



FCC Radio Test Report FCC ID: M82-ARK2250L This report concerns (check one): Original Grant Class I Change Class II Change Project No. : 1708012 Equipment : Computer Test Model : ARK-2250 Series Model : ARK-2250XXXXXXXXXXXXXXXXXX alphanumeric character, blank or "-".) Applicant : Advantech Co., Ltd. : No.1, Alley 20, Lane 26, Rueiguang Road, Neihu Address District, Taipei 11491, Taiwan, R.O.C. Date of Receipt : Sep. 10, 2017 : Sep. 10, 2017 ~ Dec. 13, 2017 Date of Test Issued Date : Dec. 18, 2017 : BTL Inc. Tested by **Testing Engineer** (Kehii Lin) **Technical Manager** (James Chiu) **Authorized Signatory** BTL IN No.18, Ln. 171, Sec. 2, Jiuzong Rd., Neihu Dist., Taipei City, Taiwan (R.O.C.) TEL:+886-2-2657-3299 FAX: +886-2-2657-3331 Testing Laboratory 0659



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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-4-1708012	Original Issue.	Dec. 18, 2017



1. CERTIFICATION

Equipment : Brand Name : Test Model :	ADVANTECH
Series Model :	ARK-2250XXXXXXXXXXXXXX, ARK2250XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Applicant :	Advantech Co., Ltd.
Manufacturer :	Advantech Co., Ltd.
Address :	No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 11491, Taiwan, R.O.C.
Factory :	N/A
Address :	N/A
Date of Test :	Sep. 10, 2017 ~ Dec. 13, 2017
	Production Unit
•	FCC Part15, Subpart E(15.407) / ANSI C63.10-2013

The above equipment has been tested and found in 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-4-1708012) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

Test result included in this report is only for the 5GHz RLAN part.

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

	FCC Part15, Subpart E(15.407)					
Standard(s) Test Item		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)	15.407(a) Power Spectral Density					
15.407(a) Radiated Emissions		PASS				
15.407(b)	Band Edge Emissions	PASS				
15.407(g)	Frequency Stability	PASS				
15.203	15.203 Antenna Requirements					
15.407(c)	Automatically Discontinue Transmission	PASS	NOTE (2)			

NOTE:

- (1)" N/A" denotes test is not applicable in this test report.
- (2) During no any information transmission, the EUT can automatically discontinue transmission and becom standby mode for power saving.
 The EUT can detect the controlling signal of ACK message transmitting from remote

The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.



2.1 TEST FACILITY

The test facilities used to collect the test data in this report:

Conducted emission Test:

C05: (VCCI RN: C-4742; FCC RN:965108; FCC DN:TW1082) No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

Radiated emission Test (Below 1 GHz):

CB15: (VCCI RN: R-20020; FCC RN:674415; FCC DN:TW0659; ISED Assigned Code:20088-5)

No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

Radiated emission Test (Above 1 GHz):

CB15: (VCCI RN: G-20031; FCC RN:674415; FCC DN:TW0659; ISED Assigned Code:20088-5)

No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 Ucispr requirement.

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

A. Conducted emission test:

Test Site	Method	Measurement Frequency Range	U,(dB)
C05	CISPR	150 kHz ~ 30MHz	2.68

B. Radiated emission test:

Test Site	Method Measurement Frequency Range		U,(dB)
CB15	CISPR	9kHz ~ 150kHz	2.82
(3m)	CIOPK	150kHz ~ 30MHz	2.58

Test Site	Method	Measurement Frequency Range		U,(dB)
		30MHz ~ 200MHz	V	4.20
CB15	CISPR	30MHz ~ 200MHz	Н	3.64
(3m)	CIOPK	200MHz ~ 1,000MHz	V	4.56
		200MHz ~ 1,000MHz	Н	3.90

Test Site	Method	Measurement Frequency Range		U,(dB)
		1GHz ~ 6GHz	V	4.46
CB15	CISPR	1GHz ~ 6GHz	Н	4.40
(3m)	CIOPK	6GHz ~ 18GHz	V	3.88
		6GHz ~ 18GHz	Н	4.00

Test Site	Method	Measurement Frequency Range	U,(dB)
CB15	CISPR	18 ~ 26.5 GHz	4.62
(1m)	CIGER	26.5 ~ 40 GHz	5.12



Our calculated Measurement Instrumentation Uncertainty is shown in the tables above. These are our U_{lab} values in CISPR 16-4-2 terminology.

Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR}, as follows:

Conducted Disturbance (mains port) - 150 kHz - 30 MHz: 3.6 dB Radiated Disturbance (electric field strength on an open area test site or alternative test site) - 30 MHz - 1000 MHz: 5.2 dB

It can be seen that our U_{lab} values are smaller than U_{CISPR} .

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	Computer			
Brand Name	ADVANTECH			
Test Model	ARK-2250			
Series Model		ARK-2250XXXXXXXXXXXXXX, ARK2250XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		
Model Difference	The market distribution is differen	t only.		
Product Description	Operation Frequency	UNII-1: 5150-5250MHz UNII-2A: 5250-5350MHz UNII-2C: 5470-5725MHz UNII-3: 5725-5850MHz		
	Modulation Type	OFDM		
	Bit Rate of Transmitter	866.7Mbps		
	Output Power (Max.)for UNII-1 (2TX)	802.11a: 16.67dBm 802.11n (20M): 15.55dBm 802.11n (40M): 15.55dBm 802.11ac (80M): 13.68dBm		
Output Power	Output Power (Max.)for UNII-2A (2TX)	802.11a: 16.37dBm 802.11n (20M): 15.29dBm 802.11n (40M): 15.18dBm 802.11ac (80M): 13.16dBm		
Oulput Fower	Output Power (Max.)for UNII-2C (2TX)	802.11a: 16.58dBm 802.11n (20M): 15.49dBm 802.11n (40M): 15.48dBm 802.11ac (80M): 13.53dBm		
	Output Power (Max.)for UNII-3 (2TX)	802.11a: 16.52dBm 802.11n (20M): 15.44dBm 802.11n (40M): 15.30dBm 802.11ac (80M): 13.45dBm		
Power Source	DC voltage supplied from DC Power Supply.			
Power Rating	EUT Rating: I/P: 12VDC, 5A			
Products Covered	N/A			





