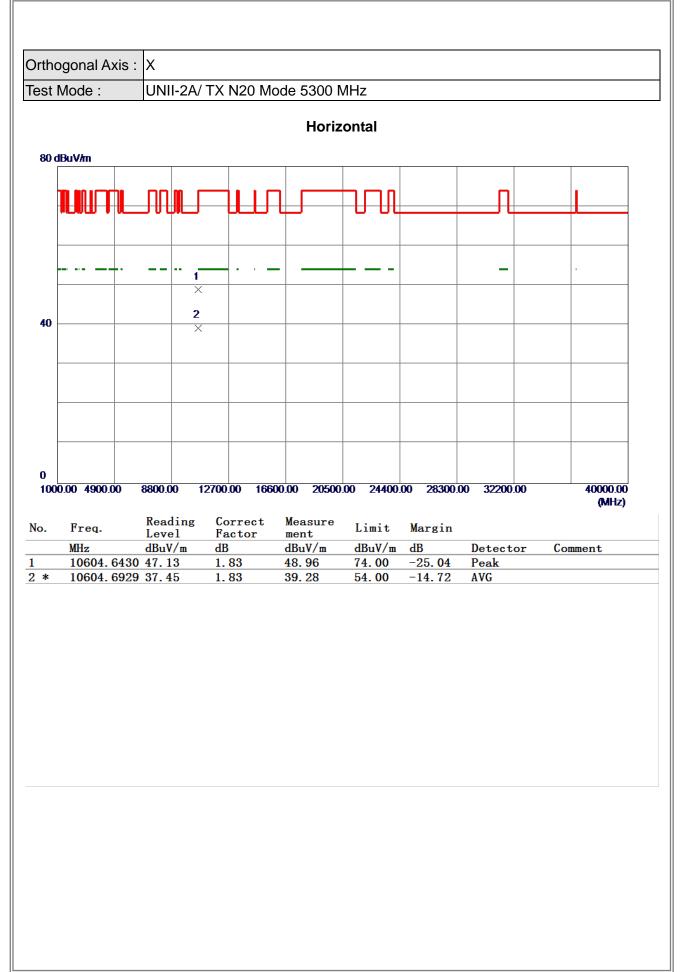






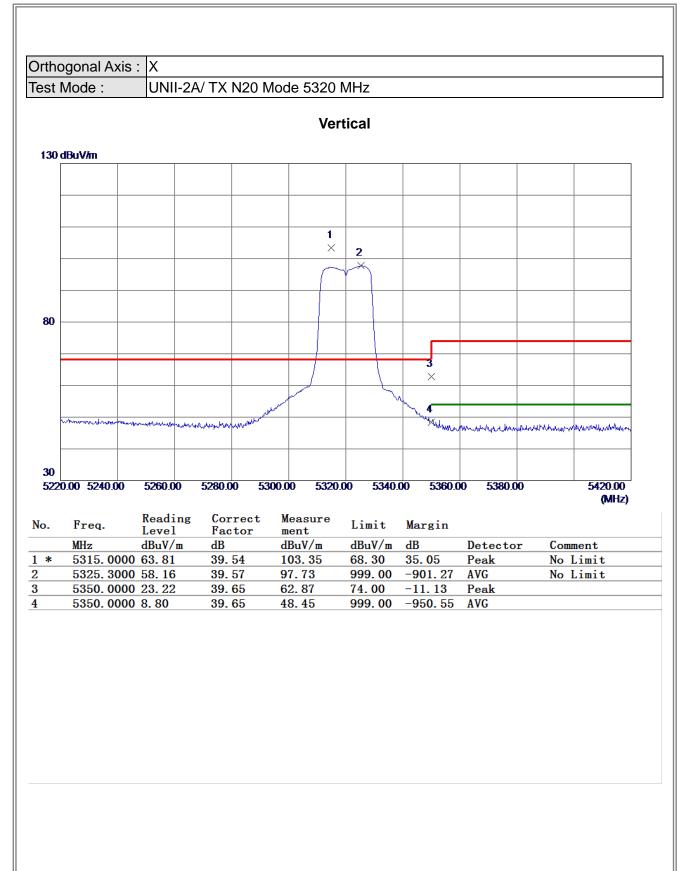






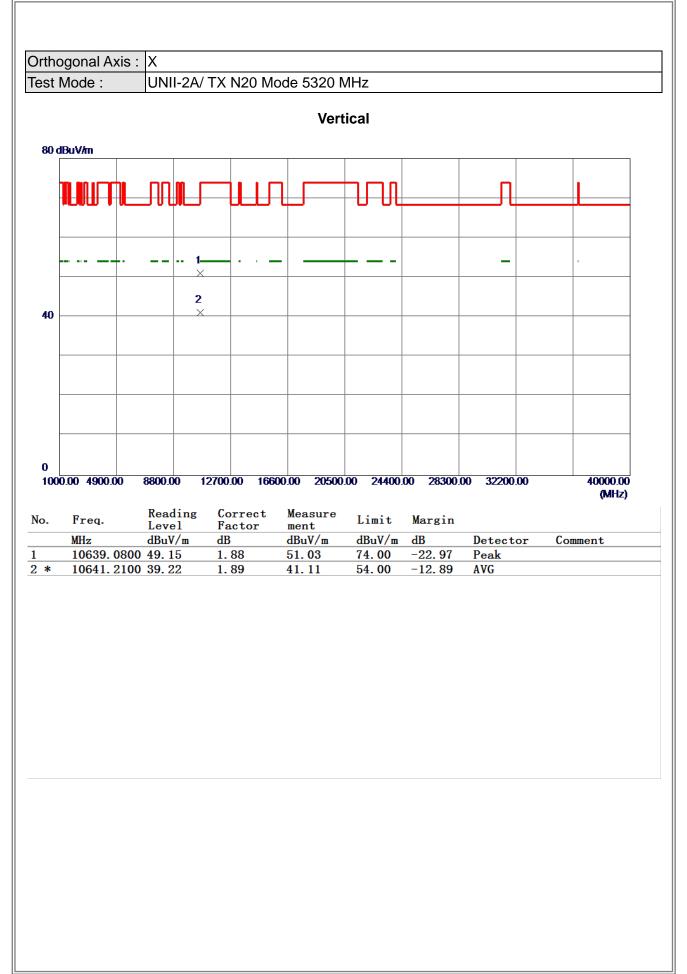






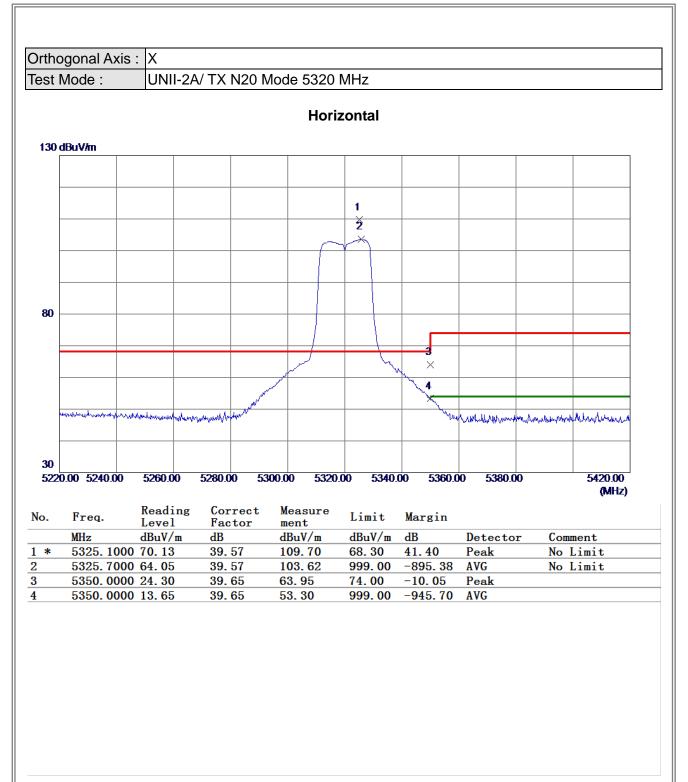






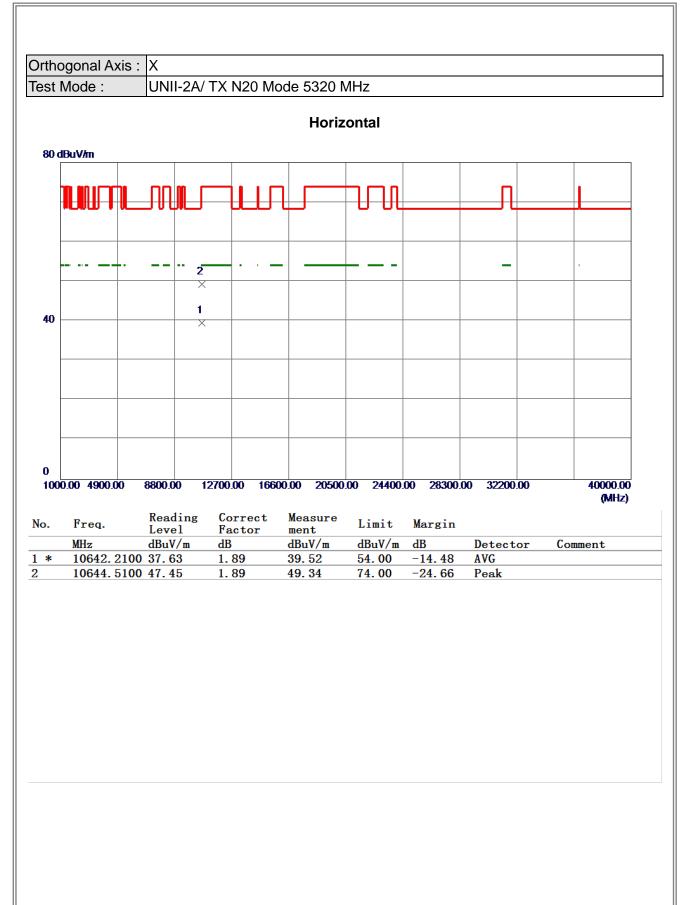






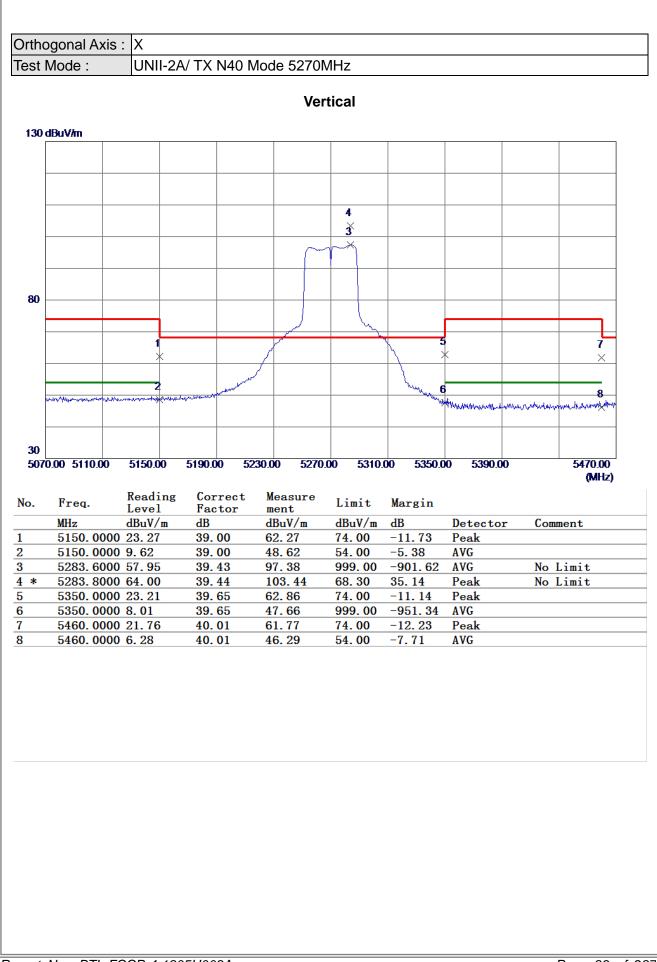












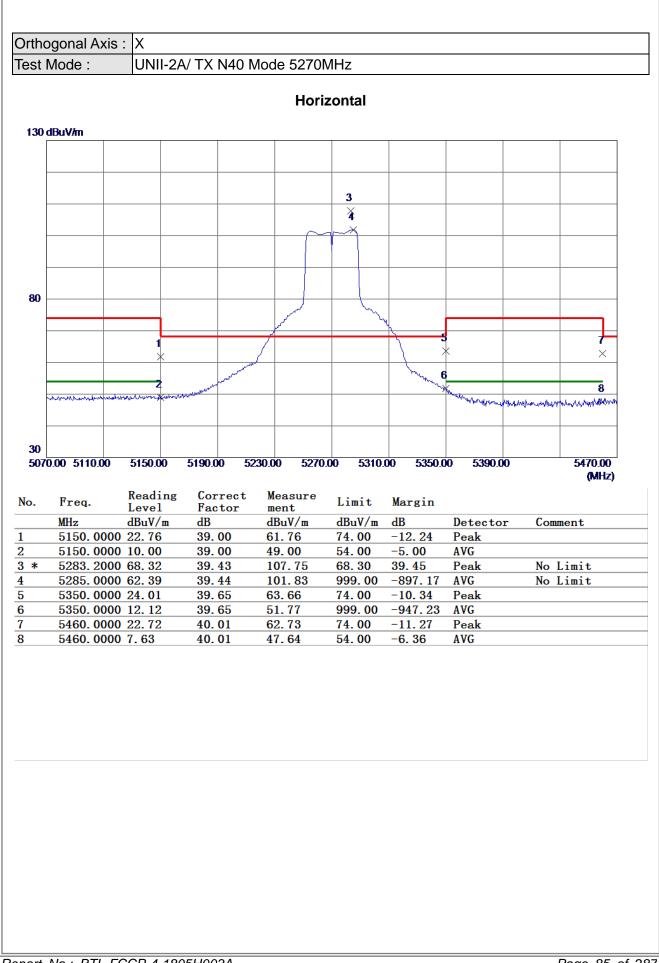












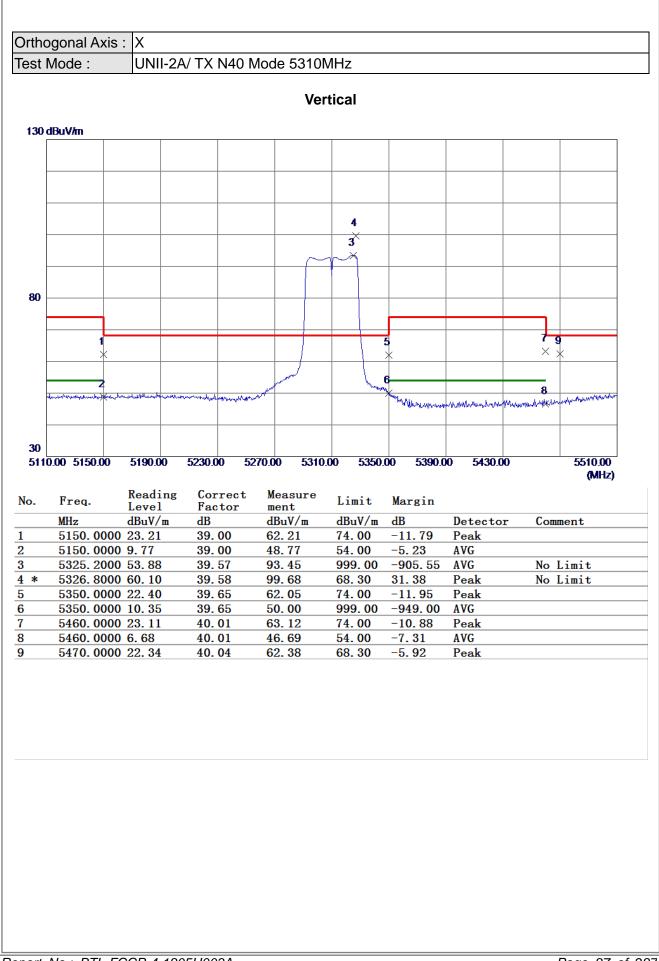






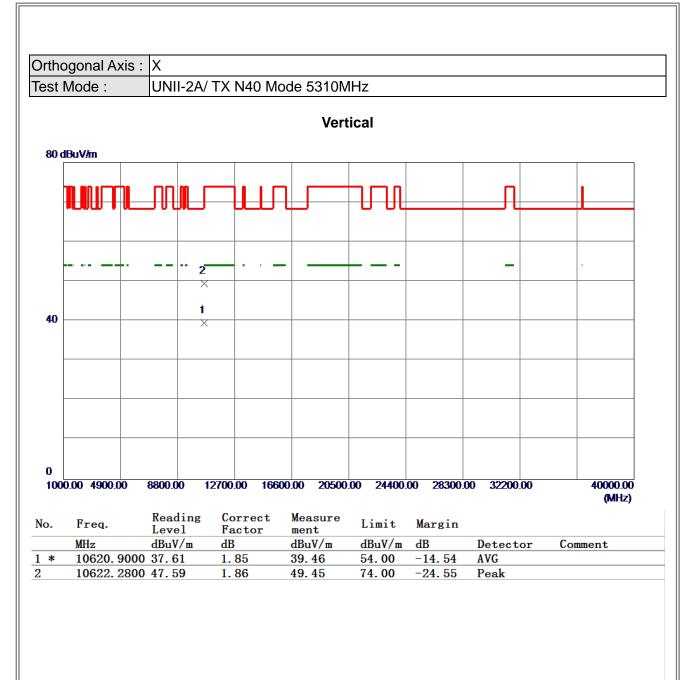






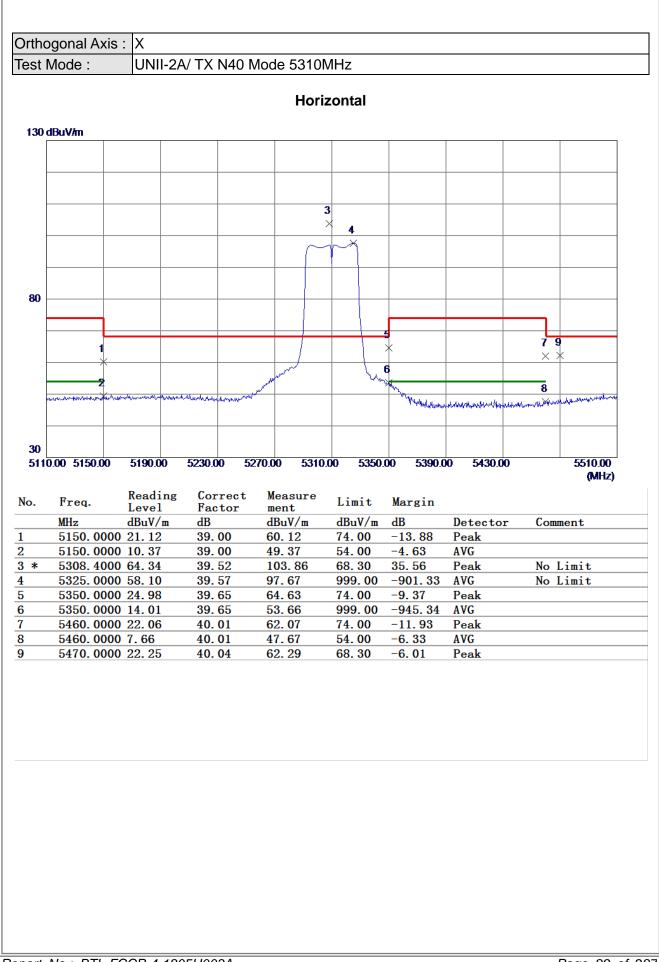






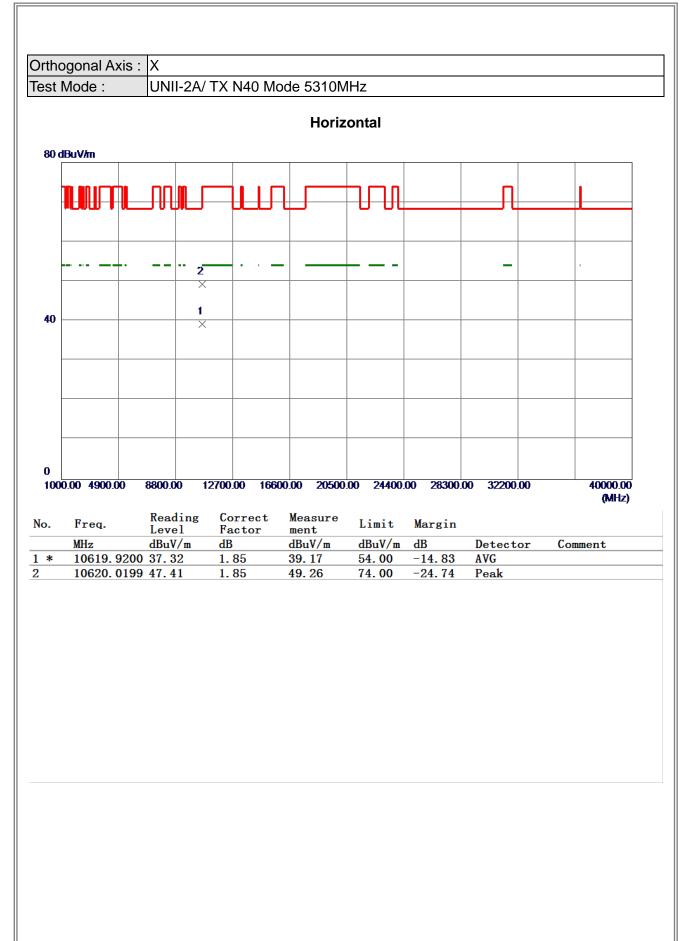






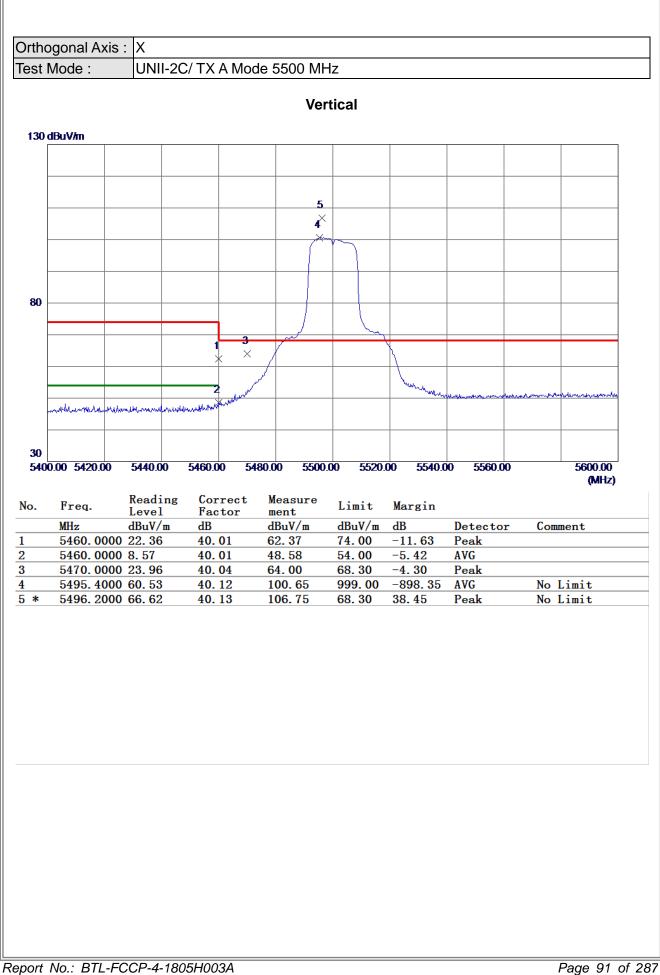






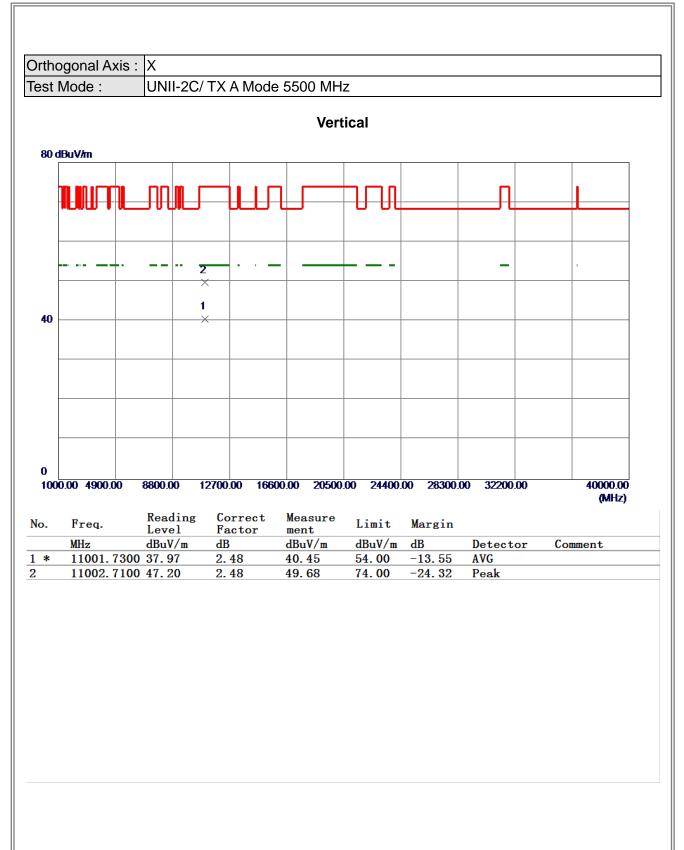






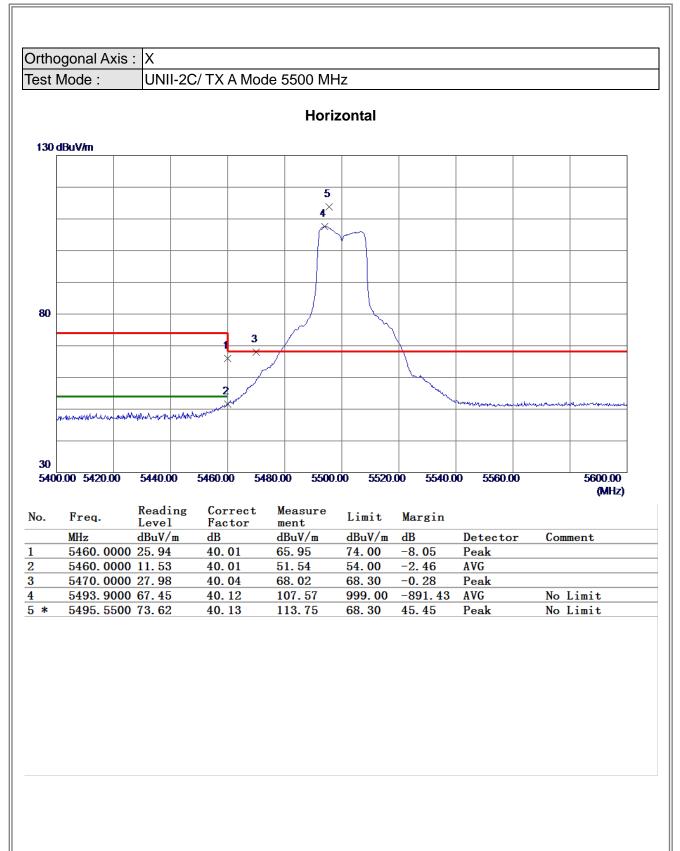