Note:

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

UNII-1		UNII-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							

UNI	-2A	UNI	I-2A	UNI	I-2A
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	54	5270	58	5290
56	5280	62	5310		
60	5300				
64	5320				

UNII	-2C	UNI	I-2C	UNI	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				

UNI	I-3	UN	III-3	UN	II-3
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755	155	5775
153	5765	159	5795		
157	5785				
161	5805				



3. Antenna Specification:

Ant.	Brand	Test Model	Antenna Type	Connector	Gain (dBi)
1	ADVANTECH	AN2450-92K01BR S	Dipole	SMA Male Reverse	5.01
2	ADVANTECH	AN2450-92K01BR S	Dipole	SMA Male Reverse	5.01

Note:

The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and receivers (2T2R) and employs Cyclic Delay Diversity (CDD). In CDD mode,

For power spectral density: Directional gain = $10*\log\{[10^{(G1/20)+10^{(G2/20)+...+10^{(Gn/20)}]^2/NANT\} = 8.02 \text{ dBi} > 6\text{dBi}.$ 5180 MHz to 5240 MHz: The reduced power spectral density limits (dBm/MHz) = 17 - (8.02-6) = 14.98 5260 MHz to $5320 \text{ MHz} \& 5500 \text{ MHz} \cong 5700 \text{ MHz}$: The reduced power spectral density limits (dBm/MHz) = 11 - (8.02-6) = 8.98 5745 MHz to 5805 MHz: The reduced power spectral density limits (dBm/MHz) = 30 - (8.02-6) = 27.98

For conducted power:

For $N_{ANT} = 2 < 5$, Direction gain (dBi) = $G_{ANT} + 0 = 5.01 + 0 = 5.01$

The Direction gain is less than 6, so conducted power limits will not be reduced.

Operating Mode	
	2TX
TX Mode	
802.11a	V (ANT 1+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)



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 AC80 Mode / CH42 (UNII-1)
Mode 5	TX A Mode / CH52, CH60, CH64 (UNII-2A)
Mode 6	TX N20 Mode / CH52, CH60, CH64 (UNII-2A)
Mode 7	TX N40 Mode / CH54, CH62 (UNII-2A)
Mode 8	TX AC80 Mode / CH58 (UNII-2A)
Mode 9	TX A Mode / CH100, CH116, CH140 (UNII-2C)
Mode 10	TX N20 Mode / CH100, CH116, CH140 (UNII-2C)
Mode 11	TX N40 Mode / CH102, CH110, CH134 (UNII-2C)
Mode 12	TX AC80 Mode / CH106, CH122 (UNII-2C)
Mode 13	TX A Mode / CH149,CH157,CH161 (UNII-3)
Mode 14	TX N20 Mode / CH149,CH157,CH161 (UNII-3)
Mode 15	TX N40 Mode / CH151,CH159 (UNII-3)
Mode 16	TX AC80 Mode / CH155 (UNII-3)
Mode 17	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 17	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 AC80 Mode / CH42 (UNII-1)
Mode 5	TX A Mode / CH52, CH60, CH64 (UNII-2A)
Mode 6	TX N20 Mode / CH52, CH60, CH64 (UNII-2A)
Mode 7	TX N40 Mode / CH54, CH62 (UNII-2A)
Mode 8	TX AC80 Mode / CH58 (UNII-2A)
Mode 9	TX A Mode / CH100, CH116, CH140 (UNII-2C)
Mode 10	TX N20 Mode / CH100, CH116, CH140 (UNII-2C)
Mode 11	TX N40 Mode / CH102, CH110, CH134 (UNII-2C)
Mode 12	TX AC80 Mode / CH106, CH122 (UNII-2C)
Mode 13	TX A Mode / CH149,CH157,CH161 (UNII-3)
Mode 14	TX N20 Mode / CH149,CH157,CH161 (UNII-3)
Mode 15	TX N40 Mode / CH151,CH159 (UNII-3)
Mode 16	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 - 2T	-X	
Test Software Version		QRCT 3.0.161	
Frequency (MHz)	5180	5200	5240
A Mode	16	16	16
Frequency (MHz)	5180	5200	5240
N20 Mode	15	15	15
Frequency (MHz)	5190	5230	
N40 Mode	15	15	

	UNII-2A - 2	ТХ	
Test Software Version		QRCT 3.0.161	
Frequency (MHz)	5260	5300	5320
A Mode	16	16	16
Frequency (MHz)	5260	5300	5320
N20 Mode	15	15	15
Frequency (MHz)	5270	5310	
N40 Mode	15	15	

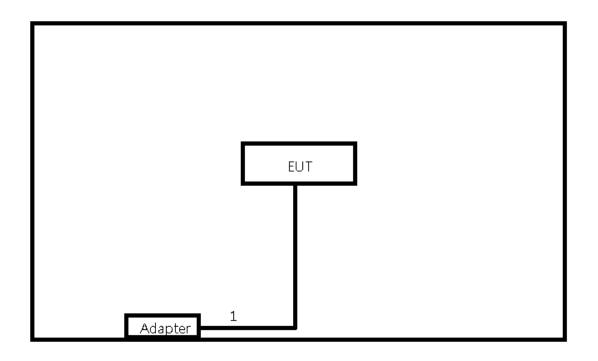
	UNII-2C - 2	ТХ	
Test Software Version		QRCT 3.0.161	
Frequency (MHz)	5500	5580	5700
A Mode	16	16	17
Frequency (MHz)	5500	5580	5700
N20 Mode	15	15	15
Frequency (MHz)	5510	5550	5670
N40 Mode	15	15	15