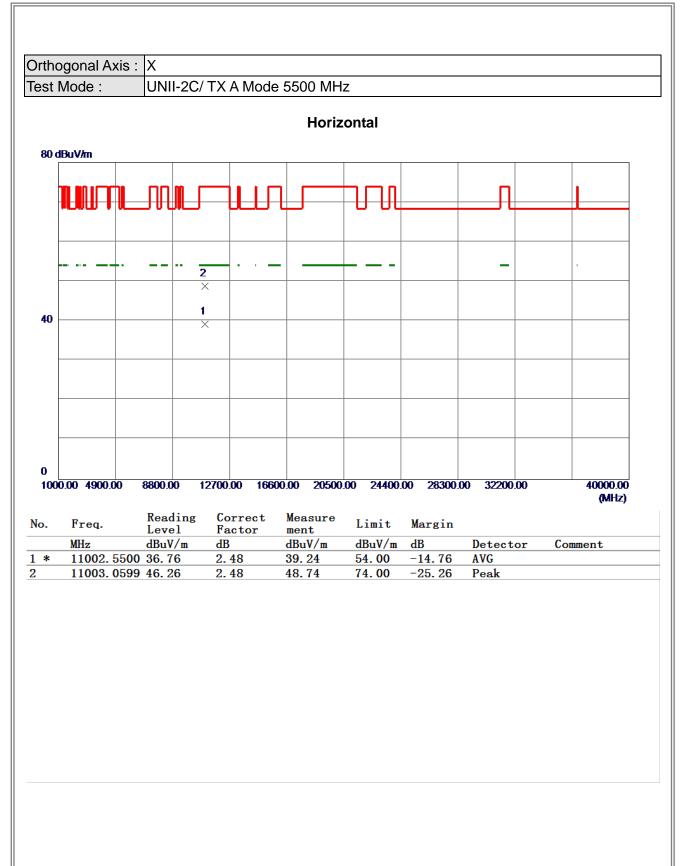






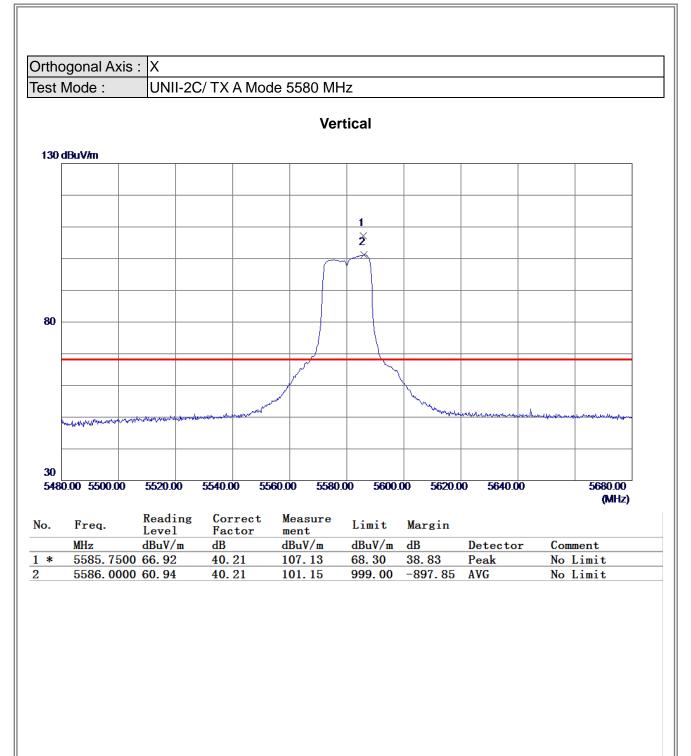






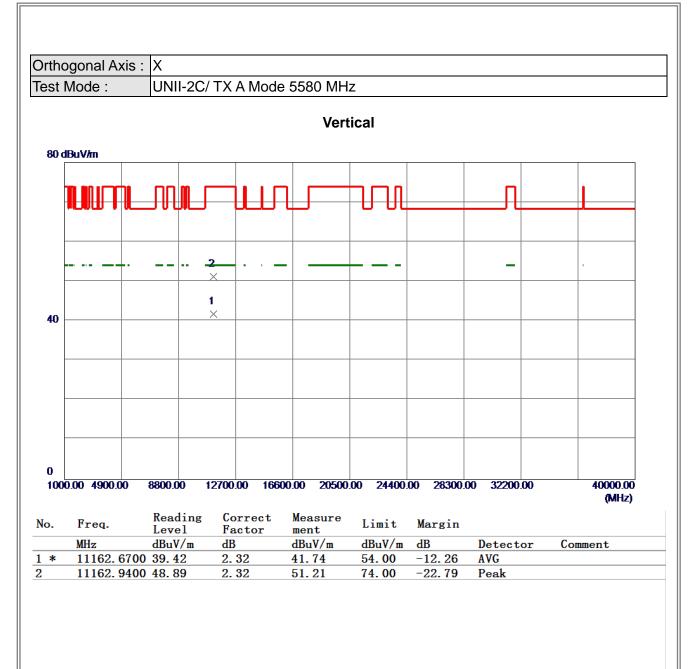






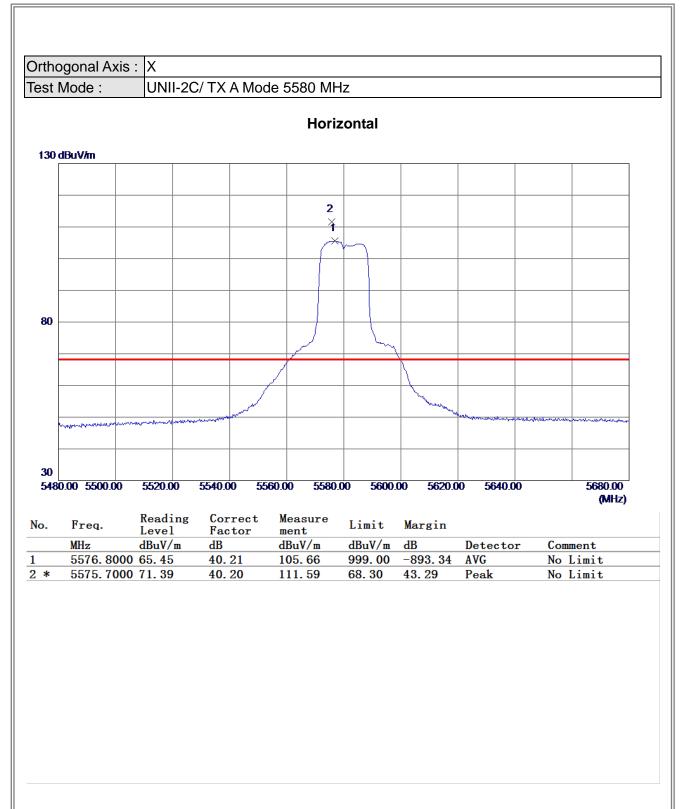






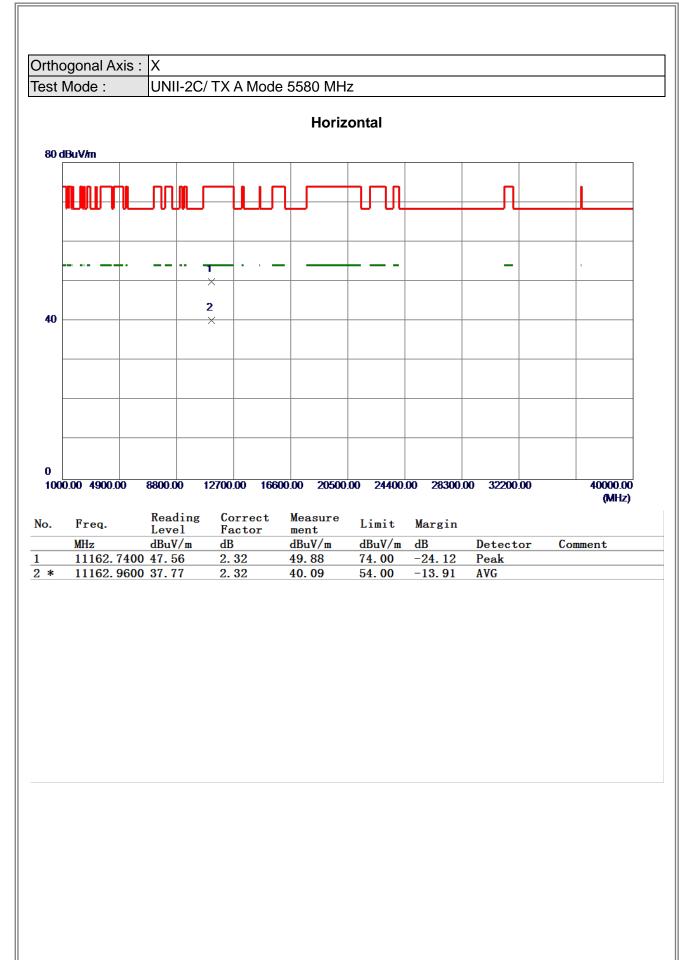






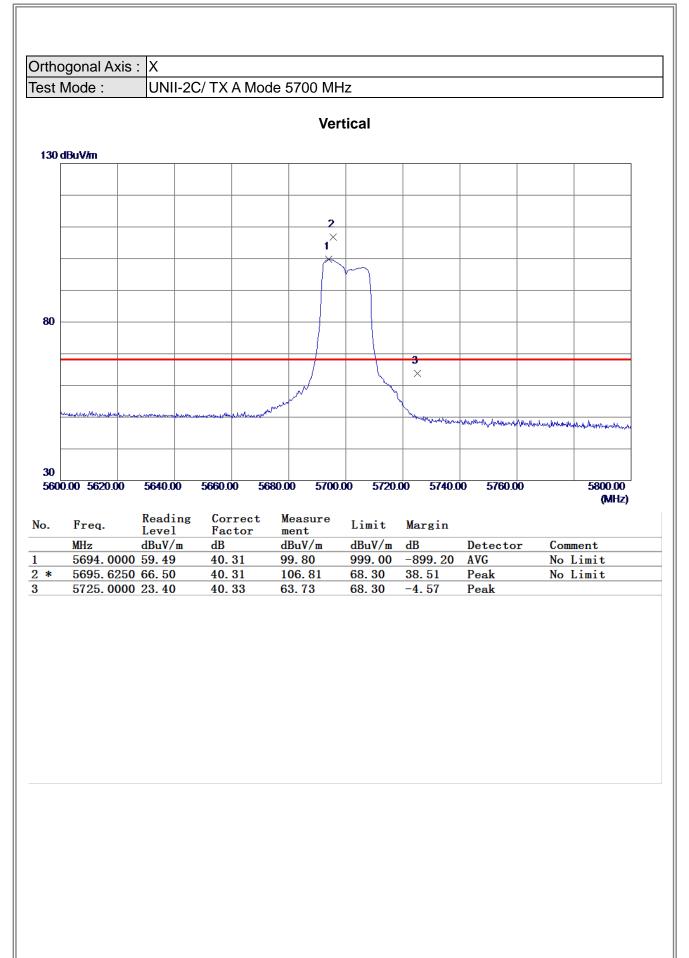






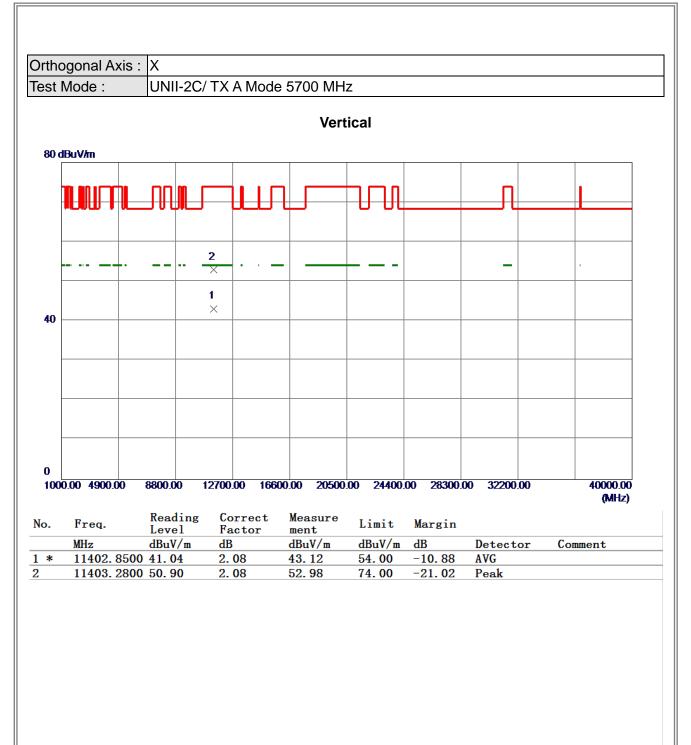






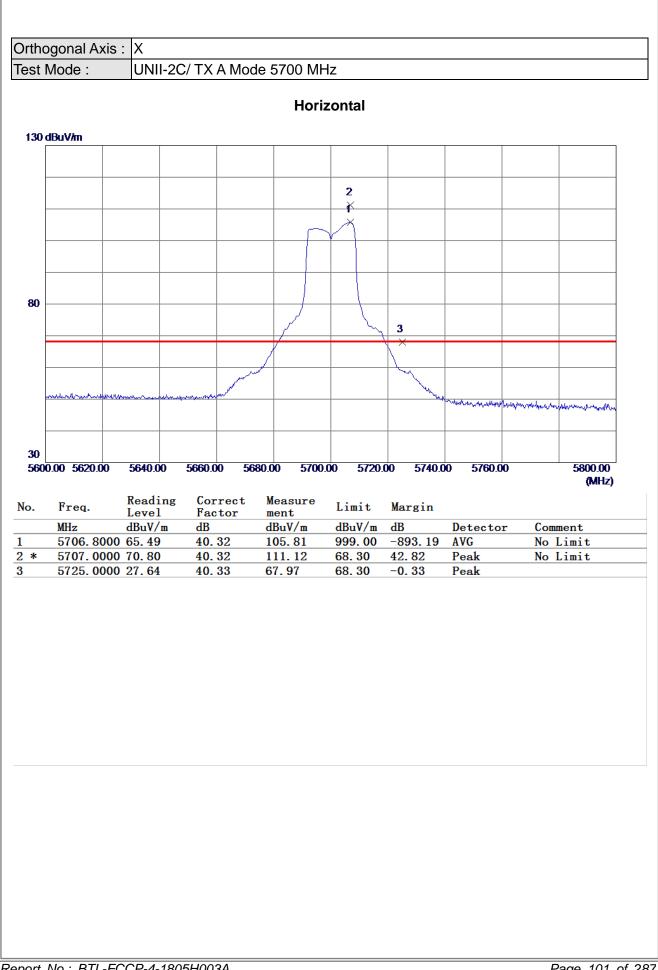






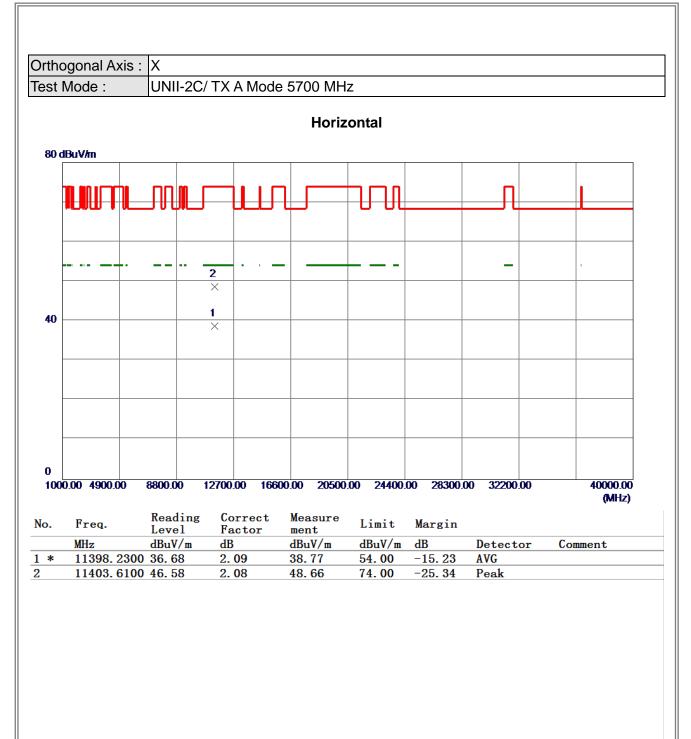






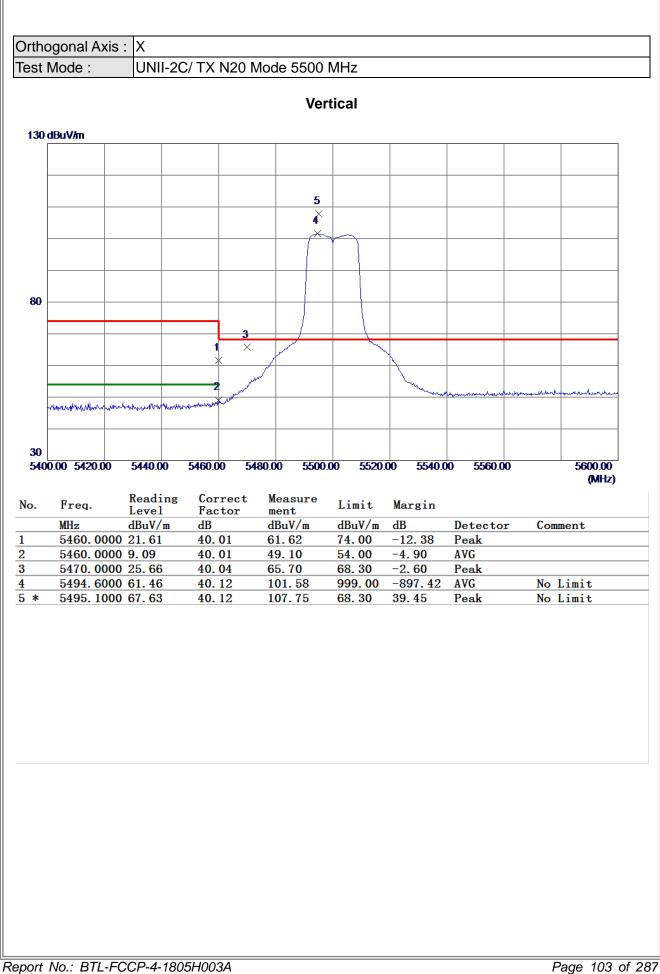






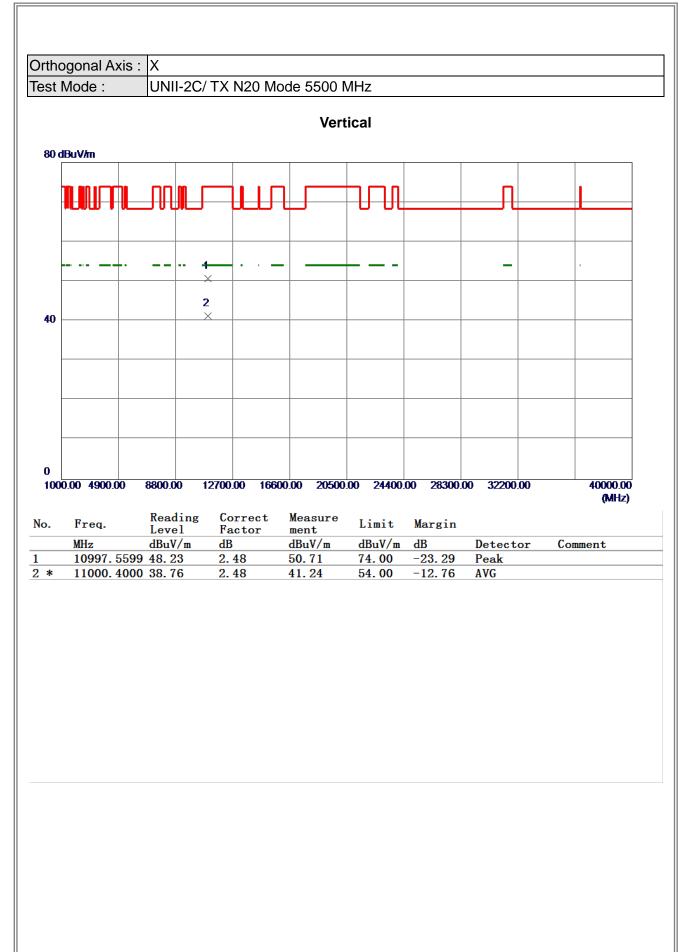






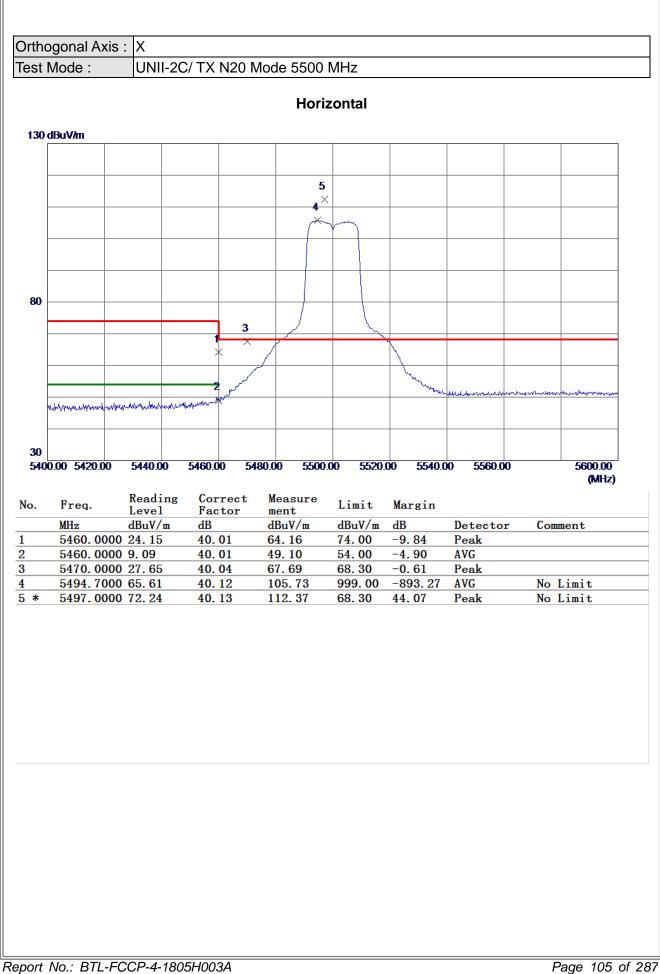






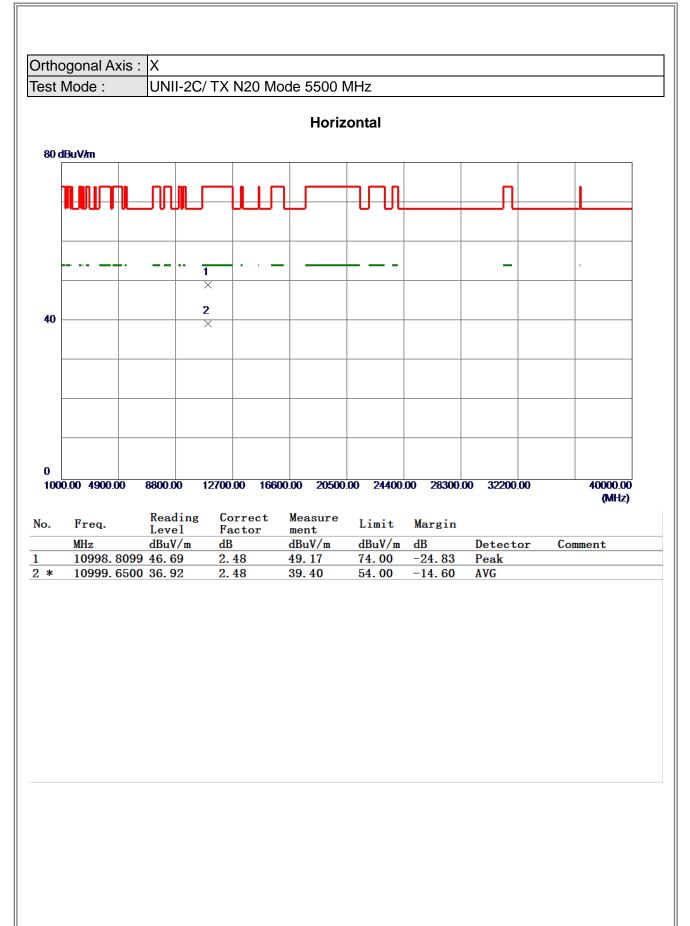






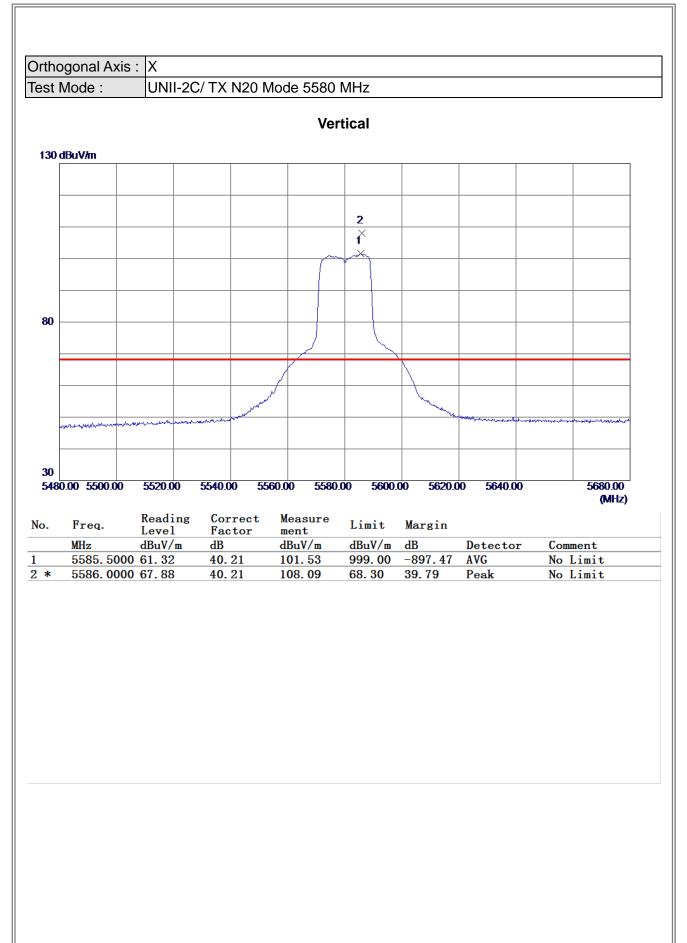






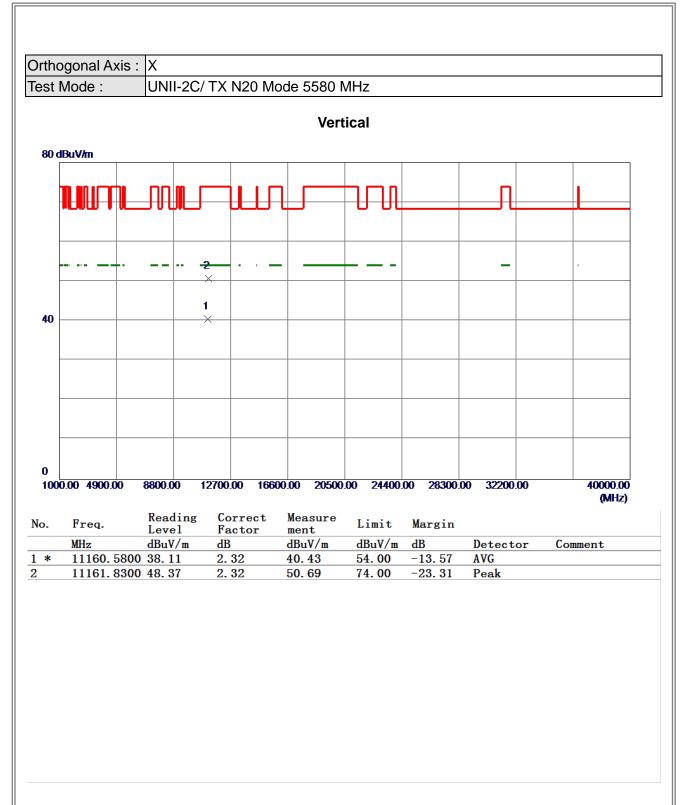






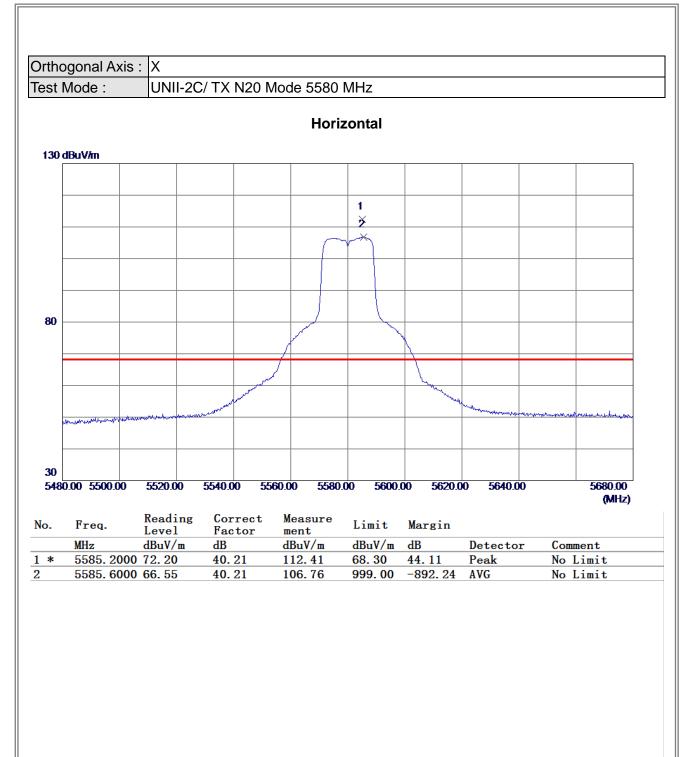






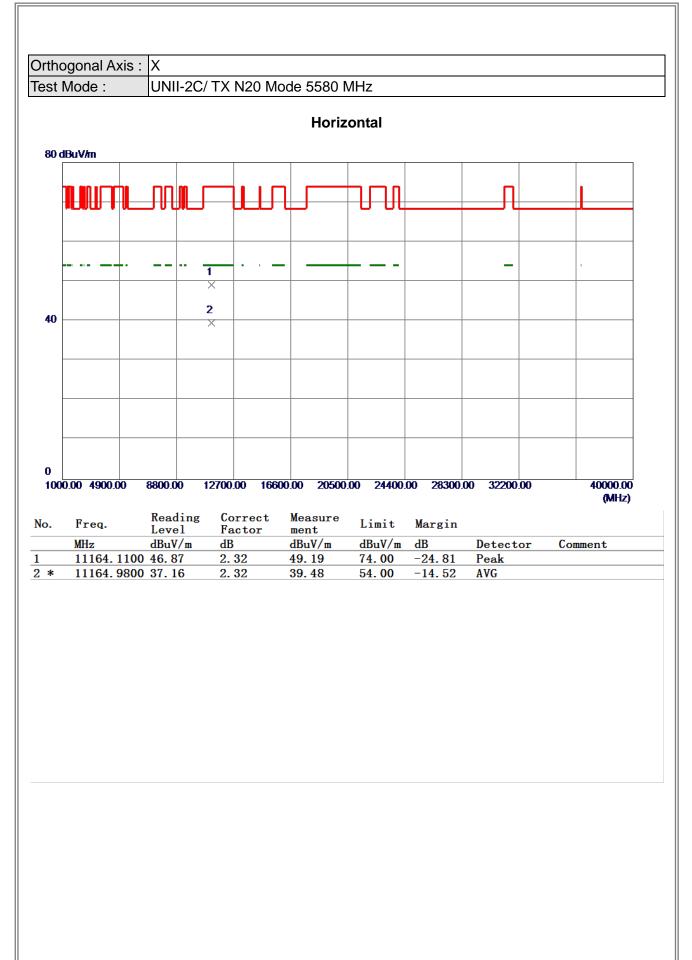






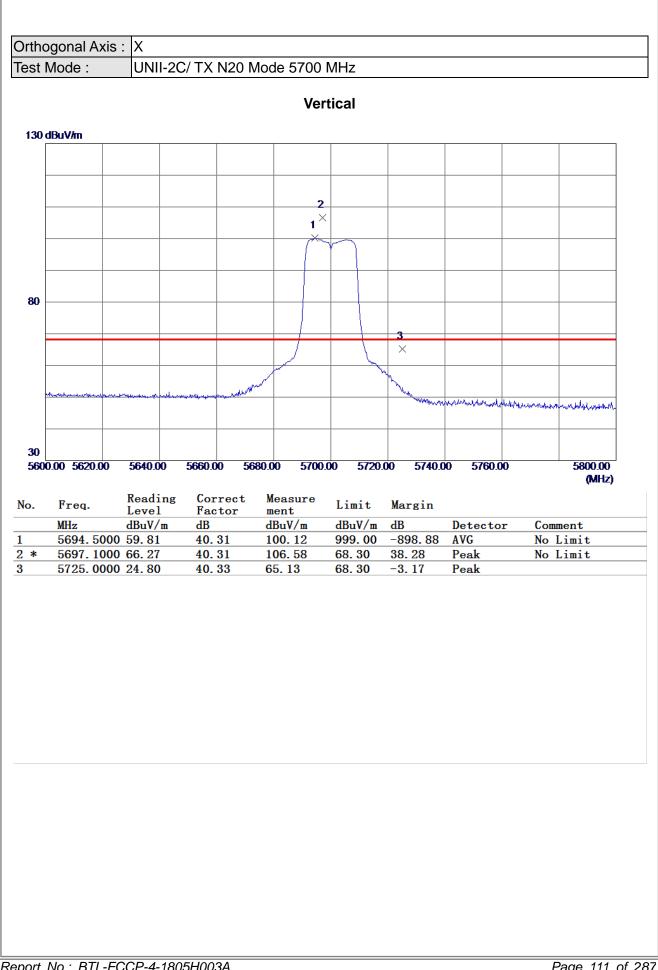






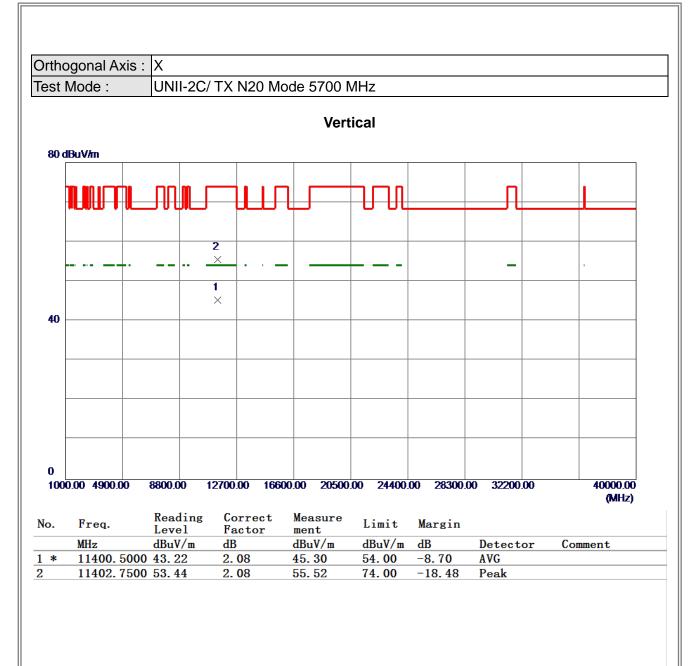






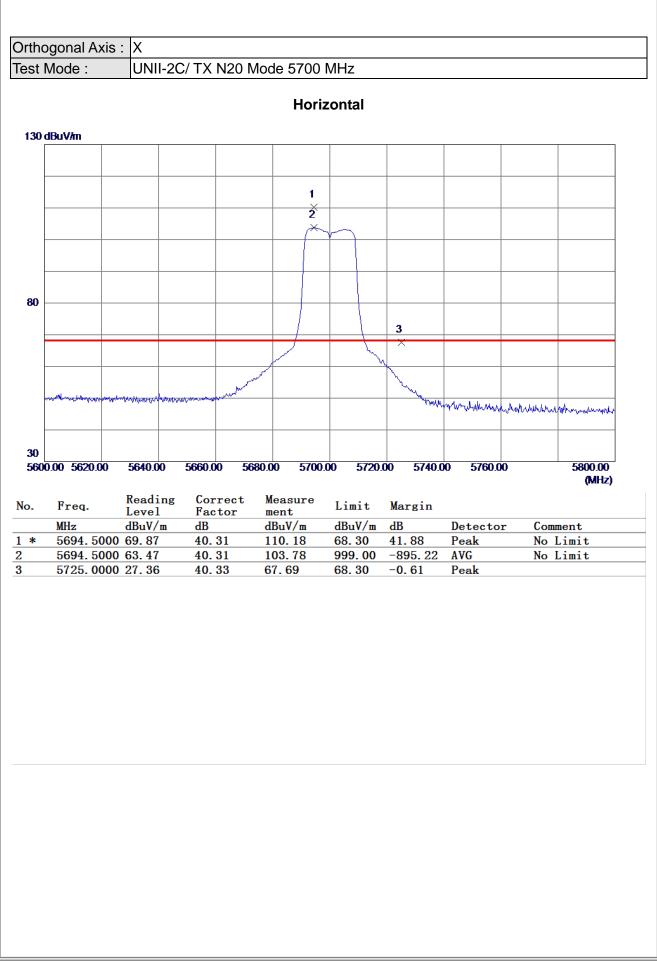






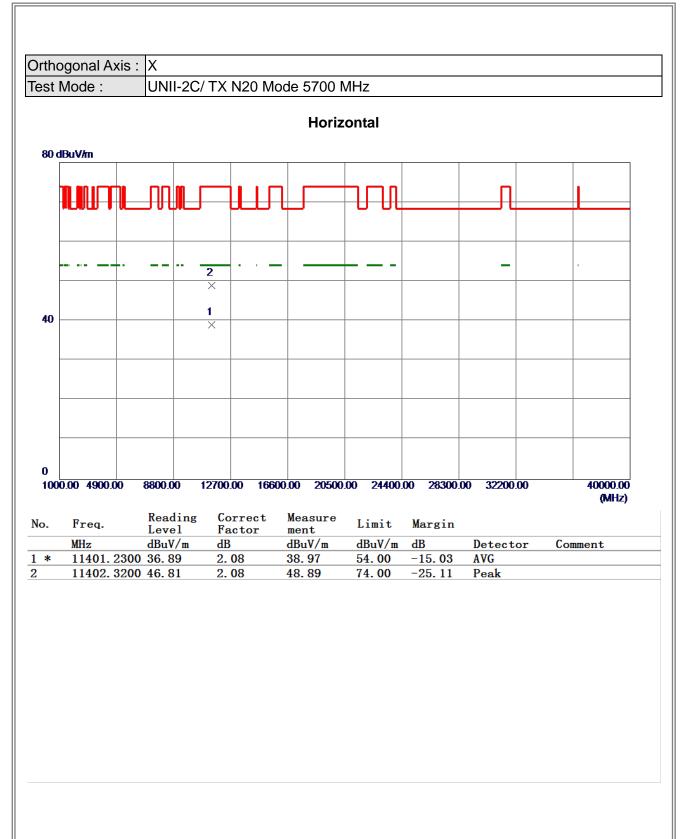






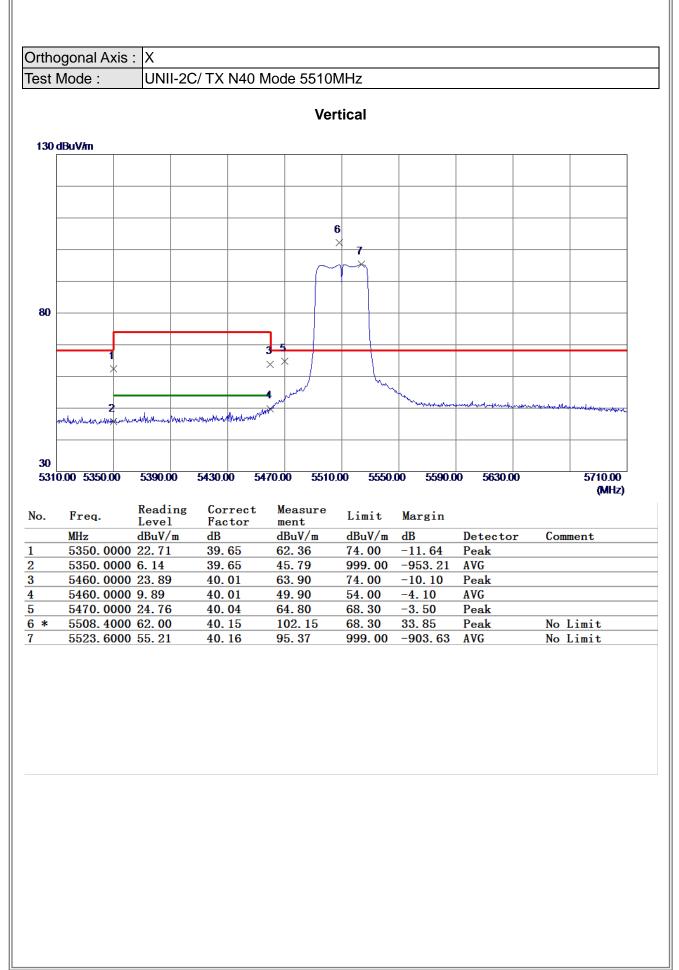






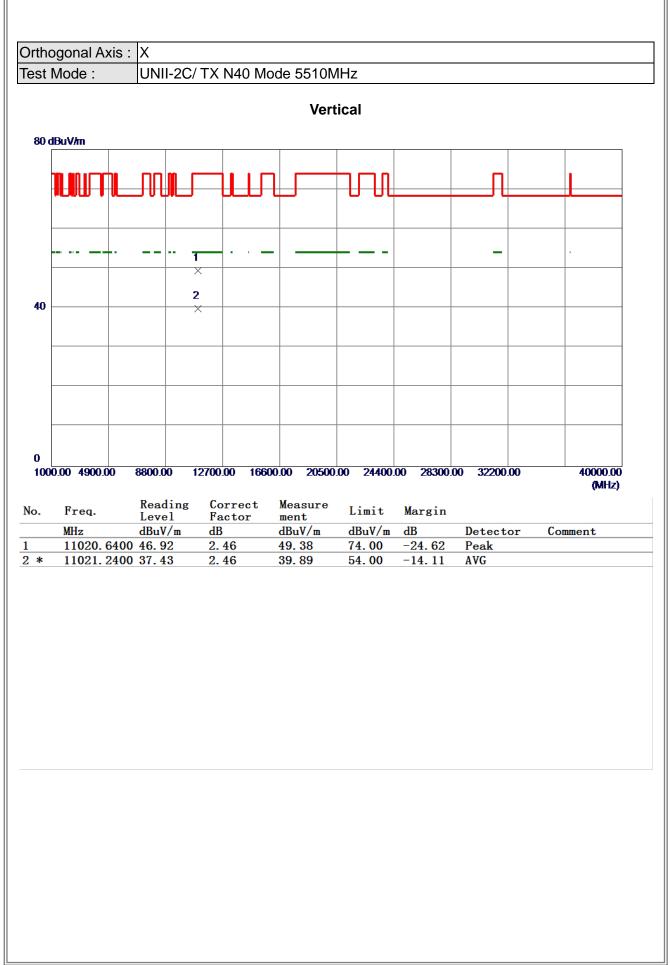






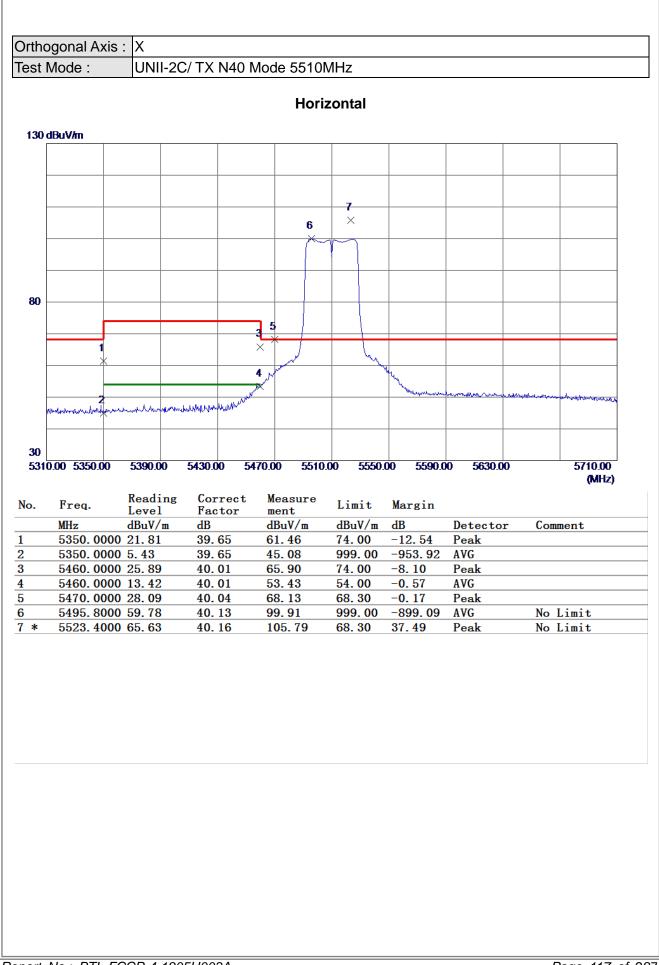






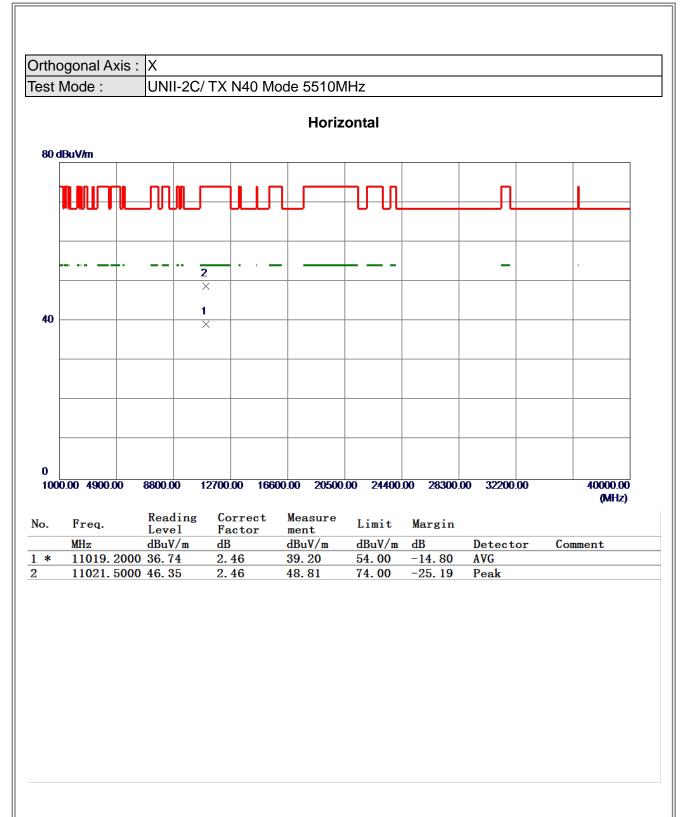






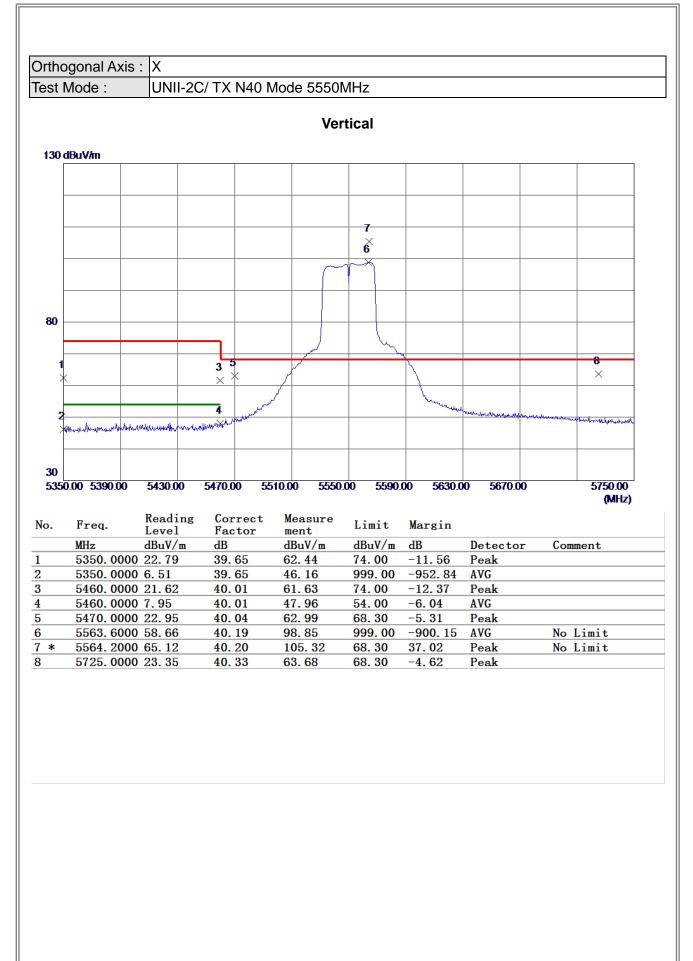






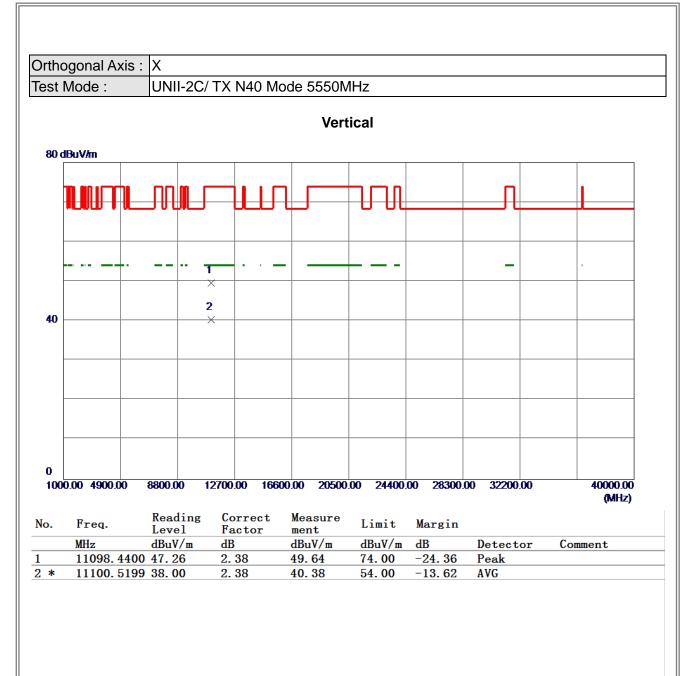






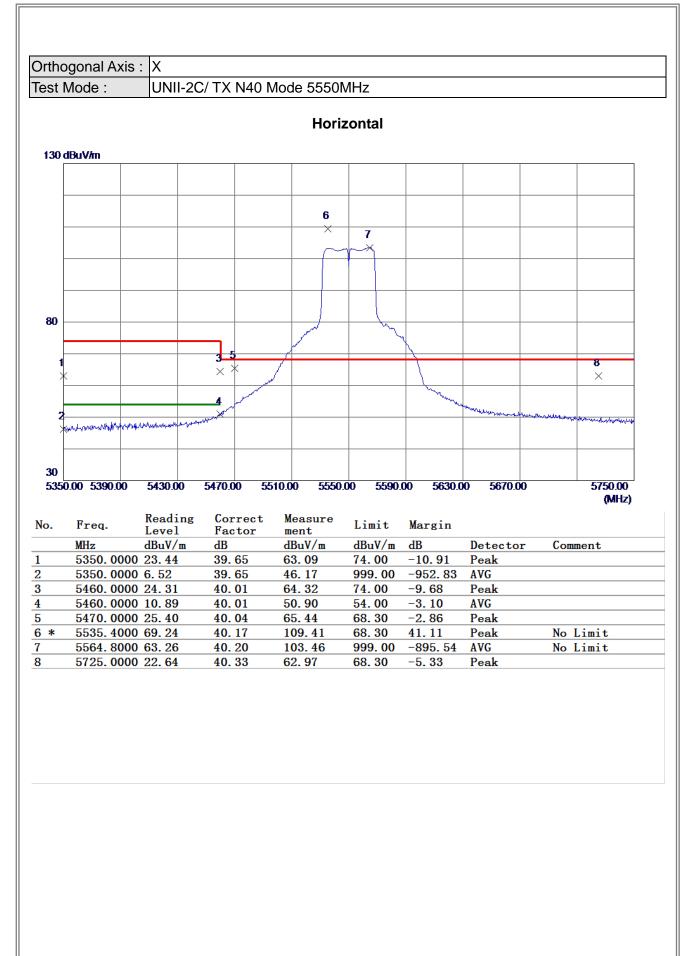