	UNII-3 - 2 ⁻	ГХ	
Test Software Version		QRCT 3.0.161	
Frequency (MHz)	5745	5785	5805
A Mode	18	18	18
Frequency (MHz)	5745	5785	5805
N20 Mode	16	17	16
Frequency (MHz)	5755	5795	
N40 Mode	16	16	
	UNII-1 - 2 ⁻	гх	
est Software Version		QRCT 3.0.161	
Frequency (MHz)	5210		
AC80 Mode	13		
	UNII-2A - 2	ТХ	
est Software Version		QRCT 3.0.161	
Frequency (MHz)	5290		
AC80 Mode	13		
	UNII-2C - 2	:TX	
est Software Version		QRCT 3.0.161	
Frequency (MHz)	5530	5610	
AC80 Mode	13	13	
	UNII-3 - 2 ⁻	гх	
est Software Version		QRCT 3.0.161	
Frequency (MHz)	5775		
AC80 Mode	14		



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.
-	Adapter	FSP	FSP084-DIBAN2	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
1	YES	YES	0.5m	Power Cable





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
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.

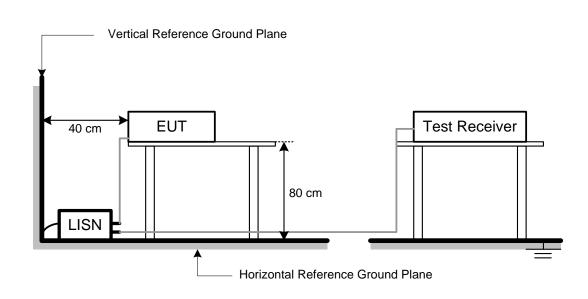
4.1.3 DEVIATION FROM TEST STANDARD

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: 55% 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 \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

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

Frequencies (MHz)	EIRP Limit (dBm)	Equivalent Field Strength at 3m (dBµV/m)
5150-5250	-27	68.3
5250-5350	-27	68.3
5470-5725	-27	68.3
	-27(Note 2)	68.3
5725 5950	10(Note 2)	105.3
5725-5850	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: $E = \frac{1000000\sqrt{30P}}{1000000\sqrt{30P}}$

 μ 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

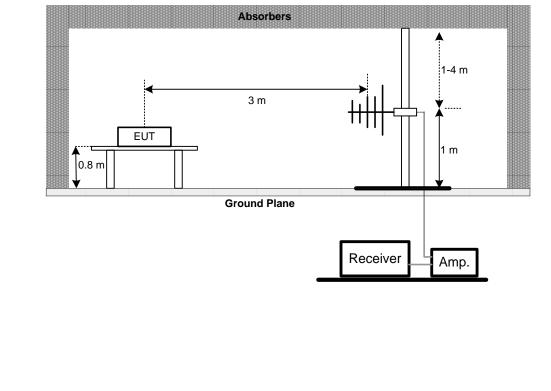
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance 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

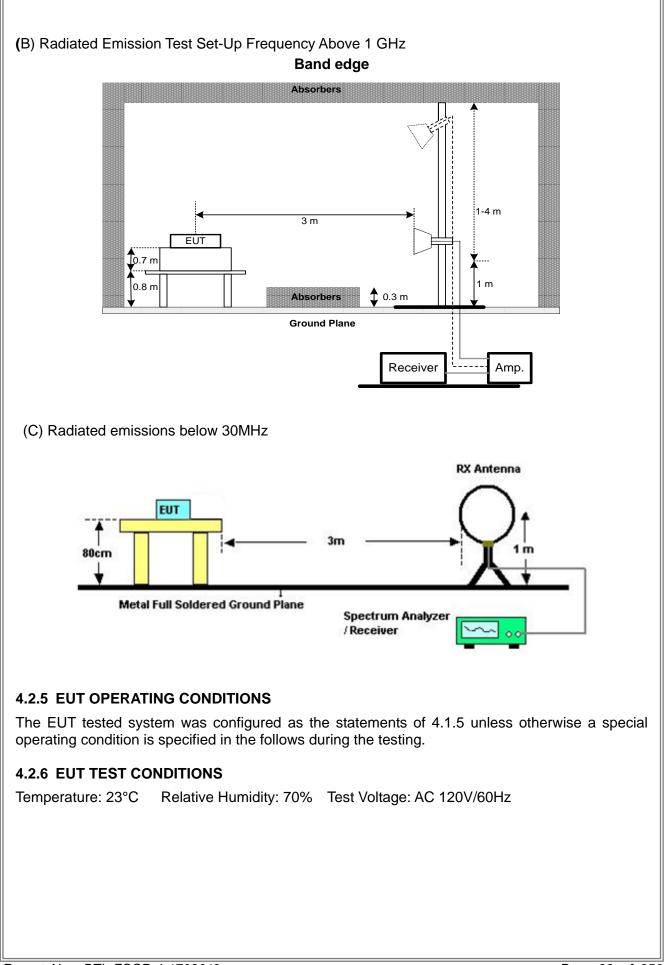
4.2.4 TEST SETUP

(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 (MHz)	Result		
	26 dB Bandwidth	5150-5250	PASS		
	26 dB Bandwidth	5250-5350	PASS		
Bandwidth	26 dB Bandwidth	5470-5725	PASS		
	Minimum 500kHz 6dB	5725 5950	PASS		
	Bandwidth	5725-5850	FA00		

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)
	KBW	1MHz(Bandwidth 40MHz and 80MHz)
	VBW	1MHz(Bandwidth 20MHz)
		3MHz(Bandwidth 40MHz and 80MHz)
	Detector	Peak
	Trace	Max Hold
	Sweep Time	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: 23°C Relative Humidity: 70% 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 (MHz)	Result	
	Fixed:1 Watt (30dBm)			
	Mobile and portable:	5150-5250	PASS	
Conducted Output	250mW (24dBm)			
Power	250mW (24dBm)	5250-5350	PASS	
	250mW (24dBm)	5470-5725	PASS	
	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 power meter and antenna output port as show in the block diagram below,

b.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	= 1MHz.
VBW	≥ 3MHz.
Detector	RMS
Trace	Max Hold
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

EUT Power Meter

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: 23°C Relative Humidity: 70% 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	Other then Mobile and portable:17dBm/MHz Mobile and portable:11dBm/MHz	5150-5250	PASS		
Density	11dBm/MHz	5250-5350	PASS		
	11dBm/MHz	5470-5725	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,

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

Note:

- 1. 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: 23°C Relative Humidity: 70% 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 (MHz)	Result		
	Specified in the user's manual	5150-5250	PASS		
		5250-5350	PASS		
Frequency Stability		5470-5725	PASS		
		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
	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 -20°C~50°C.

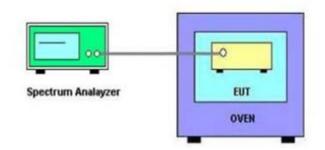
8.1.2 DEVIATION FROM STANDARD

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: 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	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	TWO-LINE V-NETWORK	R&S	ENV216	101050	Jan. 25, 2018
2	Test Cable	TIMES	CFD300-NL	C02	Jun. 14, 2018
3	EMI Test Receiver	R&S	ESR7	101433	Dec. 09, 2017
4	Measurement Software	EZ	EZ_EMC (Version NB-03A)	N/A	N/A

	Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Preamplifier	EMCI	012645B	980267	Feb. 28, 2018	
2	Preamplifier	EMCI	EMC02325	980217	Dec. 29, 2017	
3	Preamplifier	EMCI	EMC2654045	980030	Feb. 14, 2018	
4	Test Cable	EMCI	EMC104-SM-S M-8000	8m	Jan. 04, 2018	
5	Test Cable	EMCI	EMC104-SM-S M-800	150207	Jan. 04, 2018	
6	Test Cable	EMCI	EEMC104-SM-S M-3000	151205	Jan. 04, 2018	
7	MXE EMI Receiver	Agilent	N9038A	MY55420127	Jan. 09, 2018	
8	Signal Analyzer	Agilent	N9010A	MY52220990	Feb. 22, 2018	
9	Loop Ant	EMCO	6502	42960	Nov. 24, 2017	
10	Horm Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	Feb. 28, 2018	
11	Horm Ant	Schwarzbeck	BBHA 9170	187	Dec. 07, 2017	
12	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-548	Jan. 16, 2018	
13	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0623	Jan. 16, 2018	



Spectrum Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 25, 2018

	Maximum Conducted Output Power Measurement					
	Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
	1	Power Meter	Anritsu	ML2495A	1128008	Aug. 16, 2018
ſ	2	Power Sensor	Anritsu	MA2411B	1126001	Aug. 16, 2018

Power Spectral Density Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 25, 2018

Frequency Stability Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 25, 2018

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

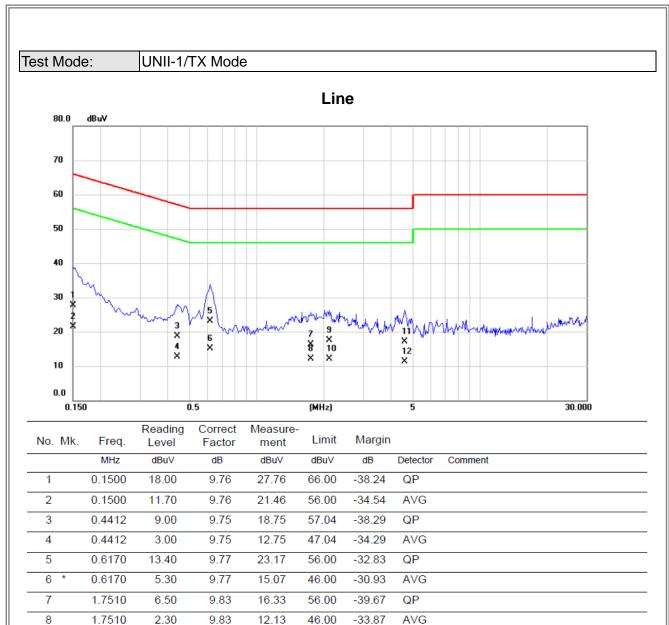
All calibration period of equipment list is one year.



APPENDIX A - CONDUCTED EMISSION







Note : The test result has included the cable loss.

9.83

9.83

9.87

9.87

17.43

12.03

17.07

11.37

56.00

46.00

56.00

46.00

-38.57

-33.97

-38.93

-34.63

QP

AVG

QP

AVG

7.60

2.20

7.20

1.50

9

10

11

12

2.1200

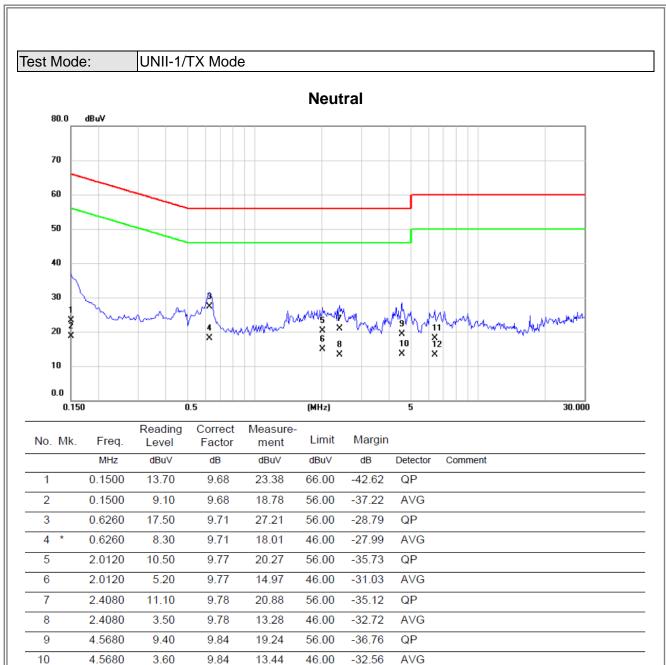
2.1200

4.5860

4.5860







Note : The test result has included the cable loss.