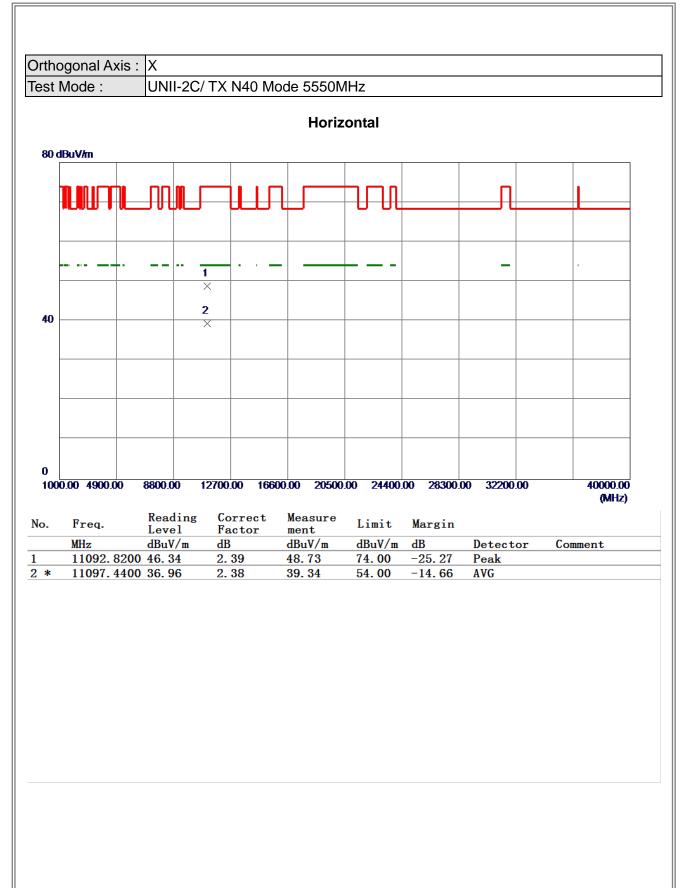






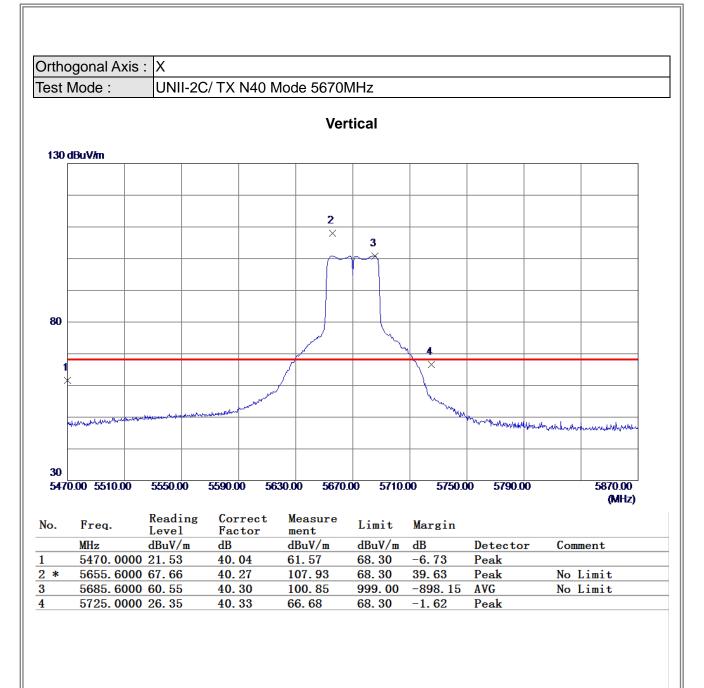






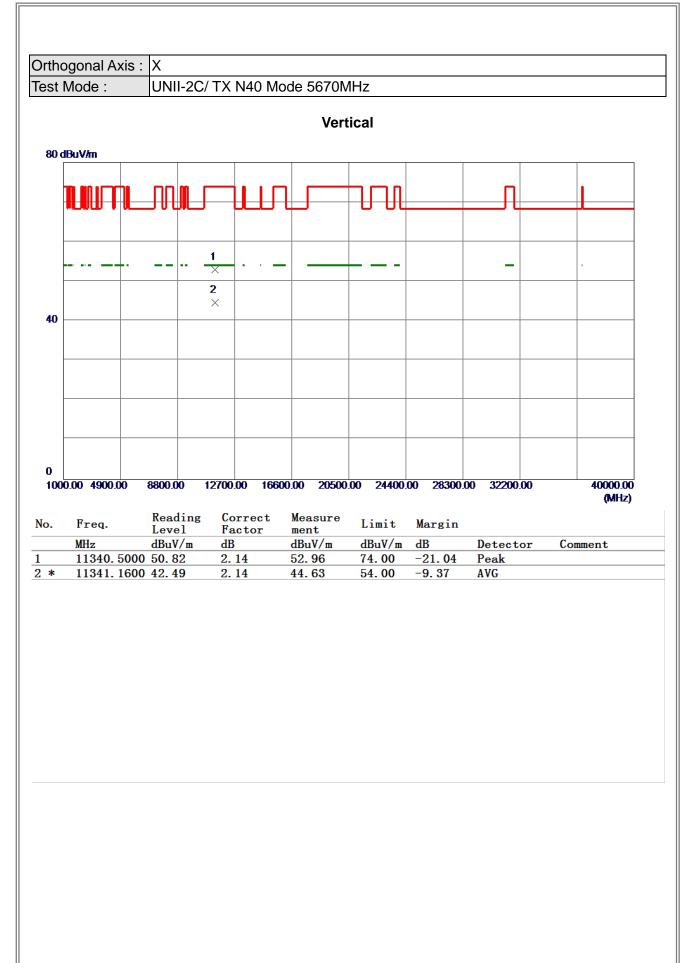






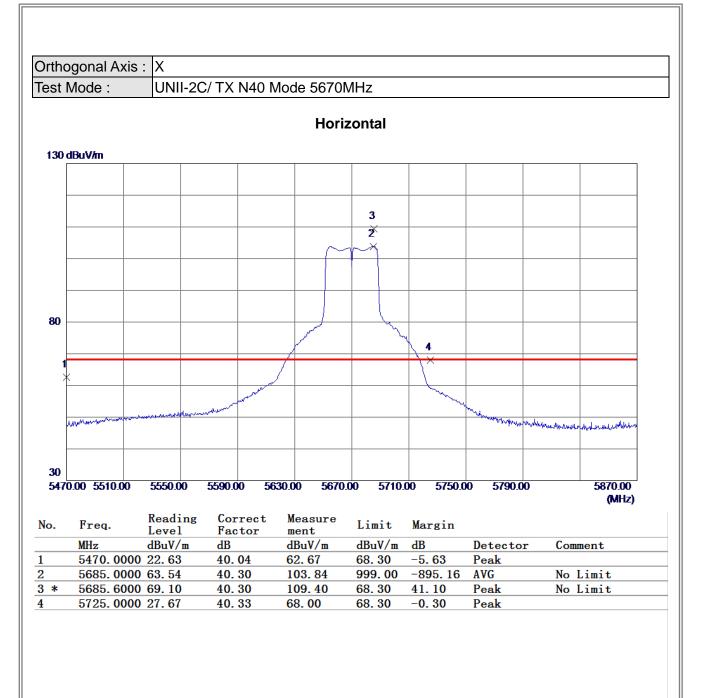






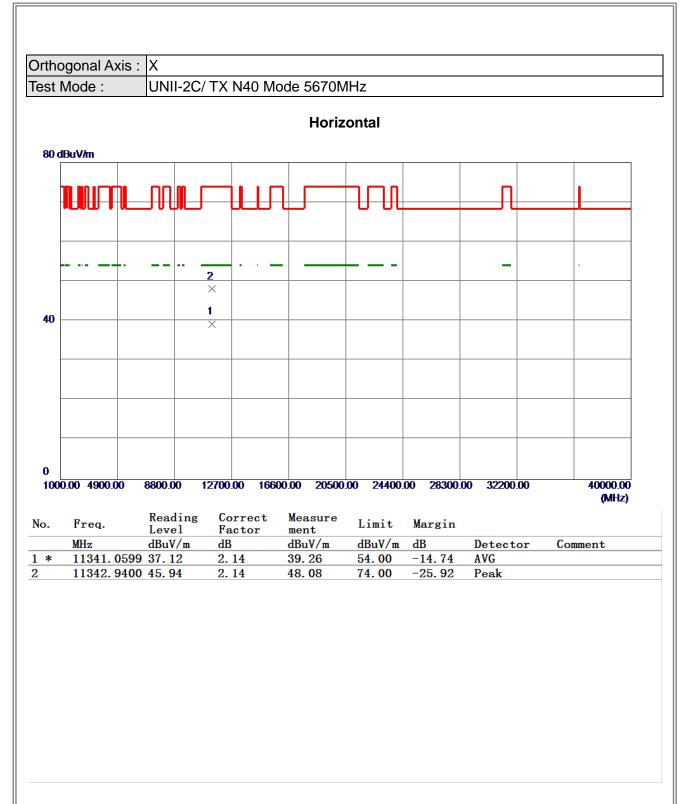






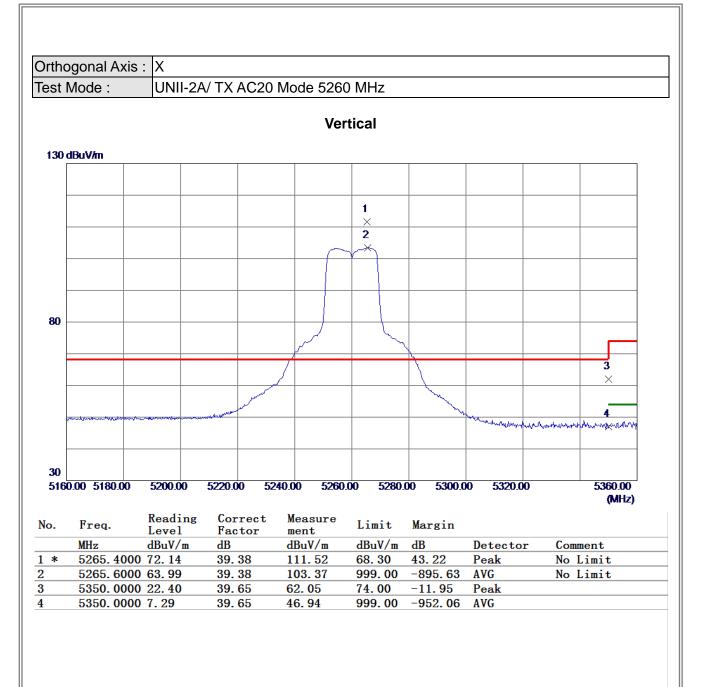






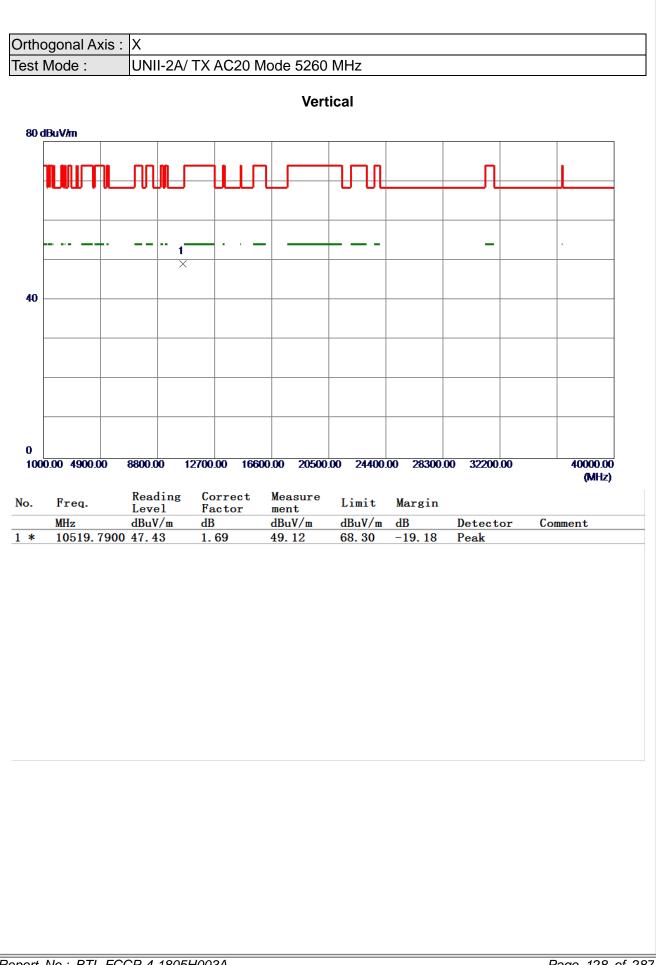






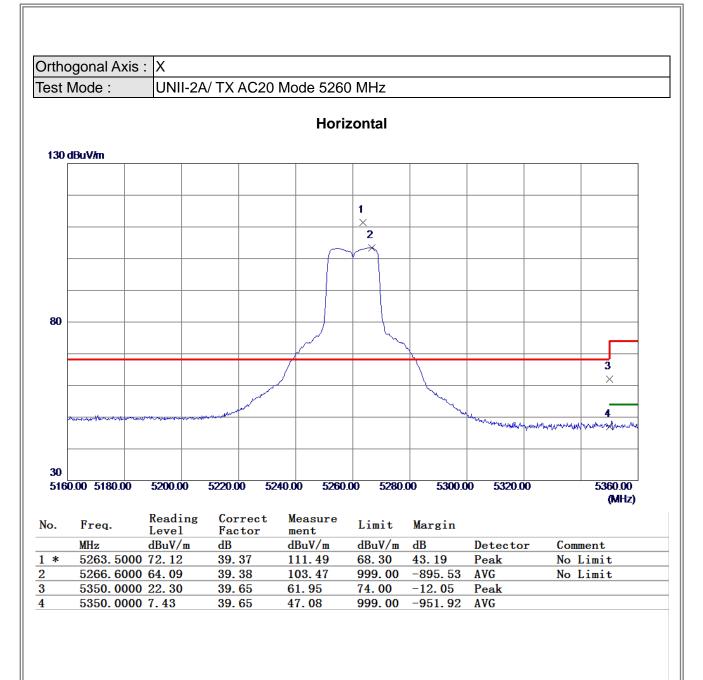






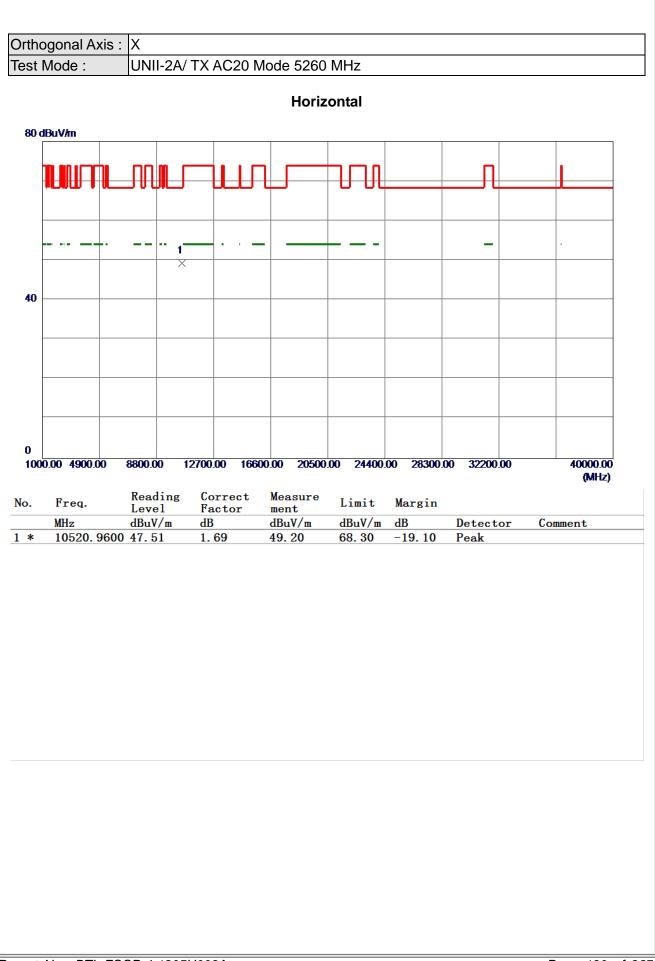






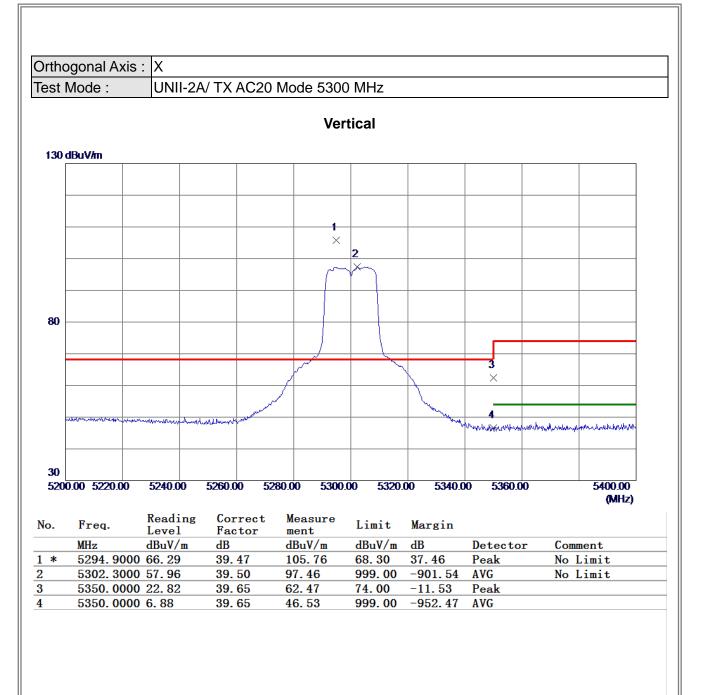






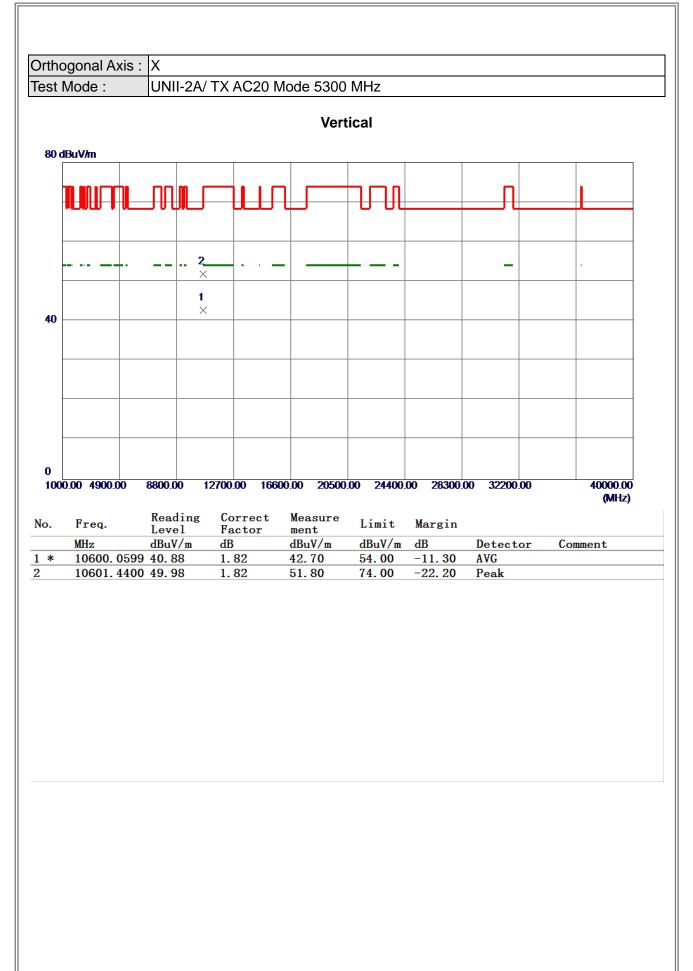






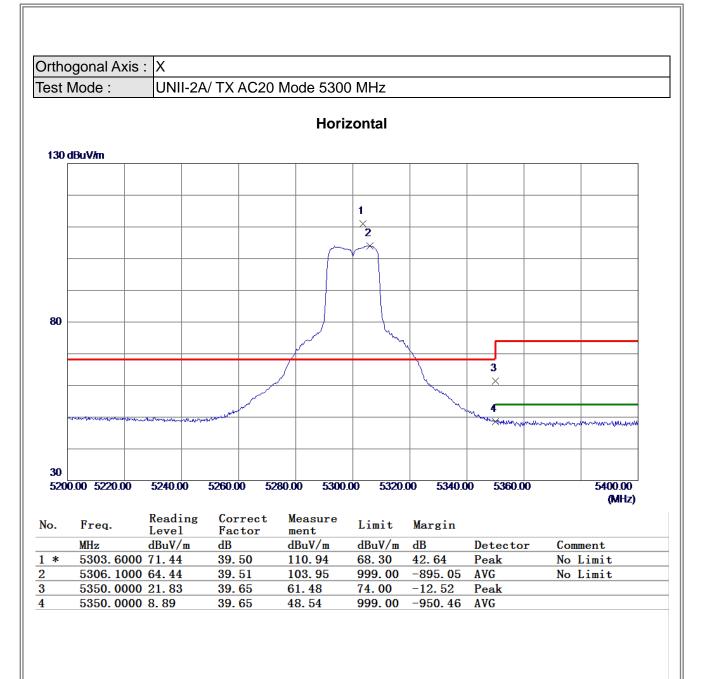






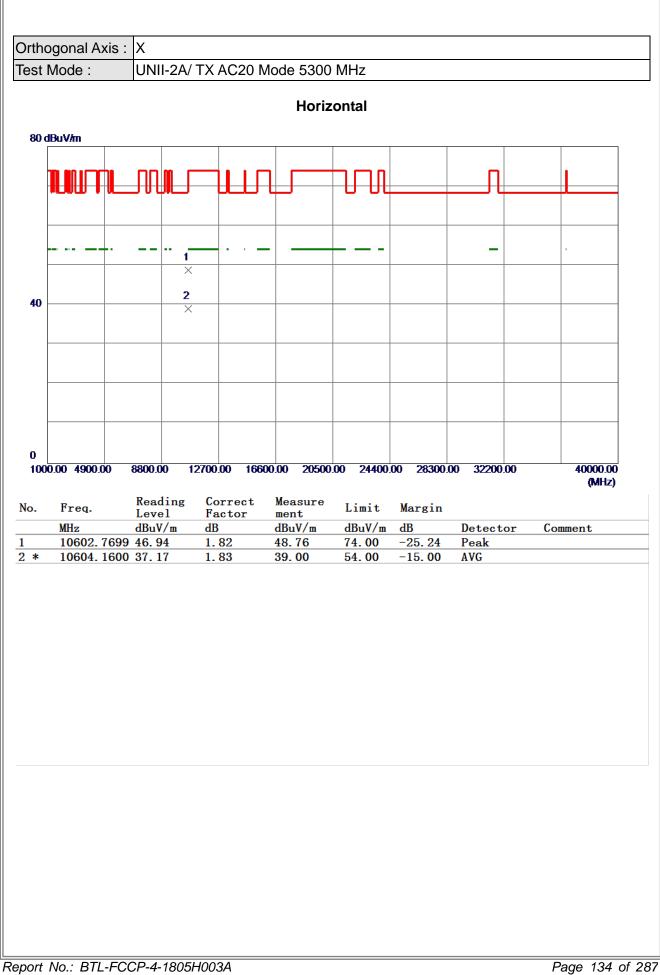






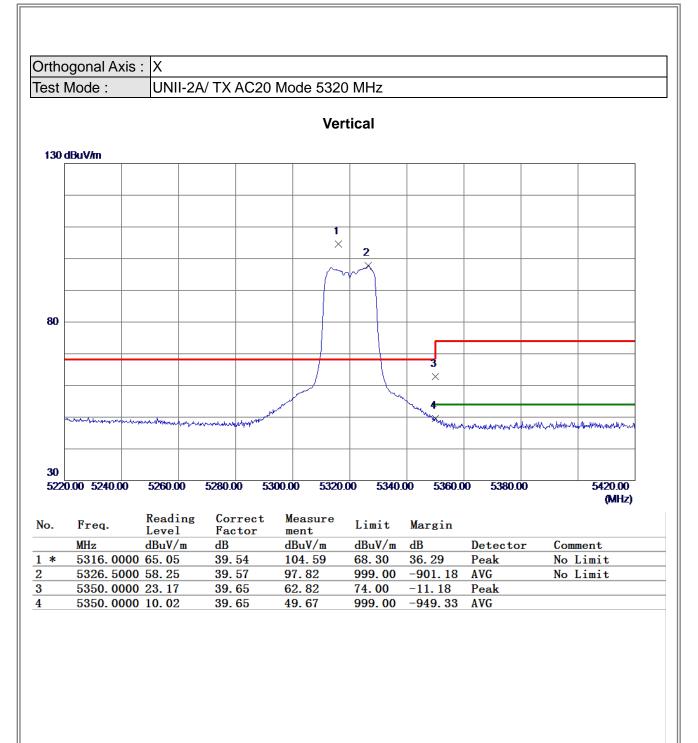






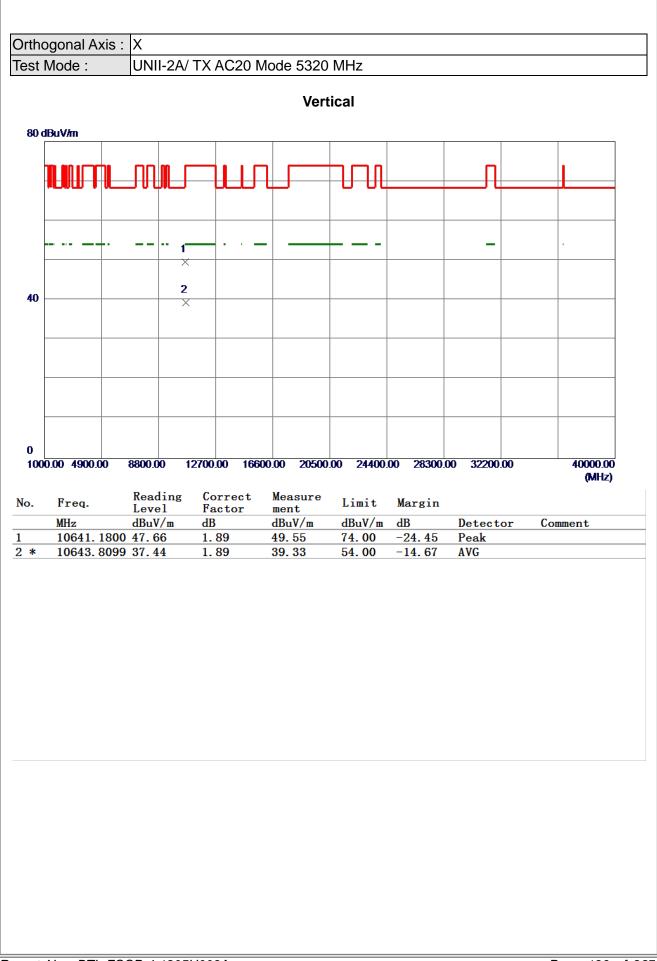






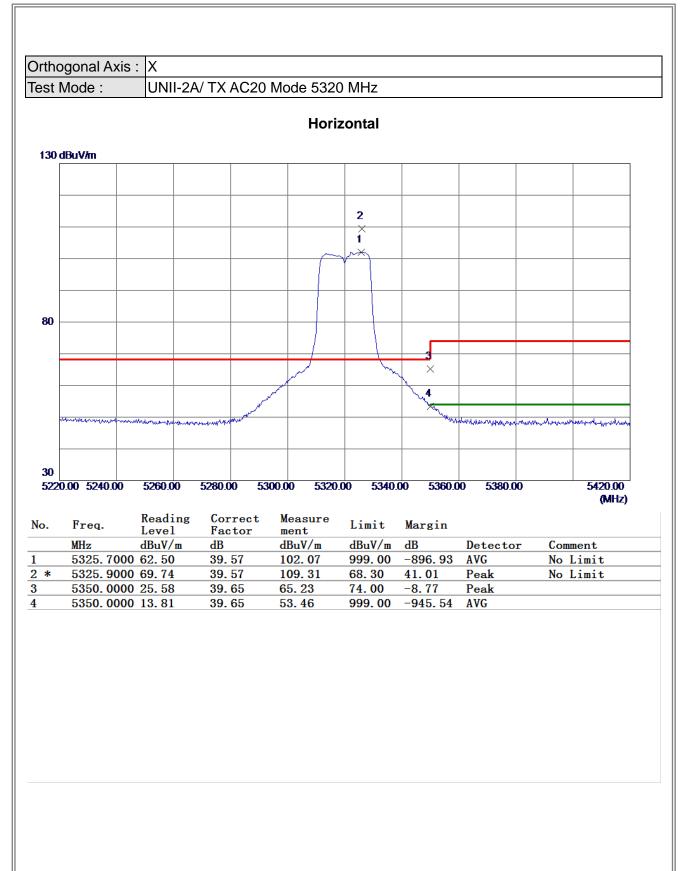






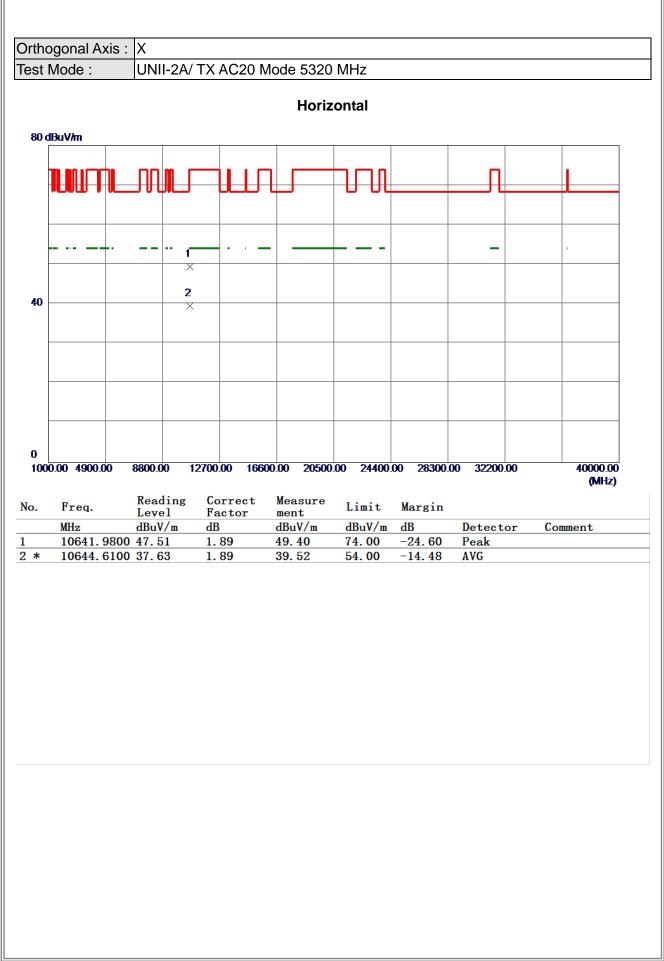






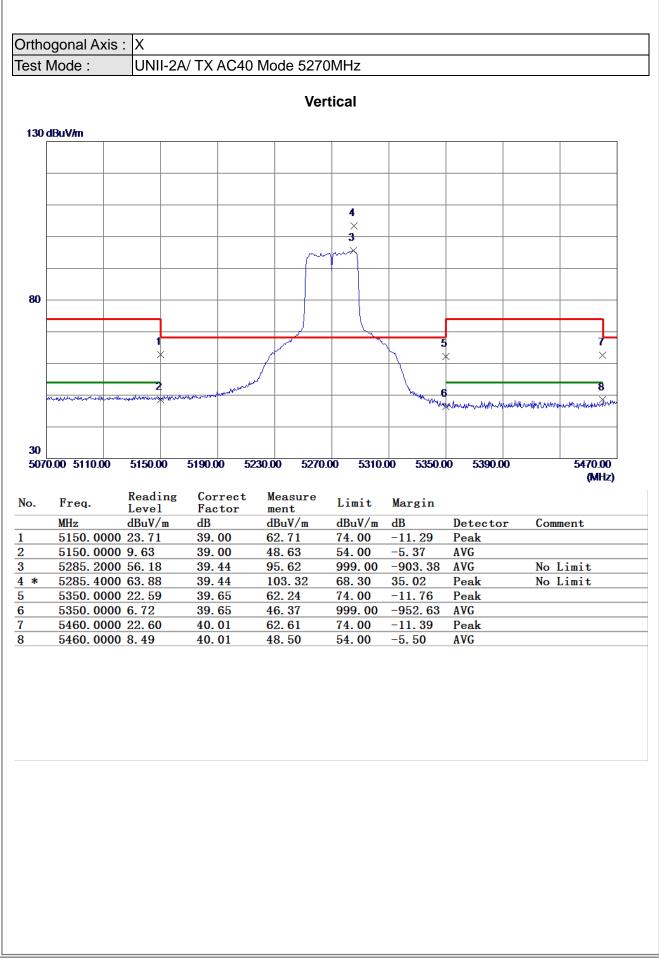






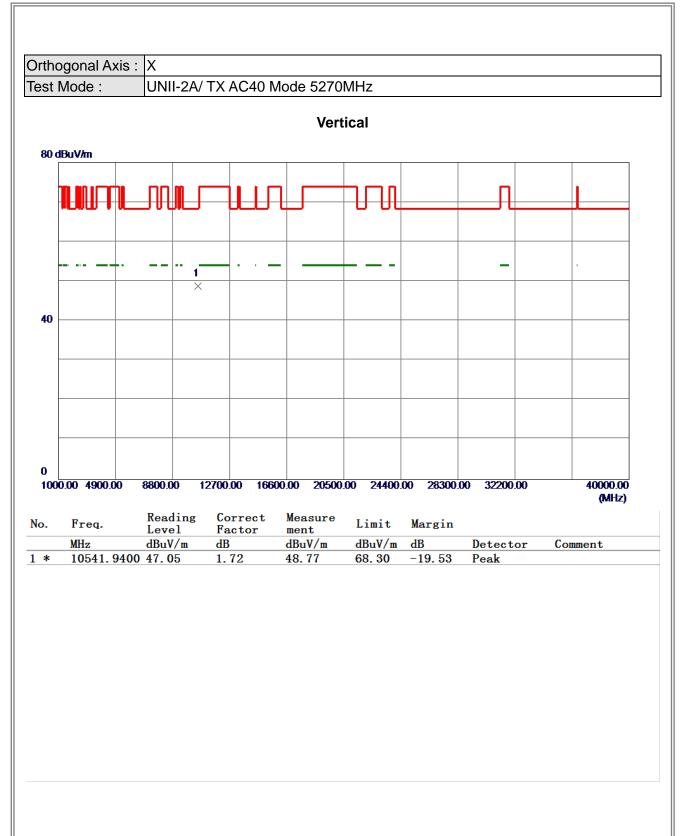






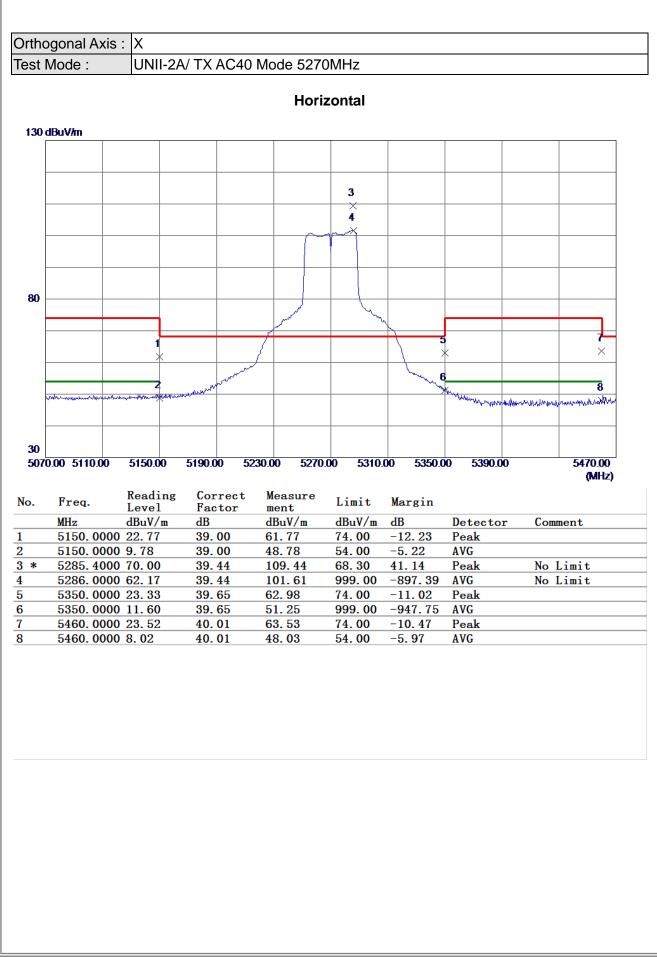






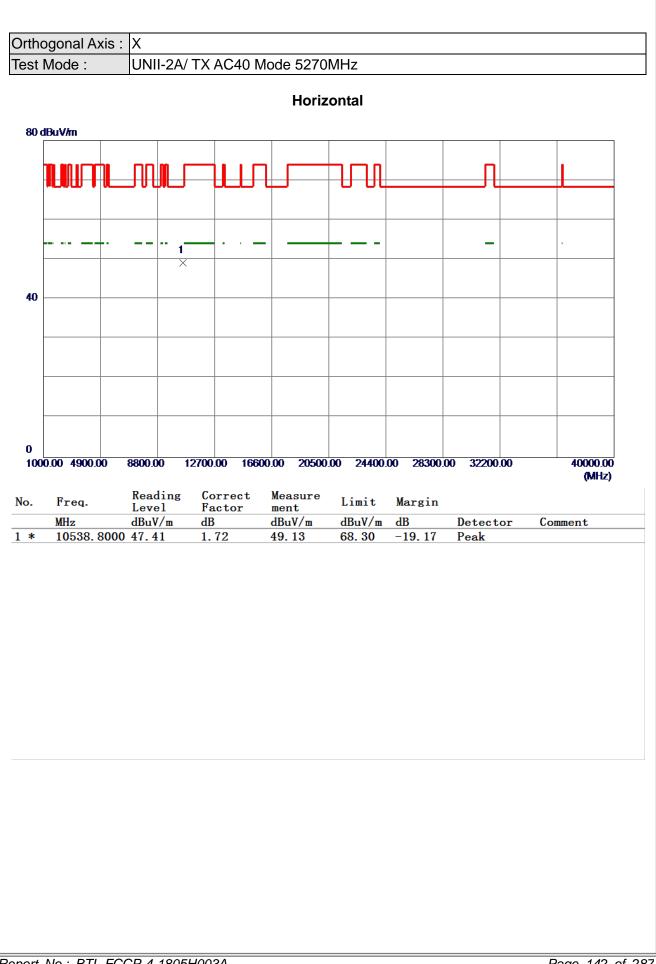






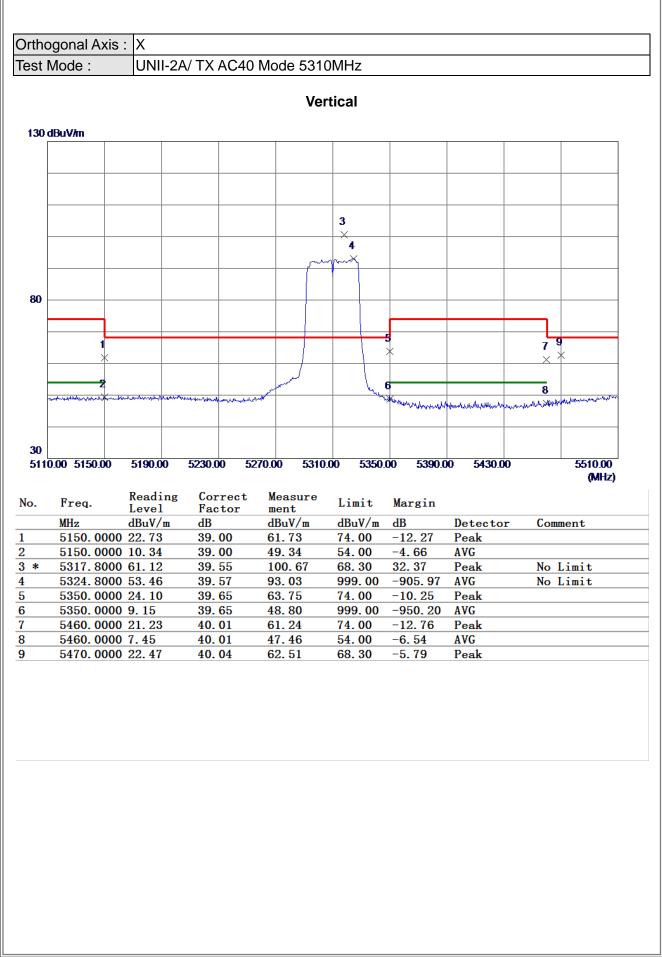






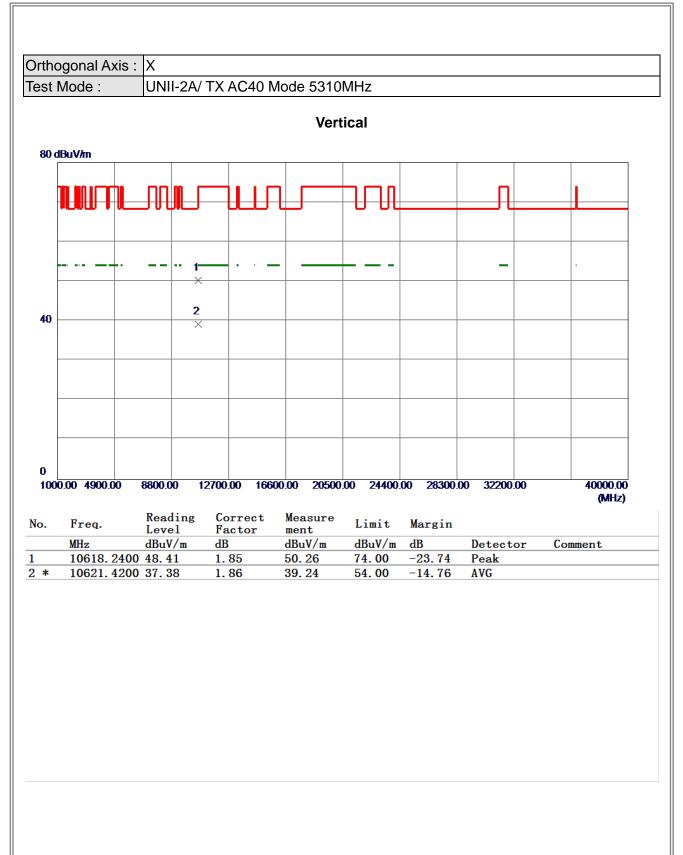






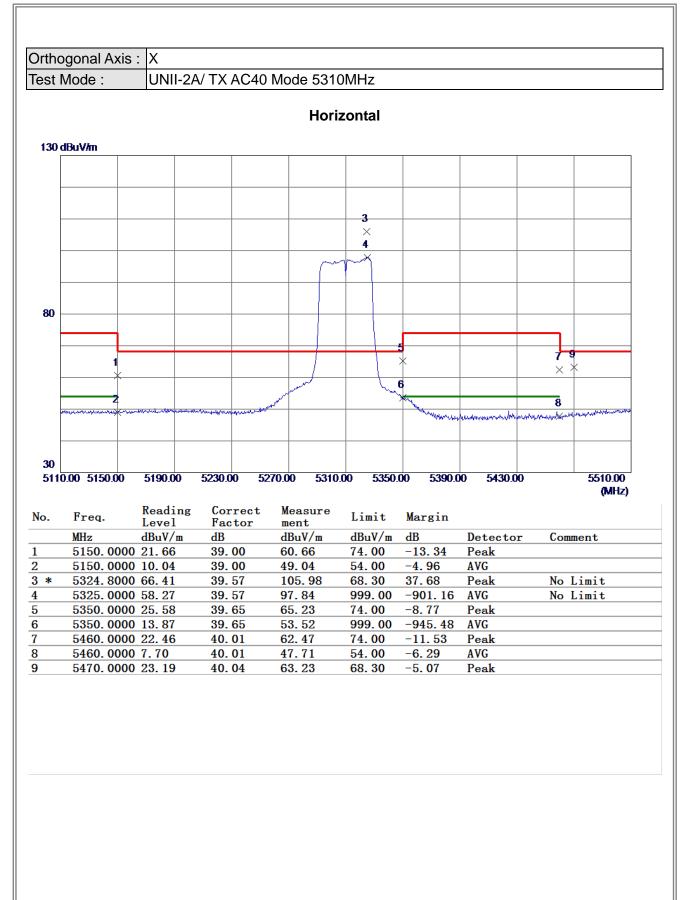






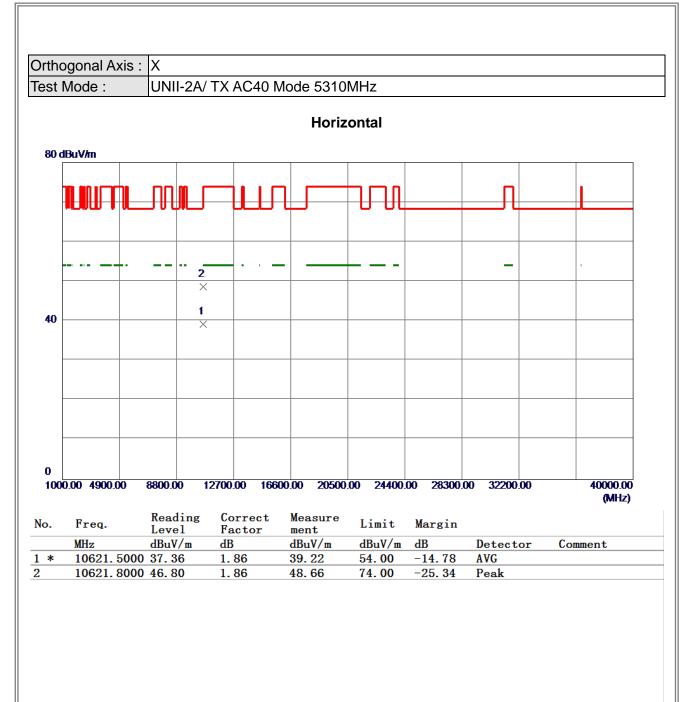






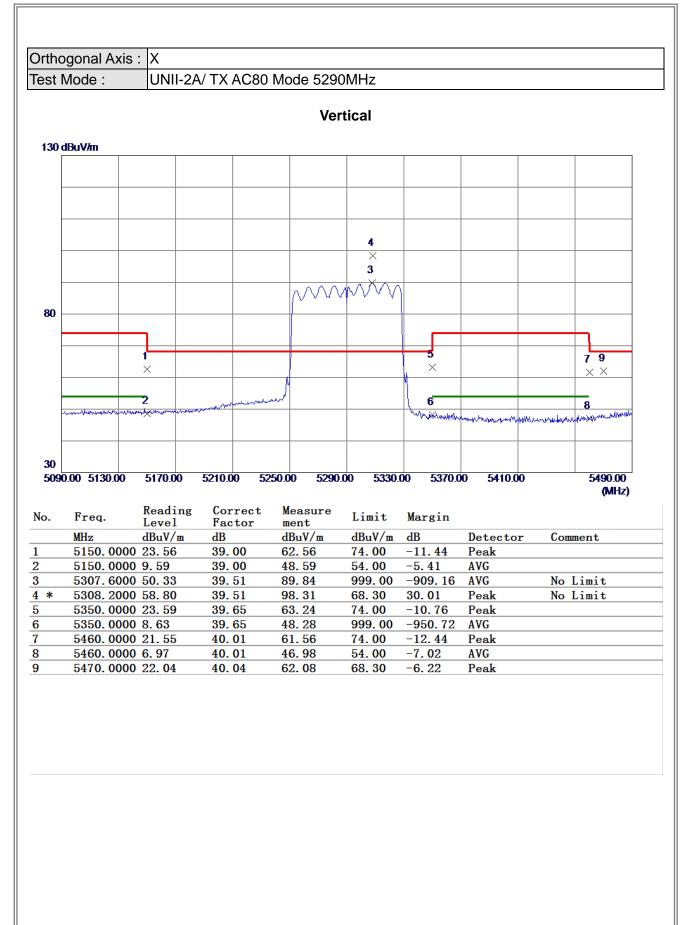






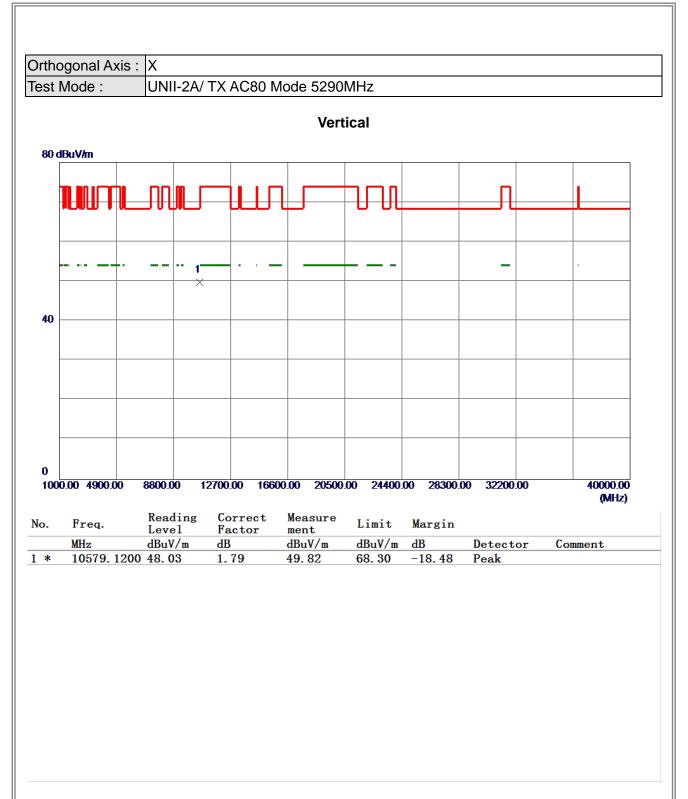






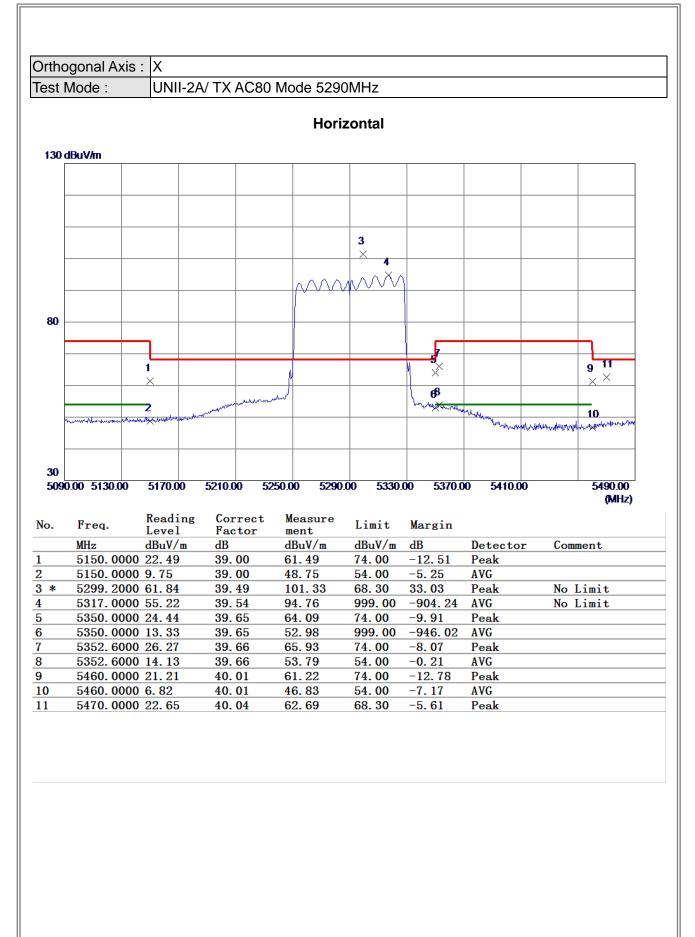












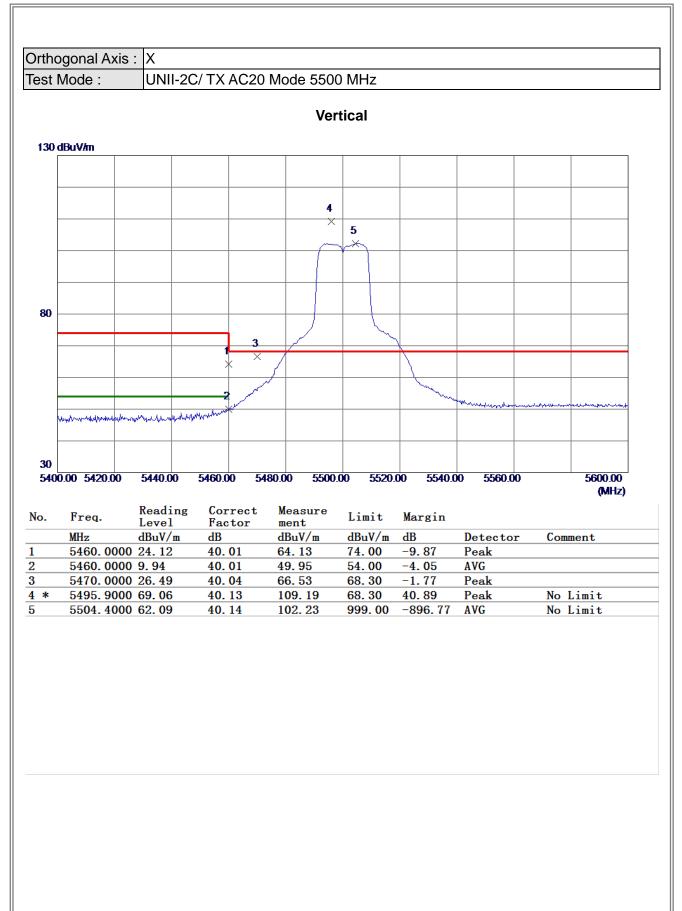