9.88

9.88

18.08

13.38

60.00

50.00

-41.92

-36.62

QP

AVG

8.20

3.50

11

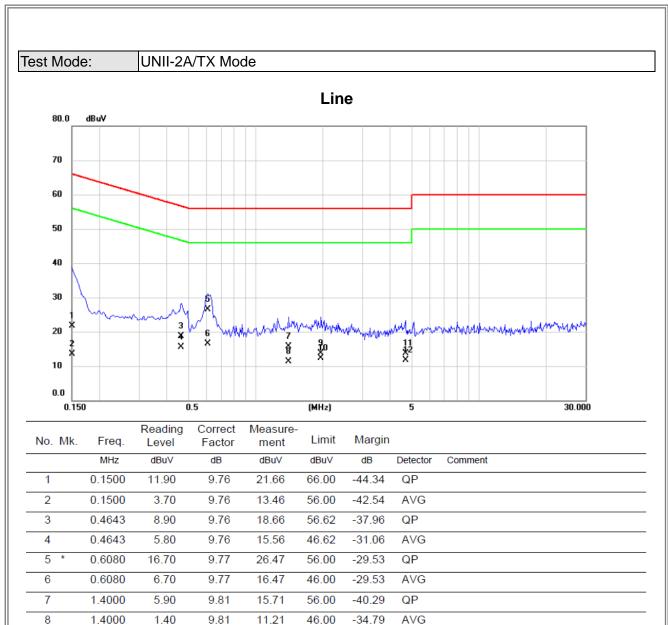
12

6.4000

6.4000







11	4.6850	3.80	9.87	13.67	56.00	-42.33	
 12	4.6850	1.80	9.87	11.67	46.00	-34.33	

9.83

9.83

13.73

12.23

56.00

46.00

-42.27

-33.77

QP

AVG

QP AVG

Note : The test result has included the cable loss.

3.90

2.40

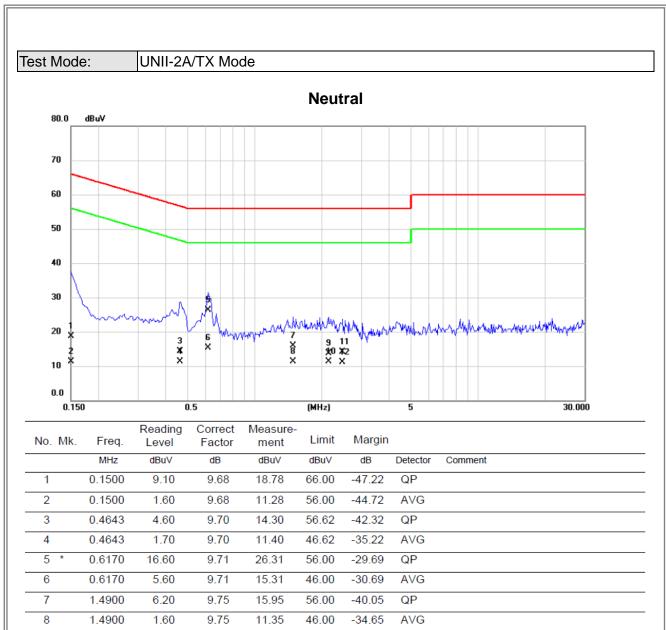
9

10

1.9580







Note : The test result has included the cable loss.

9.77

9.77

9.78

9.78

13.77

11.27

14.18

11.08

56.00

46.00

56.00

46.00

-42.23

-34.73

-41.82

-34.92

QP

AVG

QP

AVG

4.00

1.50

4.40

1.30

9

10

11

12

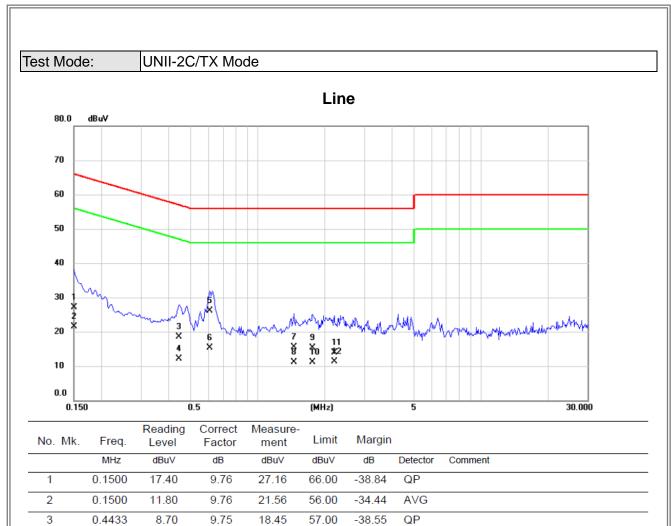
2.1380

2.1380

2.4710







8	1.4540	1.20	9.81	11.01	46.00	-34.99	AVG		
9	1.7600	5.40	9.83	15.23	56.00	-40.77	QP		
10	1.7600	1.30	9.83	11.13	46.00	-34.87	AVG		
11	2.2010	4.10	9.83	13.93	56.00	-42.07	QP		
12	2.2010	1.40	9.83	11.23	46.00	-34.77	AVG		
		14.1		1.0				 	

12.15

26.07

15.27

15.41

47.00

56.00

46.00

56.00

-34.85

-29.93

-30.73

-40.59

AVG

QP

AVG

QP

Note : The test result has included the cable loss.

0.4433

0.6080

0.6080

1.4540

4

5

7

* 6

2.40

16.30

5.50

5.60

9.75

9.77

9.77



8

9

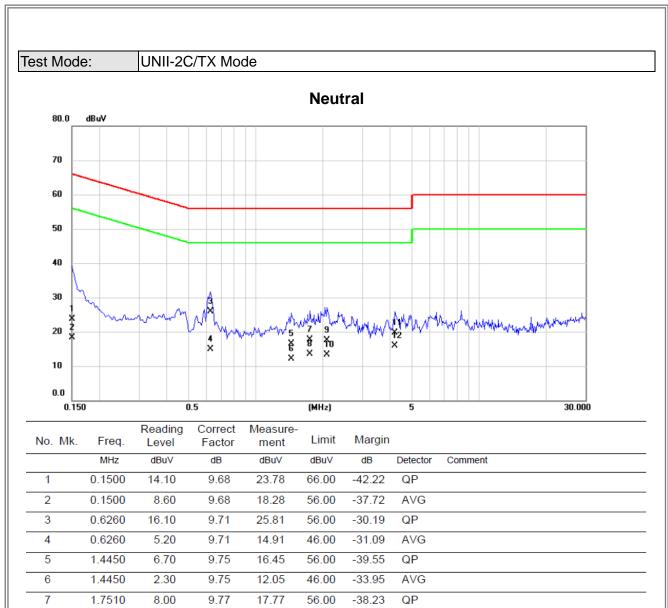
10

1.7510

2.0840

2.0840





11	4.2080	9.90	9.83	19.73	56.00	-36.27	QP
12 *	4.2080	6.00	9.83	15.83	46.00	-30.17	AVG

9.77

9.77

9.77

13.47

17.57

13.27

46.00

56.00

46.00

-32.53

-38.43

-32.73

AVG

QP

AVG

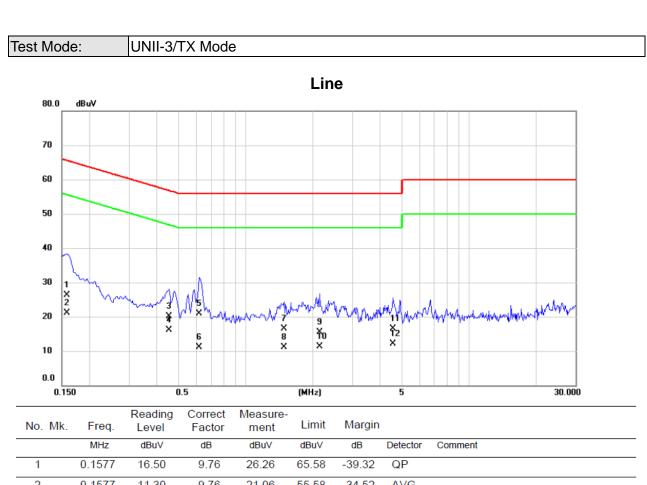
Note : The test result has included the cable loss.

3.70

7.80





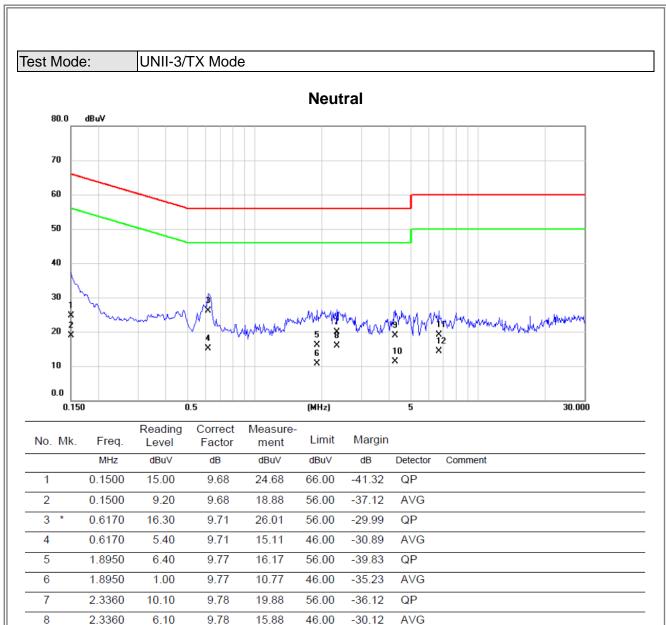


2	0.1577	11.30	9.76	21.06	55.58	-34.52	AVG
3	0.4538	10.40	9.76	20.16	56.81	-36.65	QP
4 *	0.4538	6.40	9.76	16.16	46.81	-30.65	AVG
5	0.6170	11.10	9.77	20.87	56.00	-35.13	QP
6	0.6170	1.30	9.77	11.07	46.00	-34.93	AVG
7	1.4810	6.70	9.81	16.51	56.00	-39.49	QP
8	1.4810	1.30	9.81	11.11	46.00	-34.89	AVG
9	2.1470	5.60	9.83	15.43	56.00	-40.57	QP
10	2.1470	1.40	9.83	11.23	46.00	-34.77	AVG
11	4.5500	6.70	9.87	16.57	56.00	-39.43	QP
12	4.5500	2.20	9.87	12.07	46.00	-33.93	AVG

Note : The test result has included the cable loss.







Note : The test result has included the cable loss.