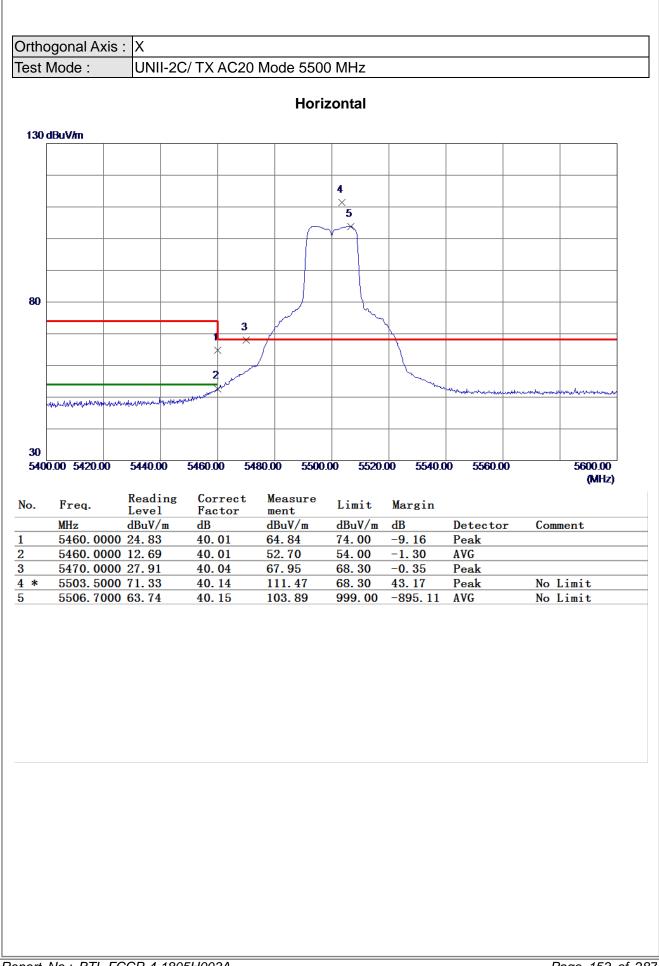






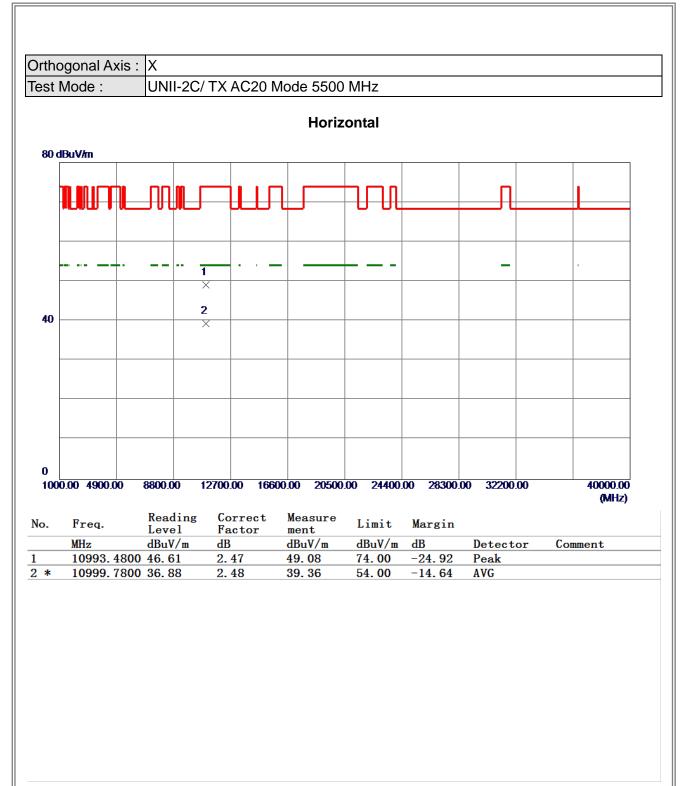






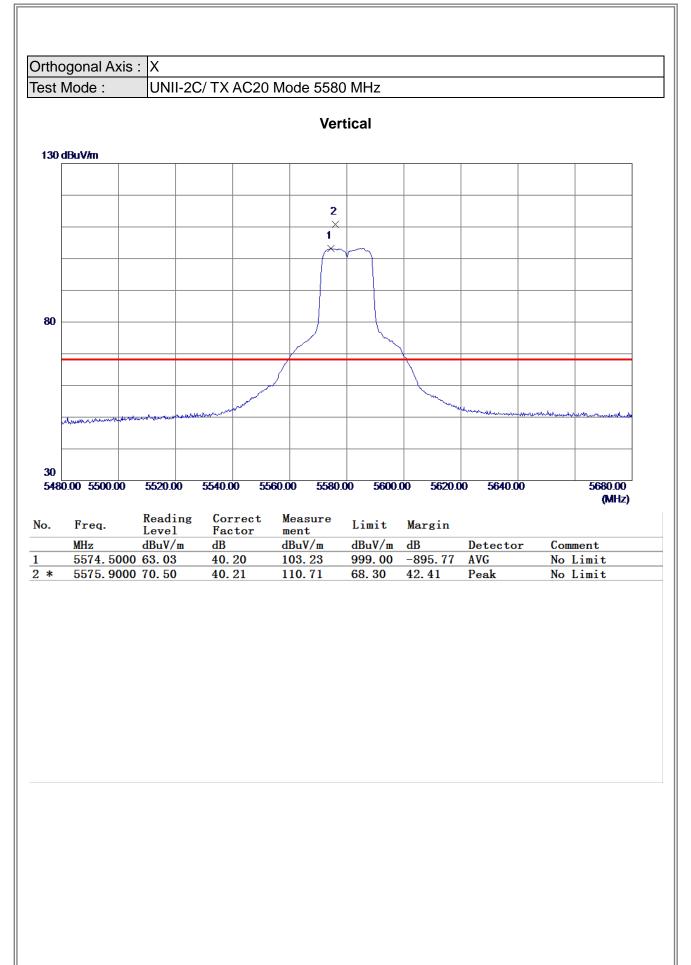






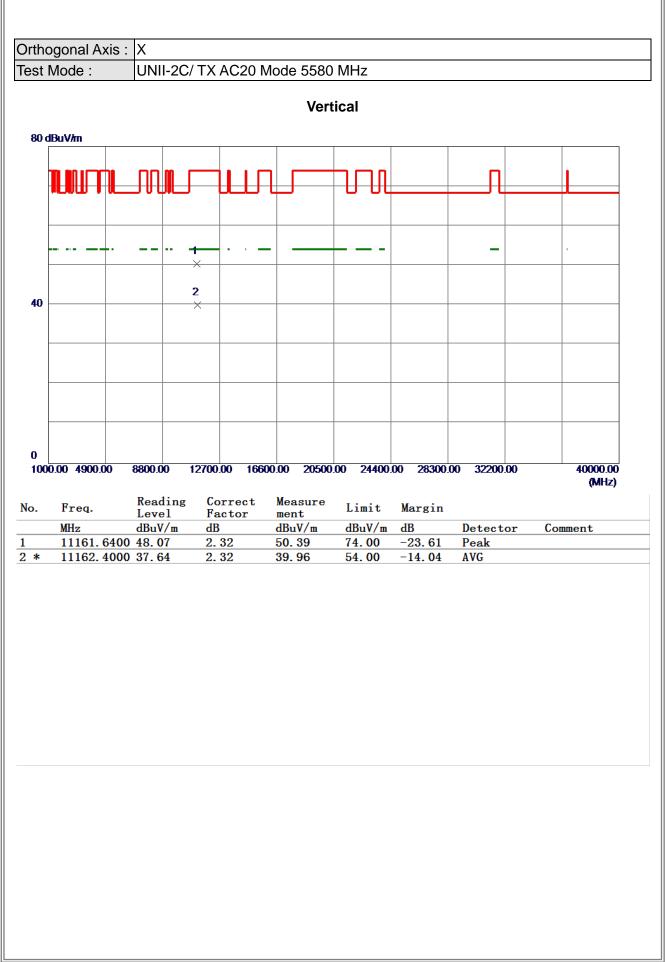






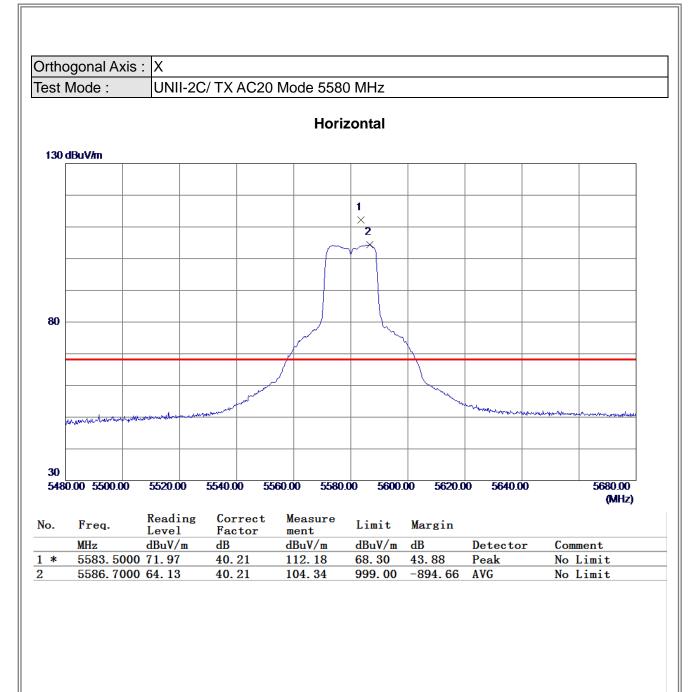






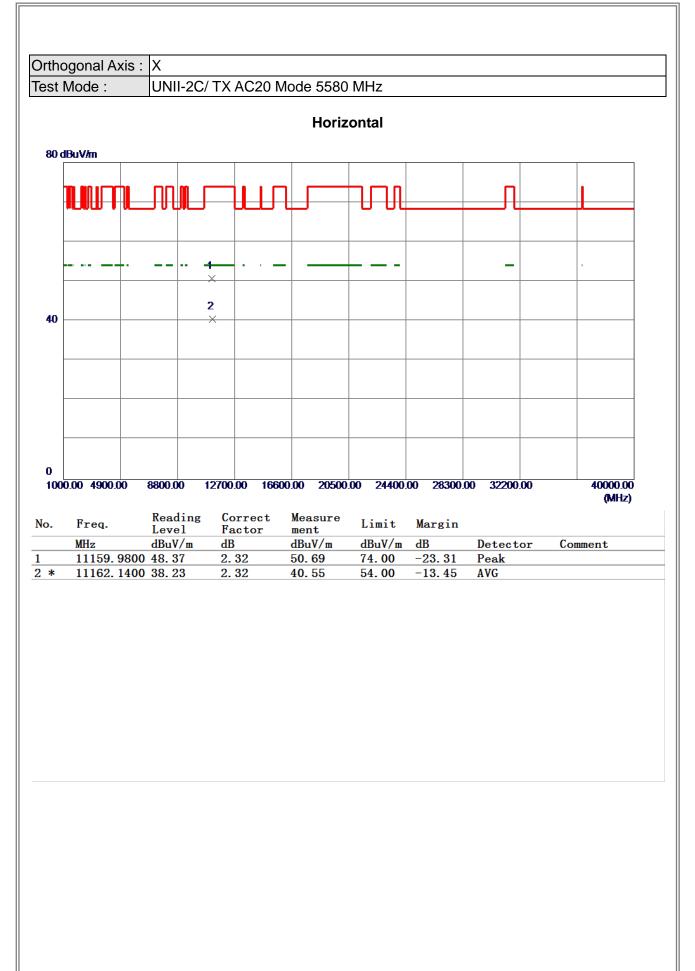






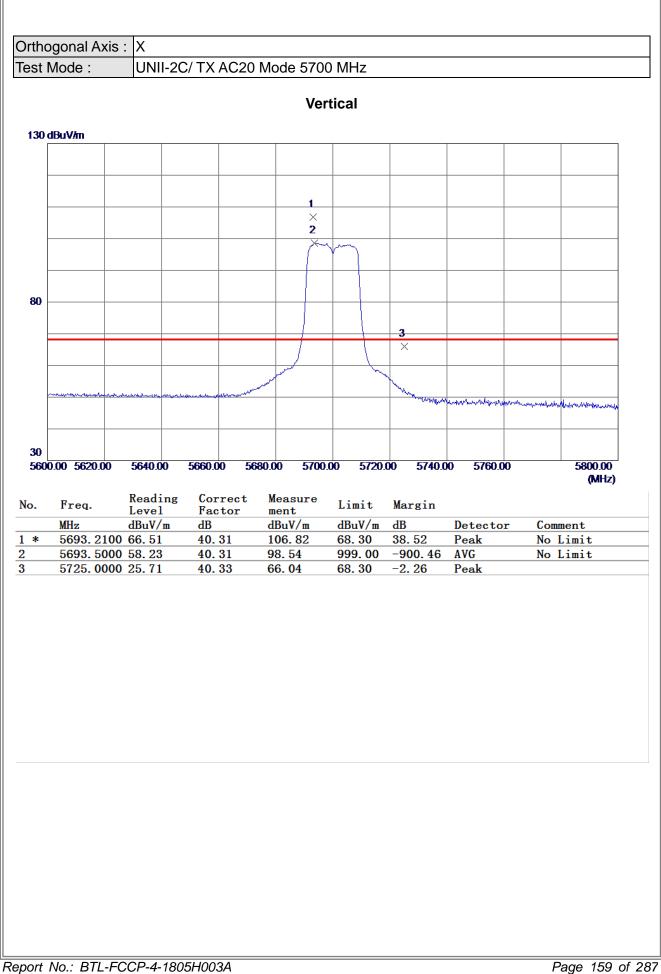






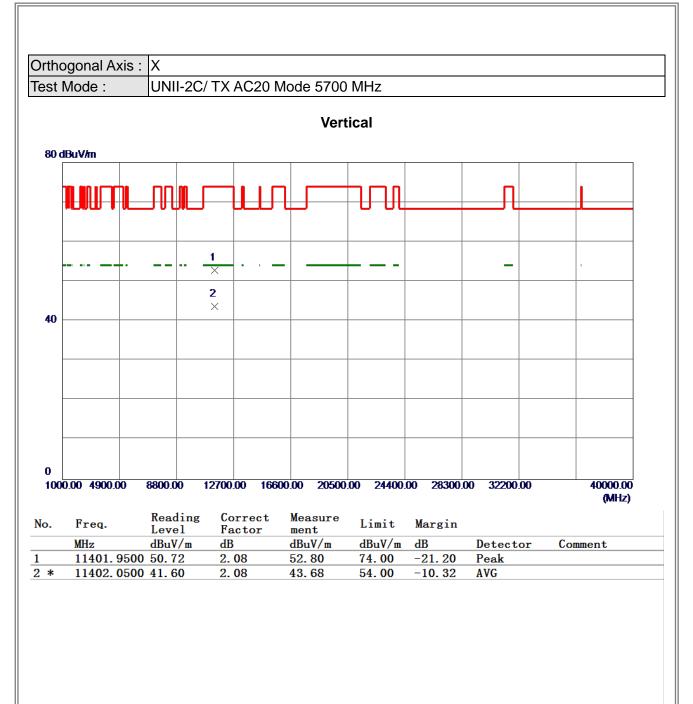






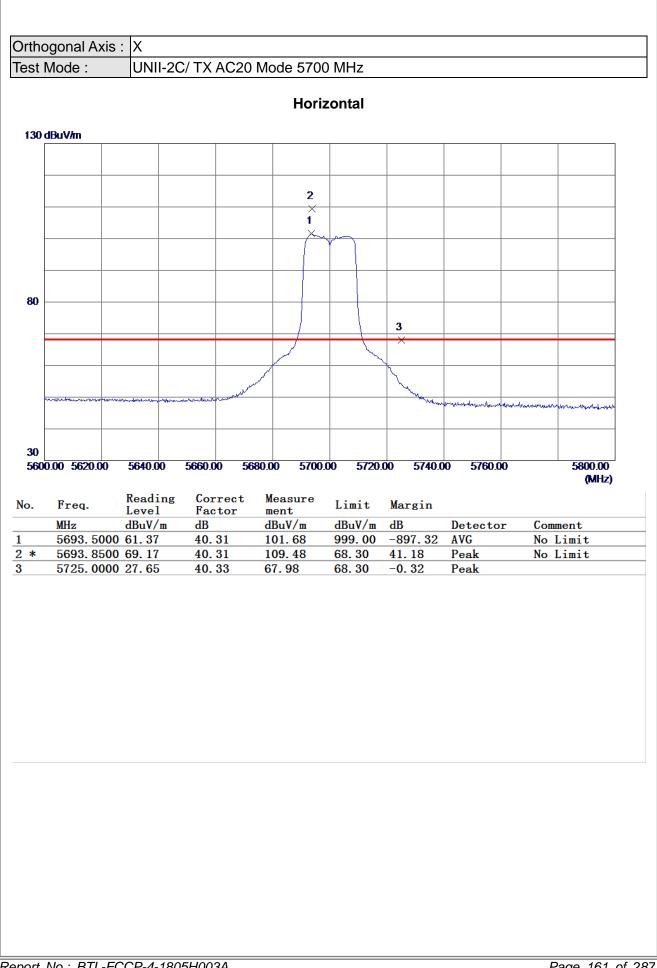






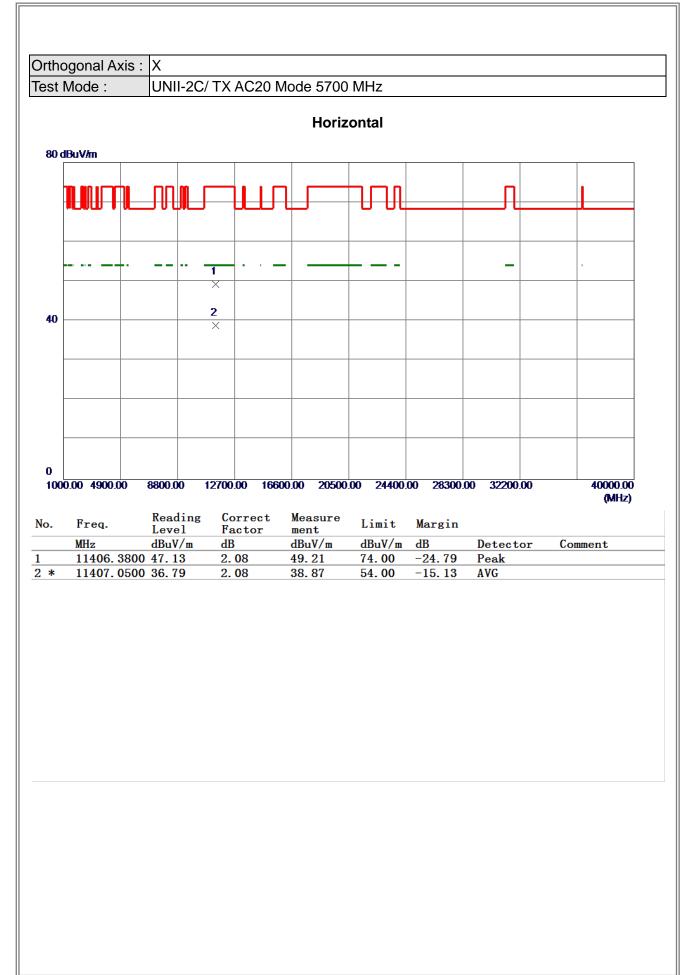






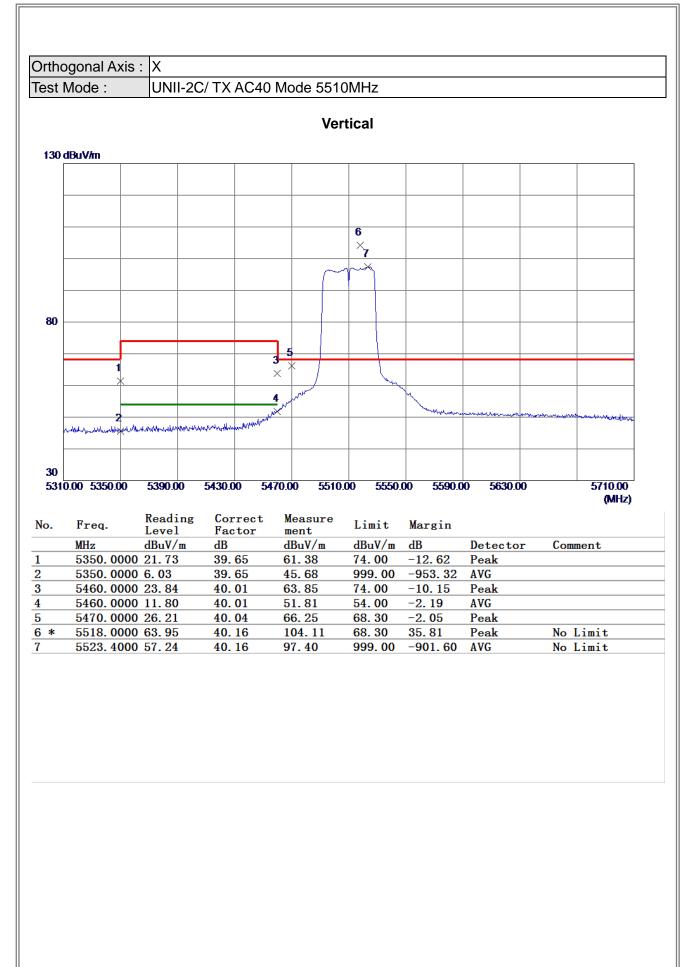






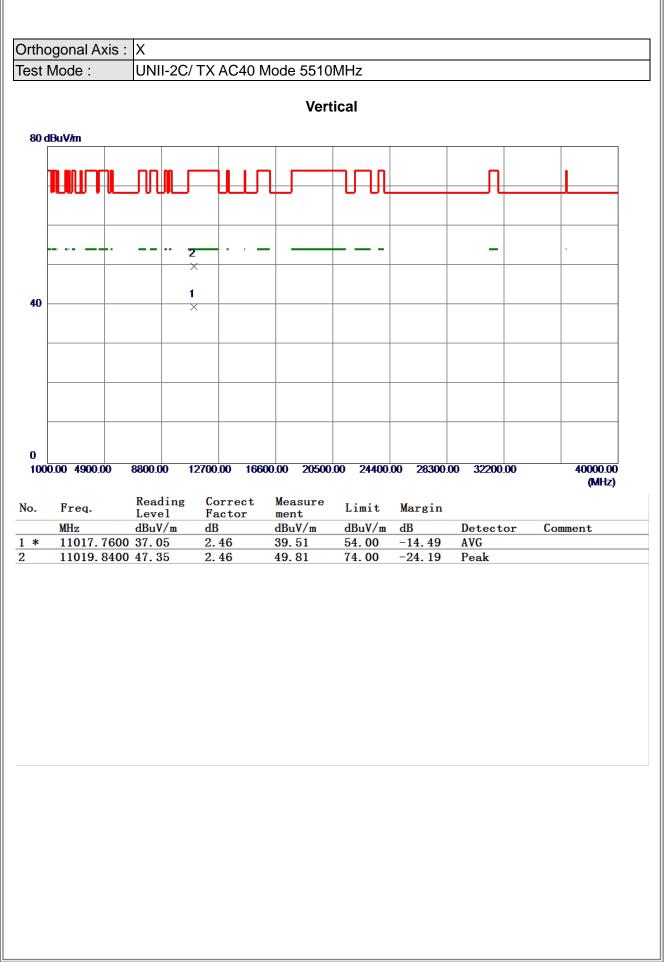






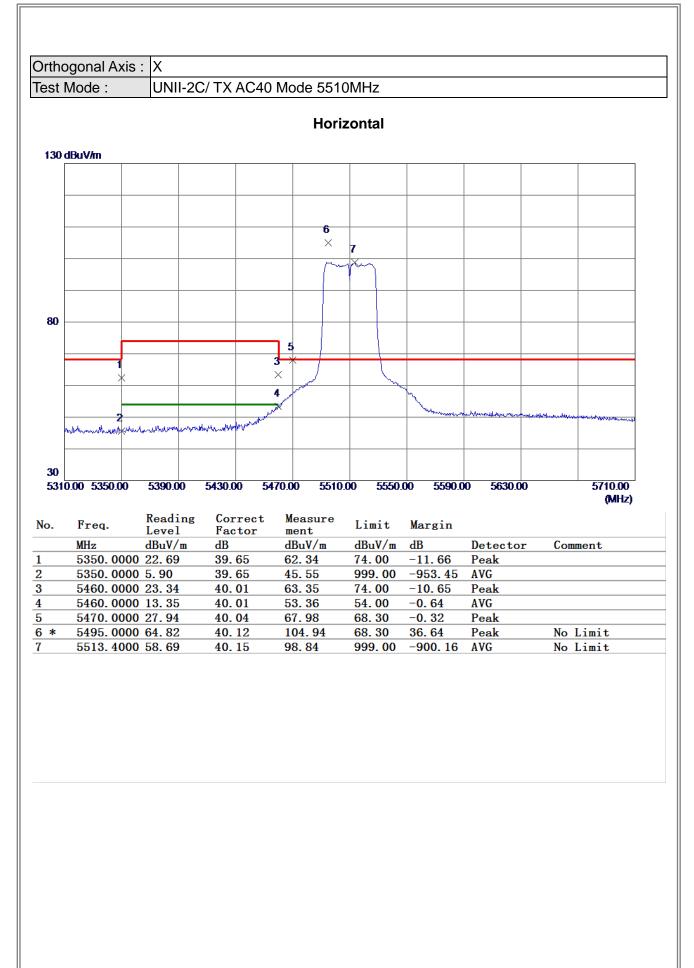






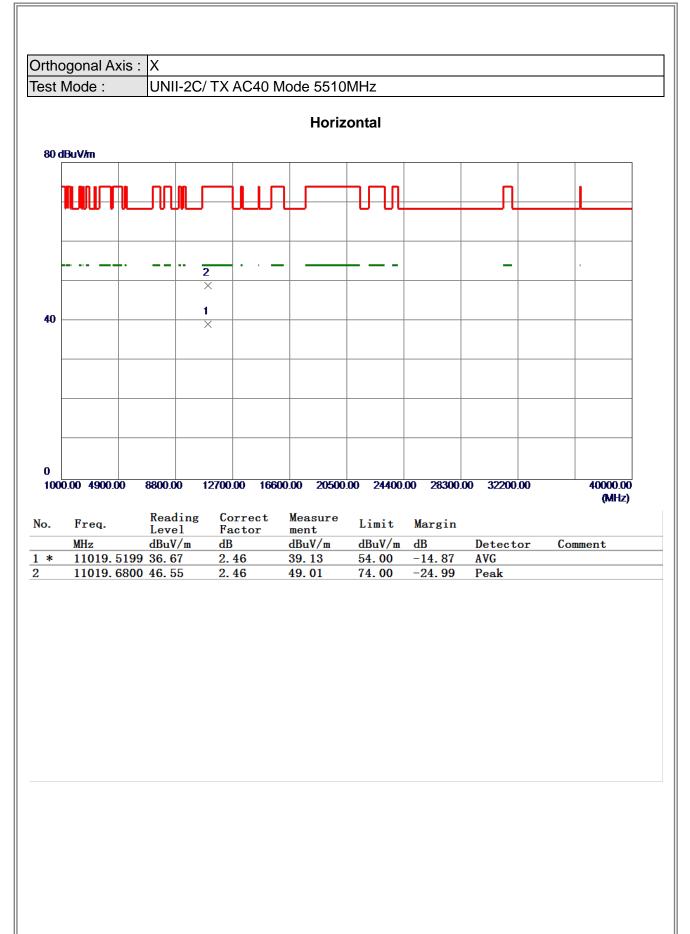