9.83

9.83

9.90

9.90

18.93

11.33

19.10

14.30

56.00

46.00

60.00

50.00

-37.07

-34.67

-40.90

-35.70

QP

AVG

QP

AVG

9.10

1.50

9.20

4.40

9

10

11

12

4.2440

4.2440

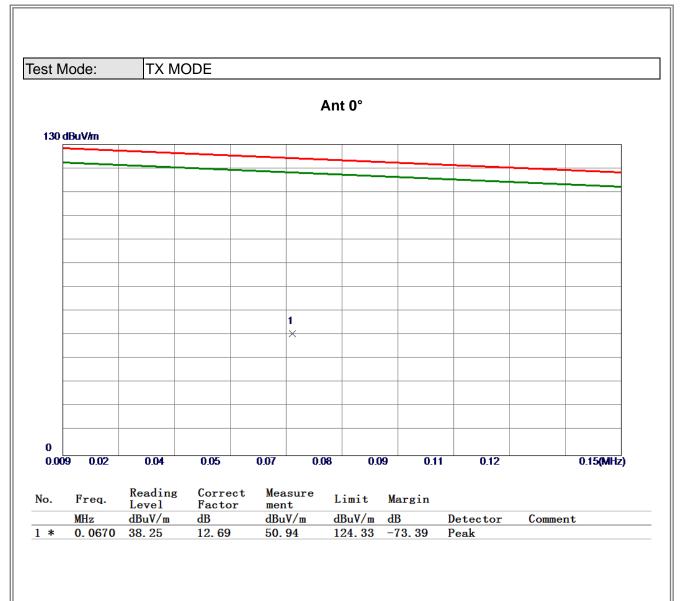
6.7000



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