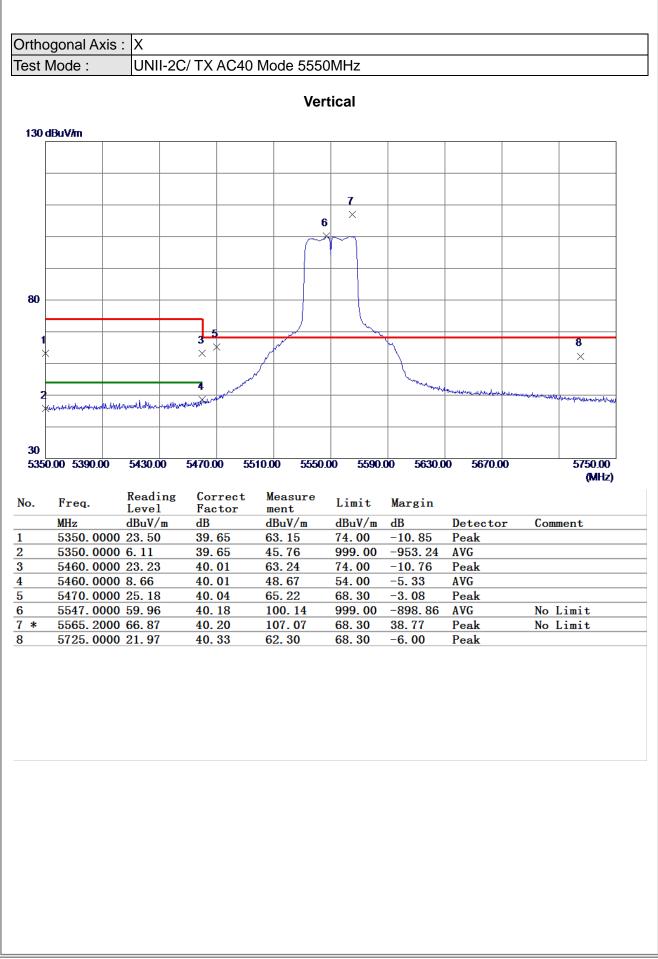






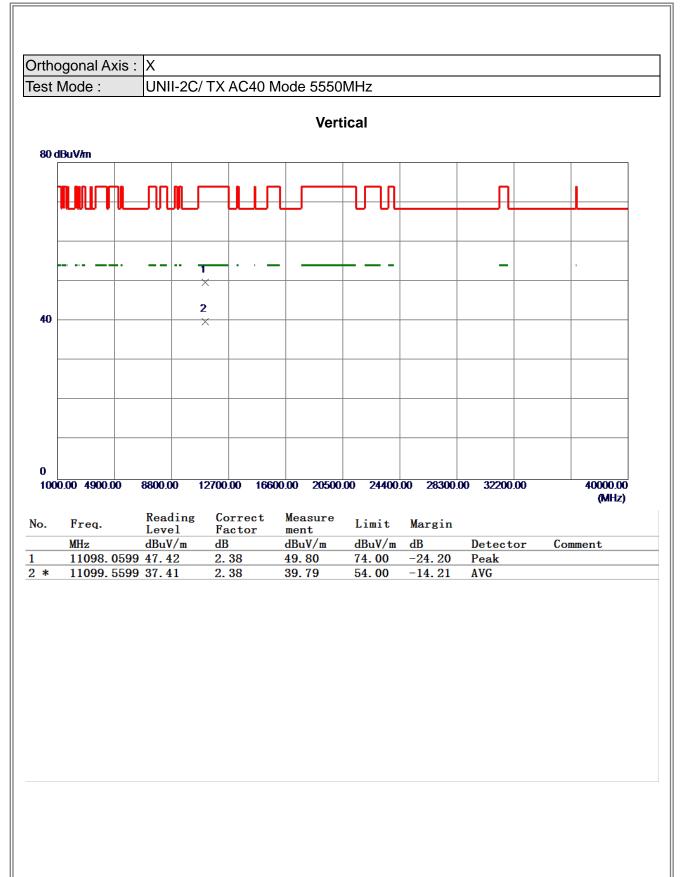






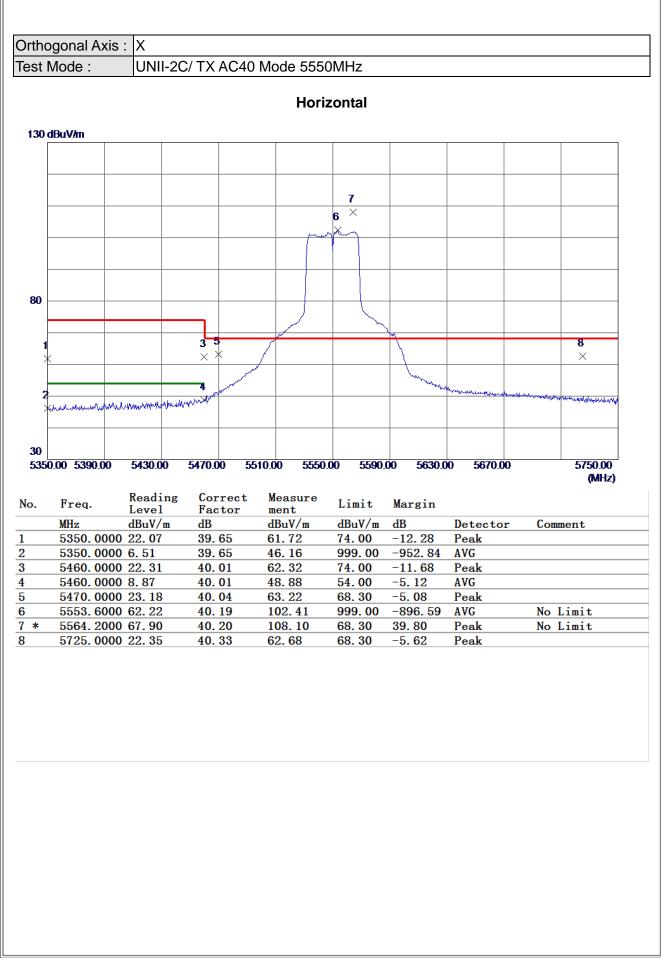






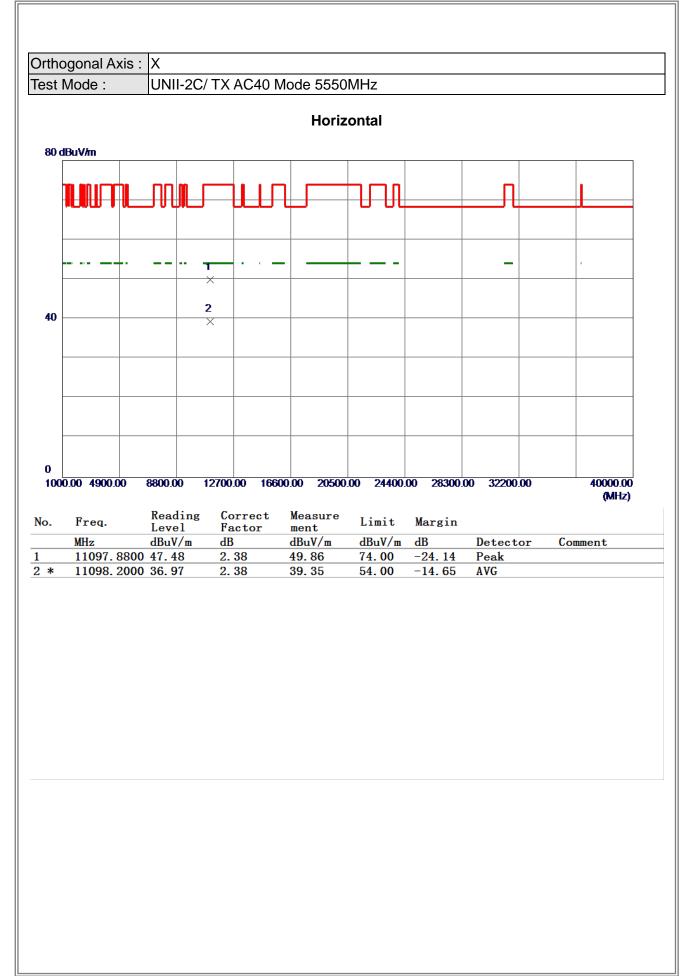






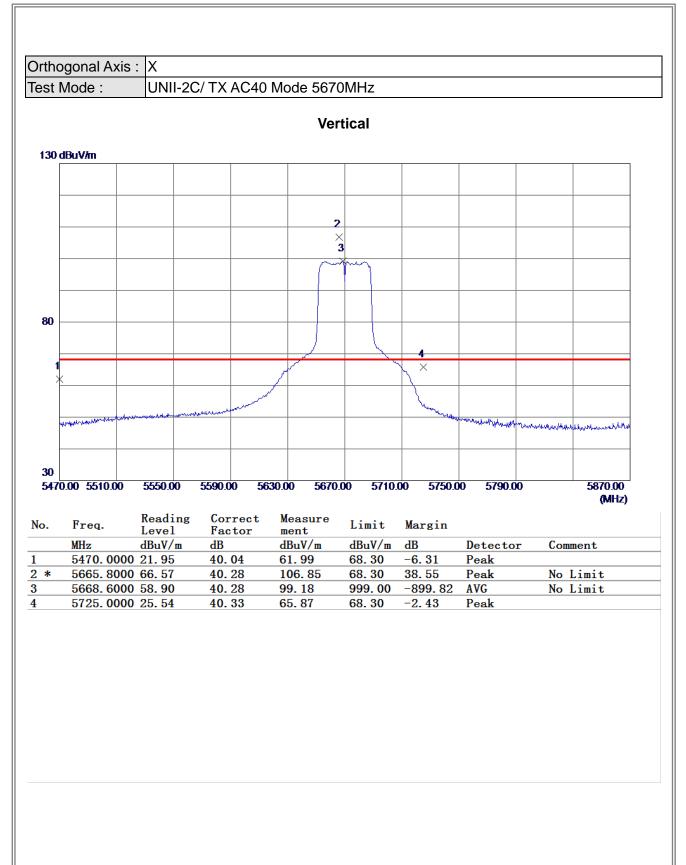






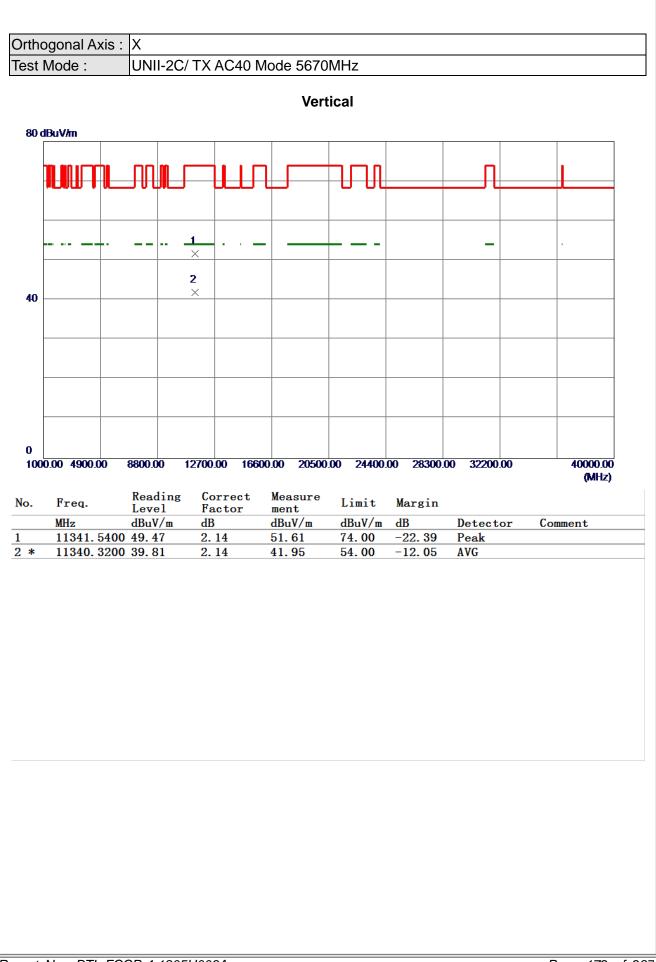






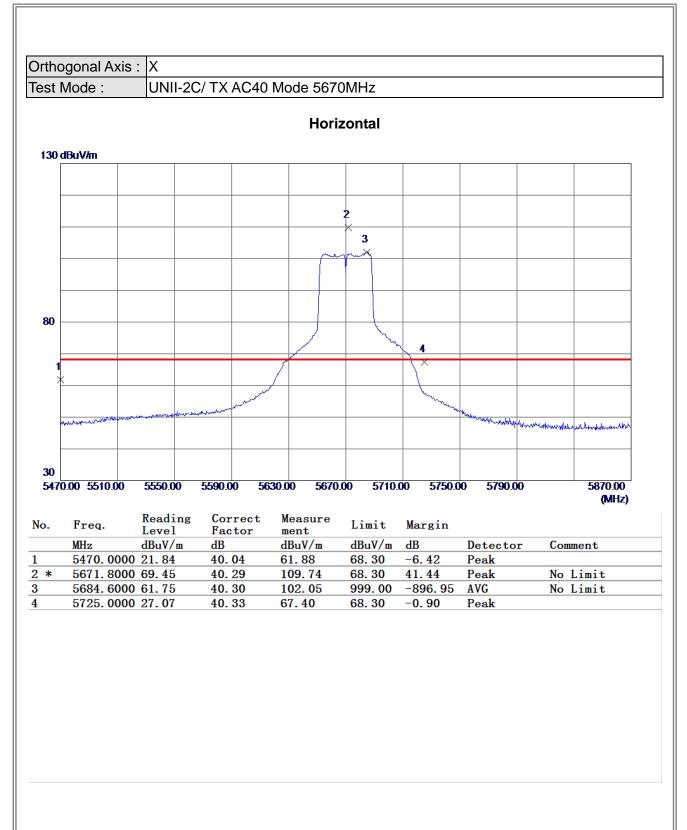






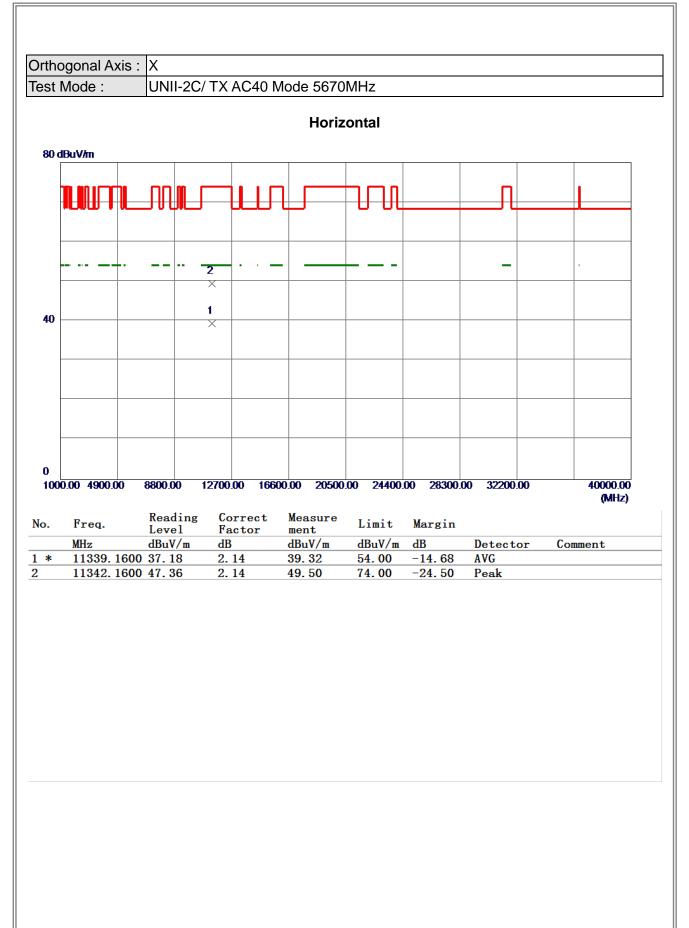






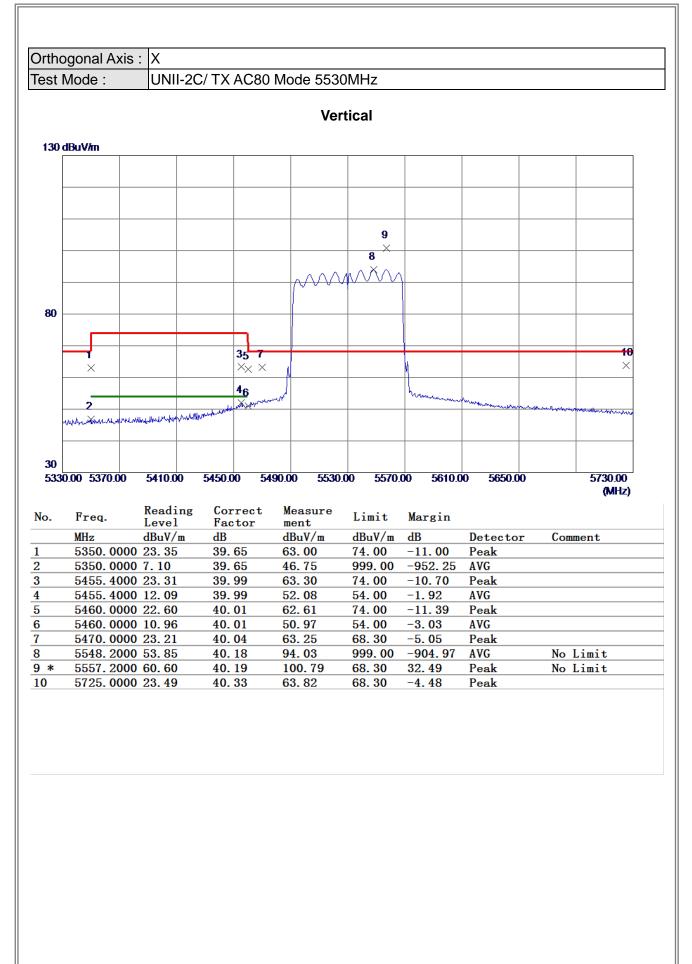






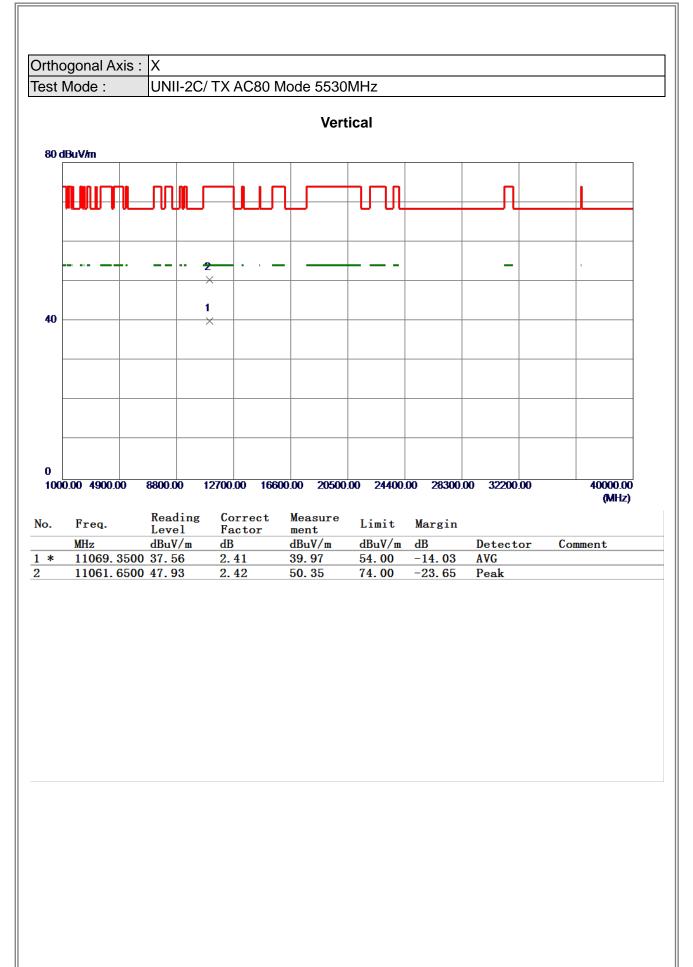






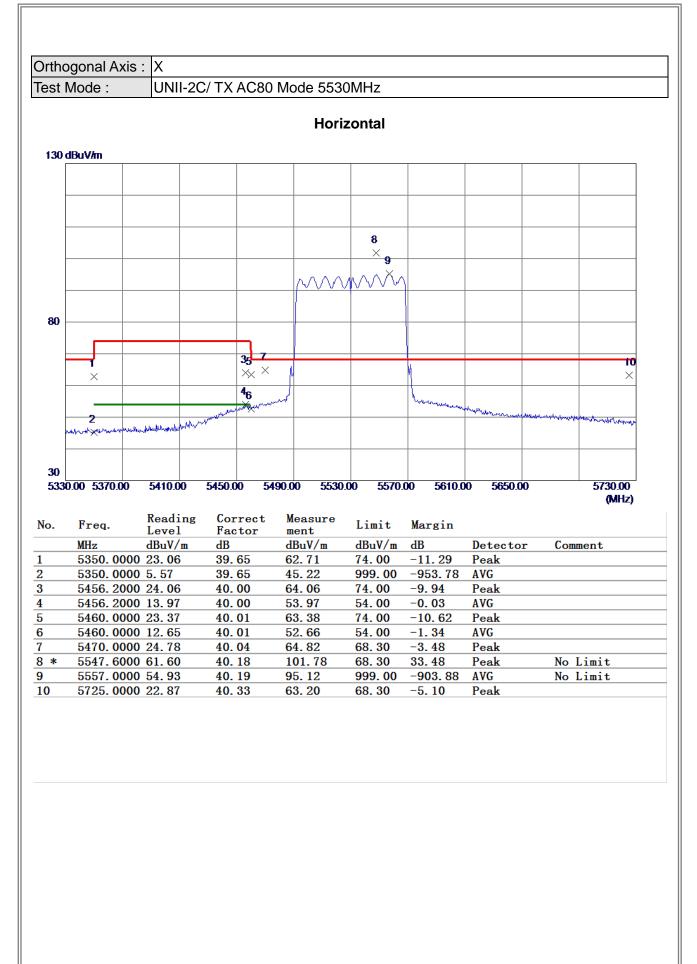






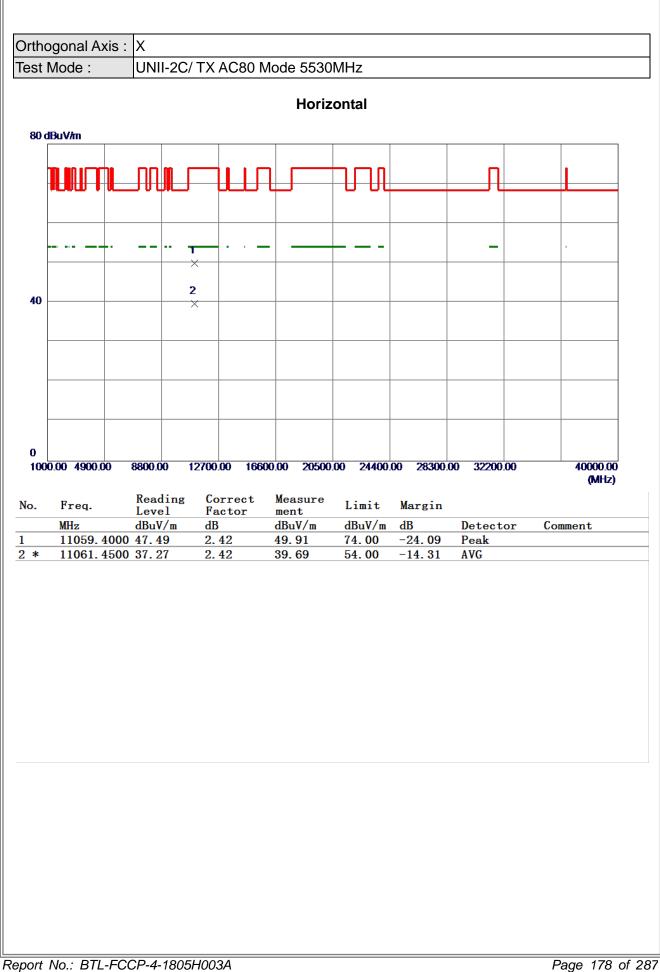






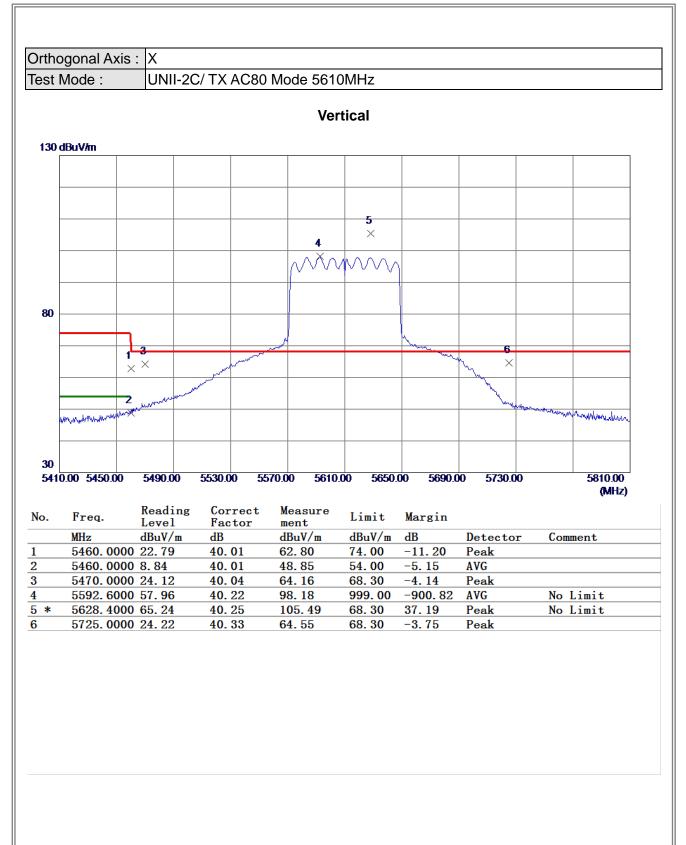






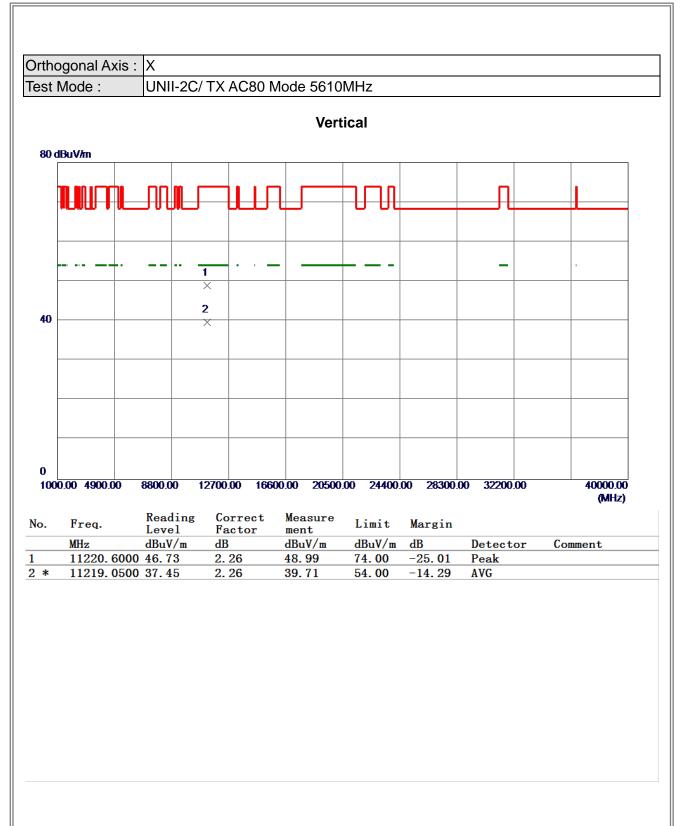






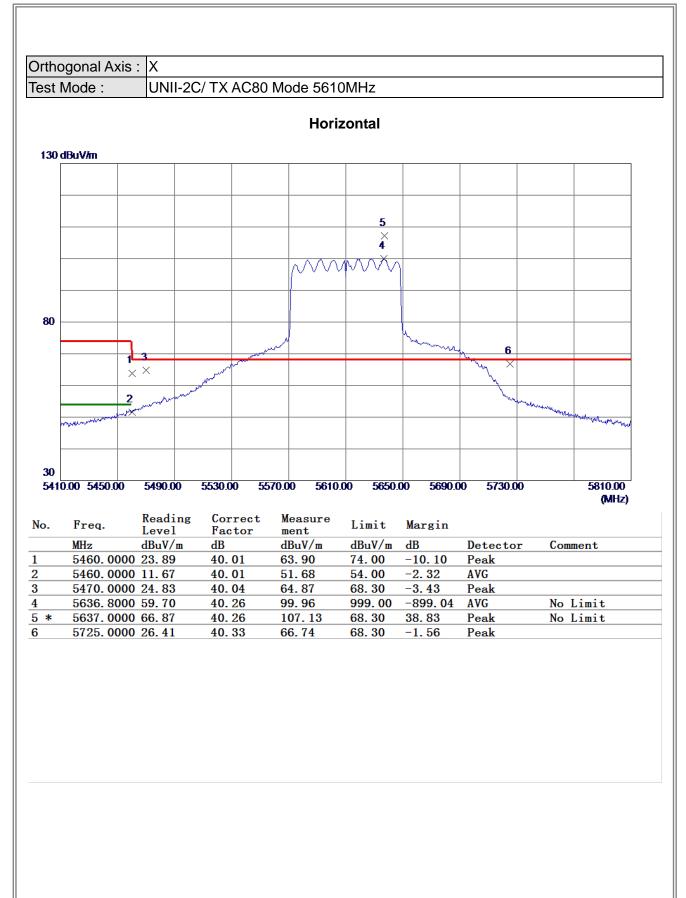






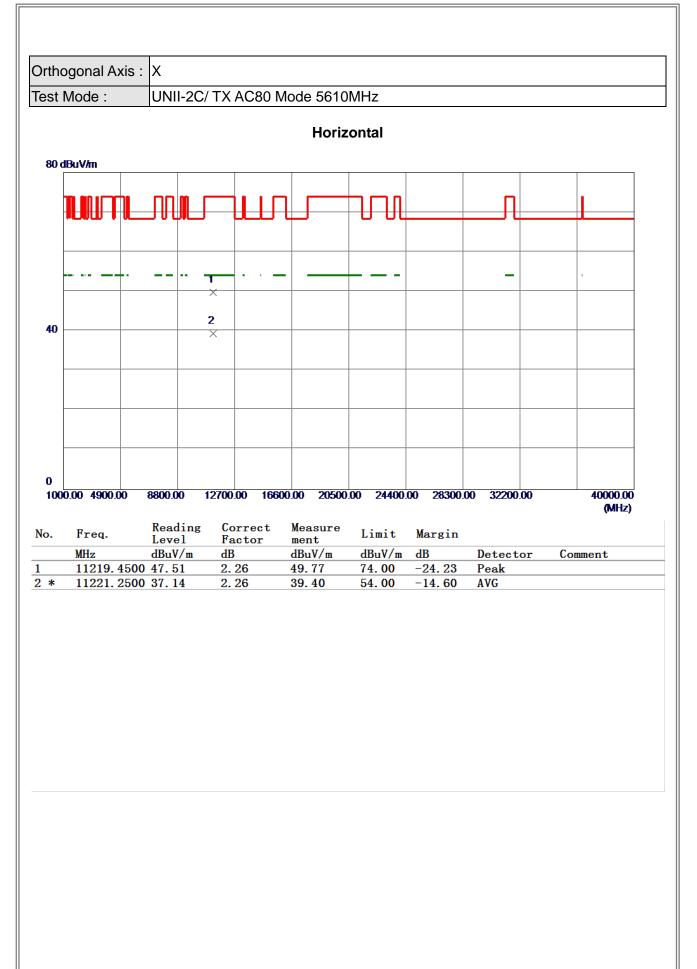




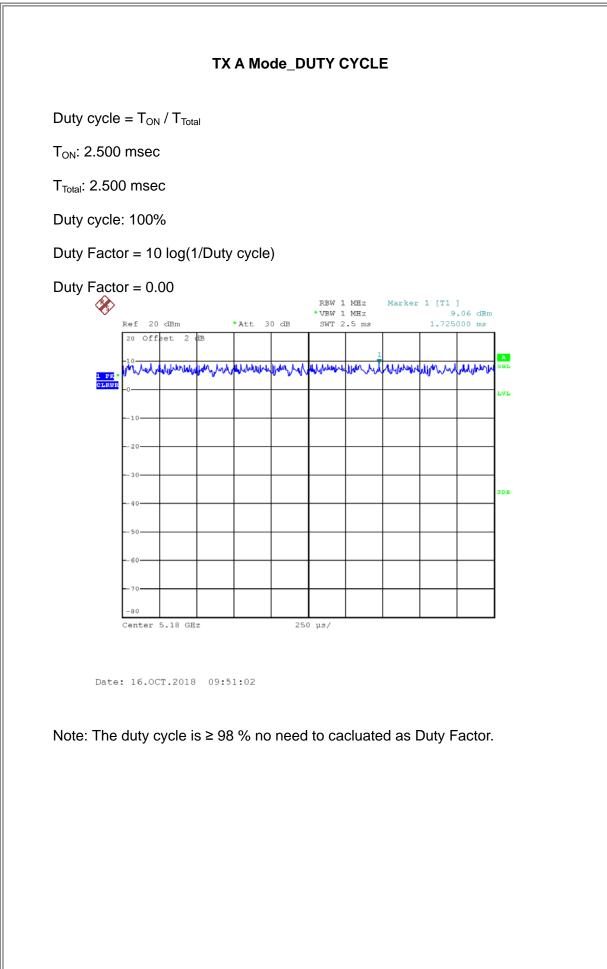




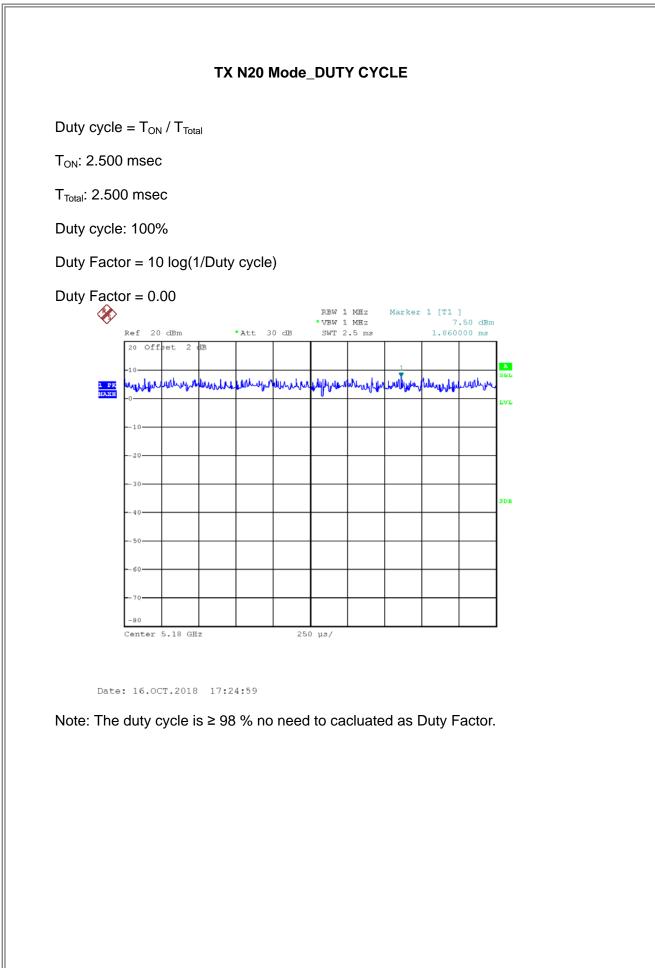




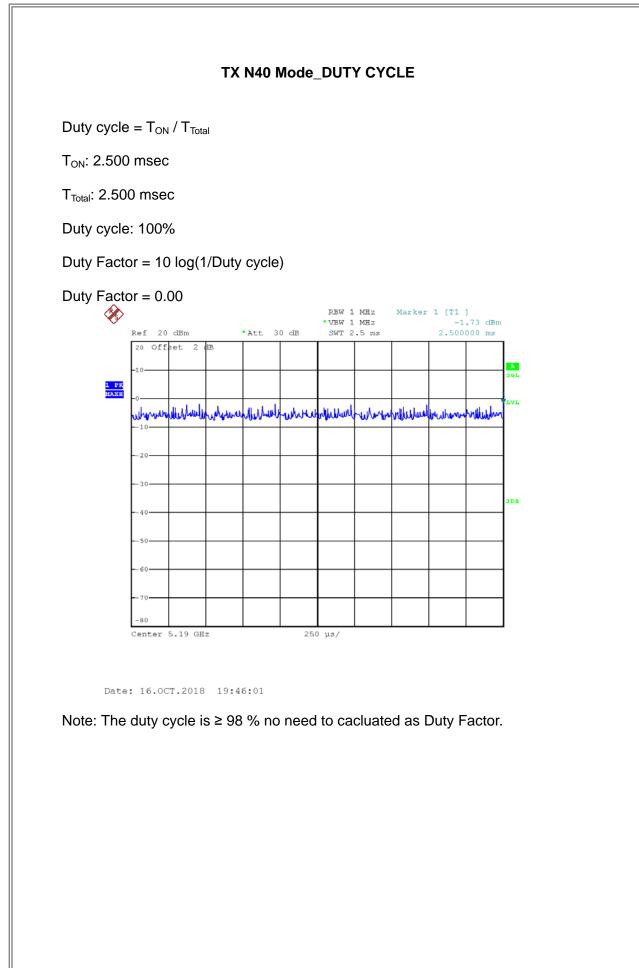




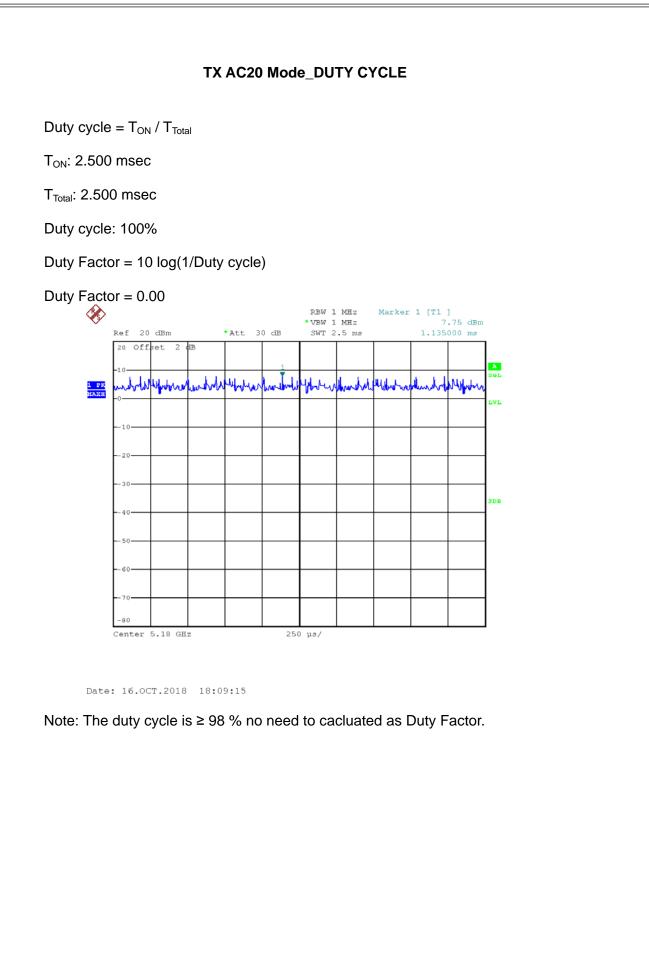




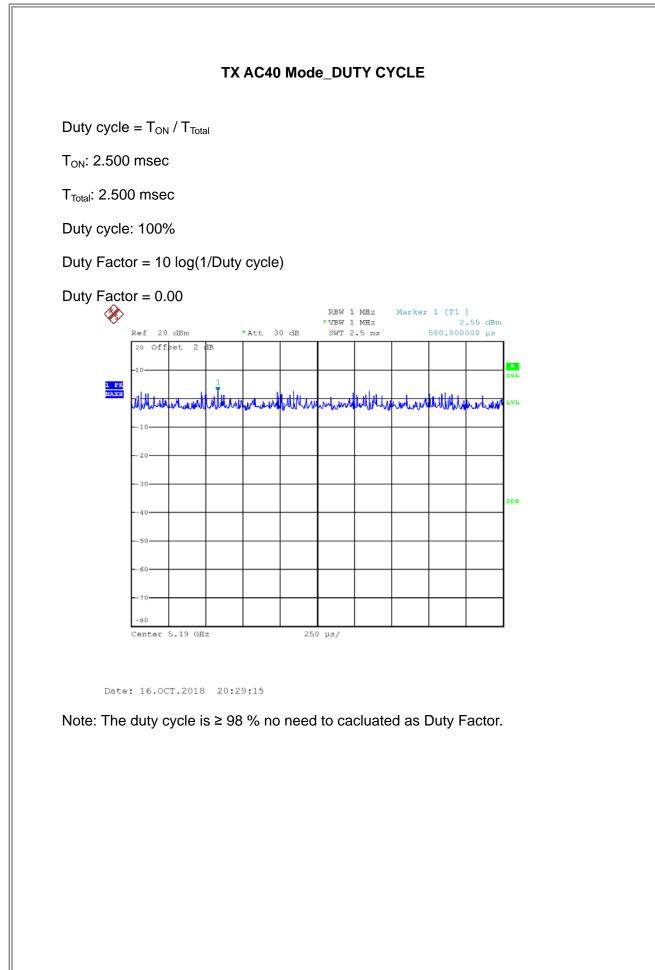




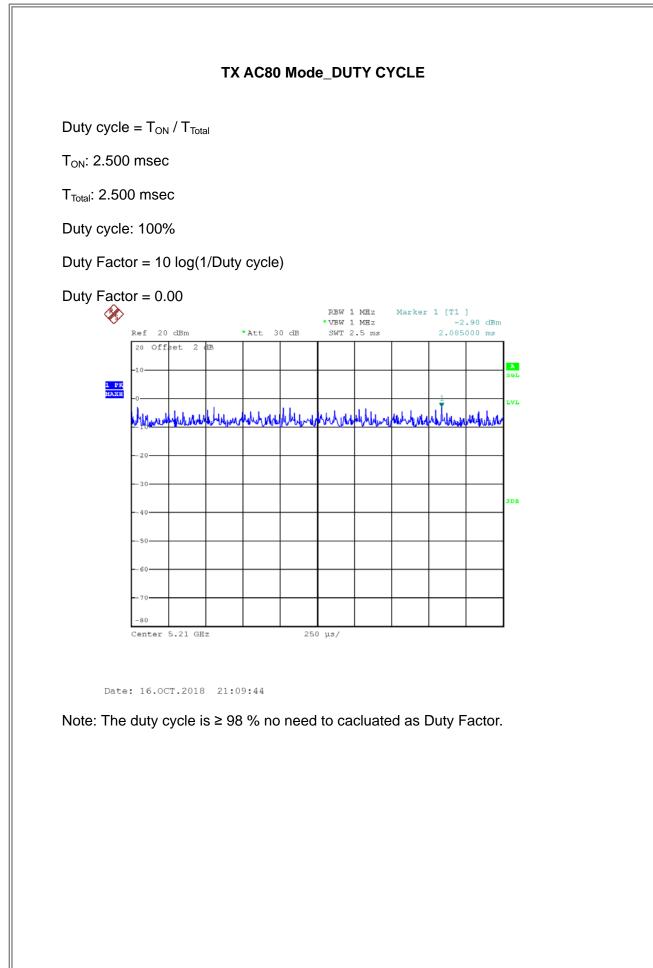














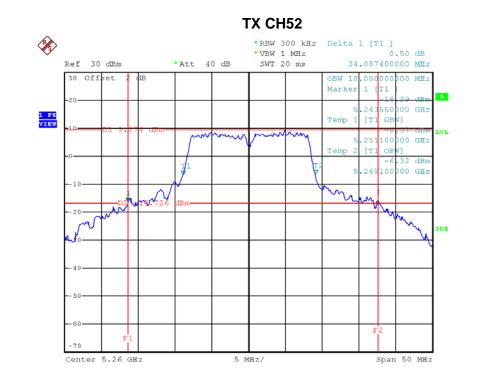
## **APPENDIX E - BANDWIDTH**



## Beamforming

## Test Mode: UNII-2A/TX A Mode\_CH52/CH60/CH64

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
CH52	5260	34.09	18.00
CH60	5300	33.09	17.50
CH64	5320	20.89	16.80



Date: 16.0CT.2018 16:21:32