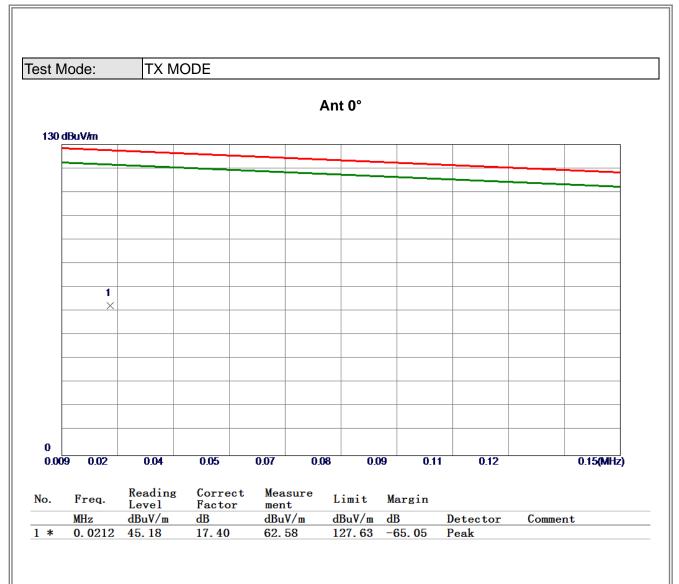






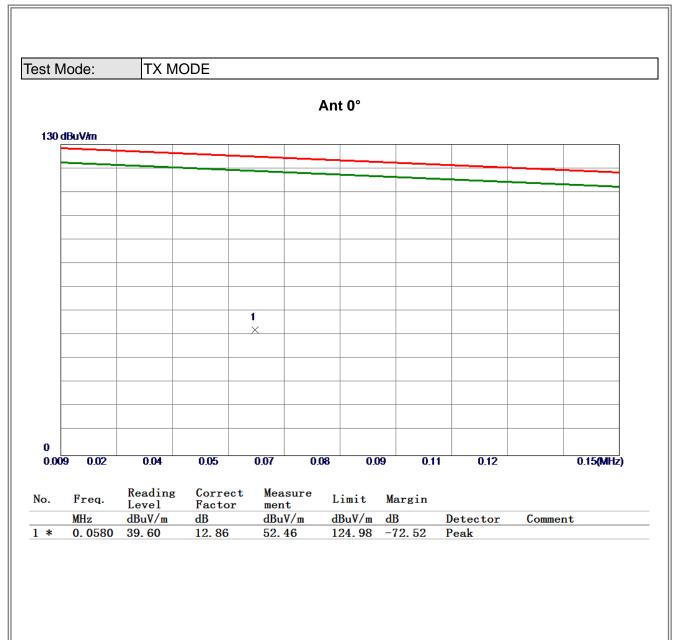






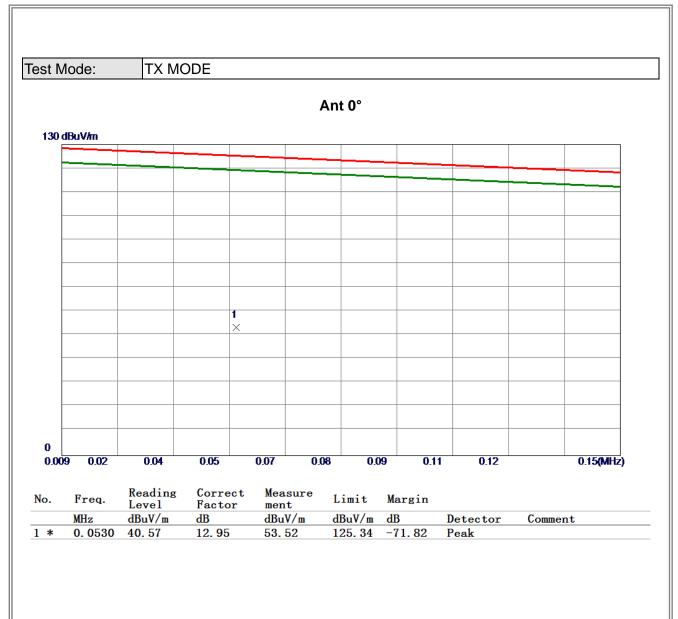






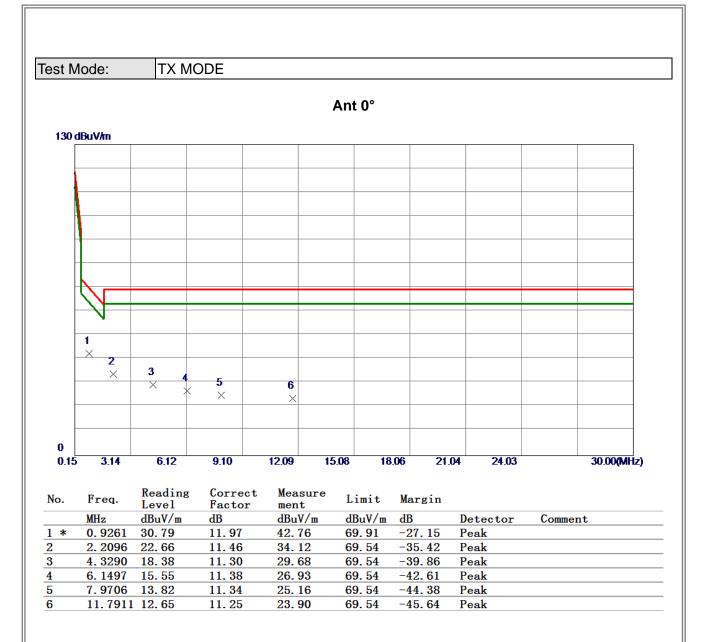






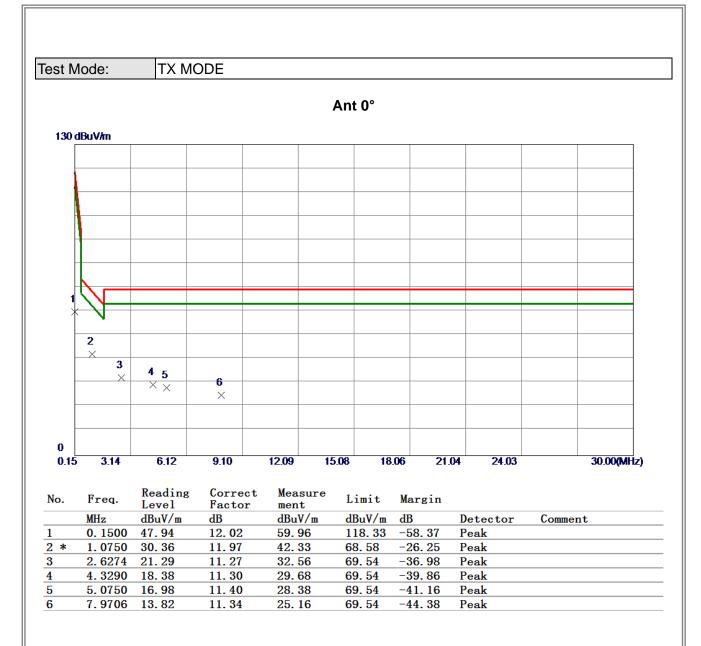






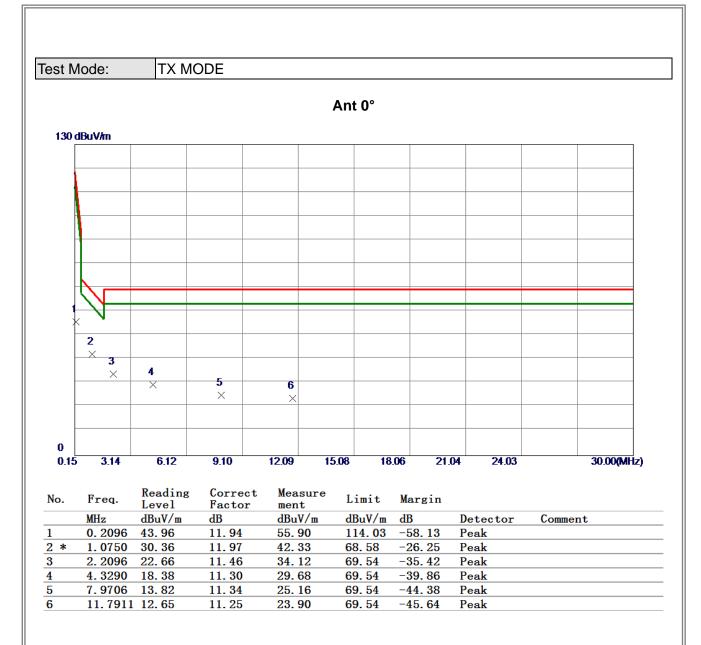






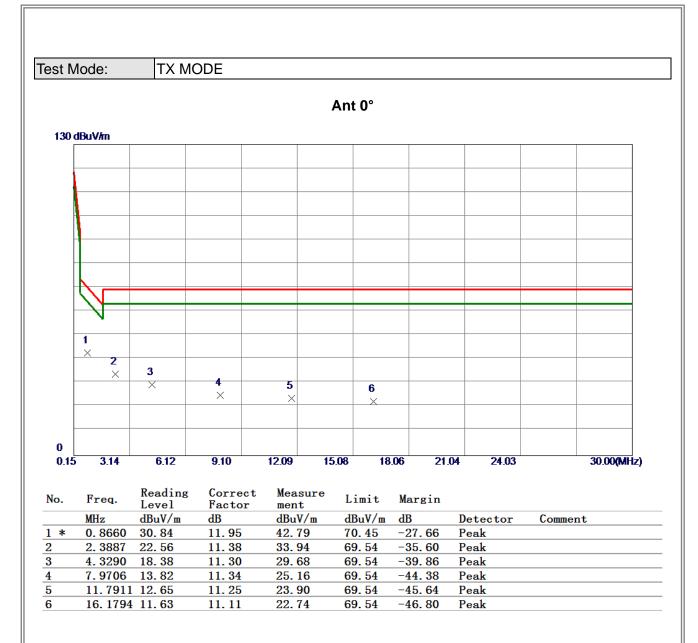






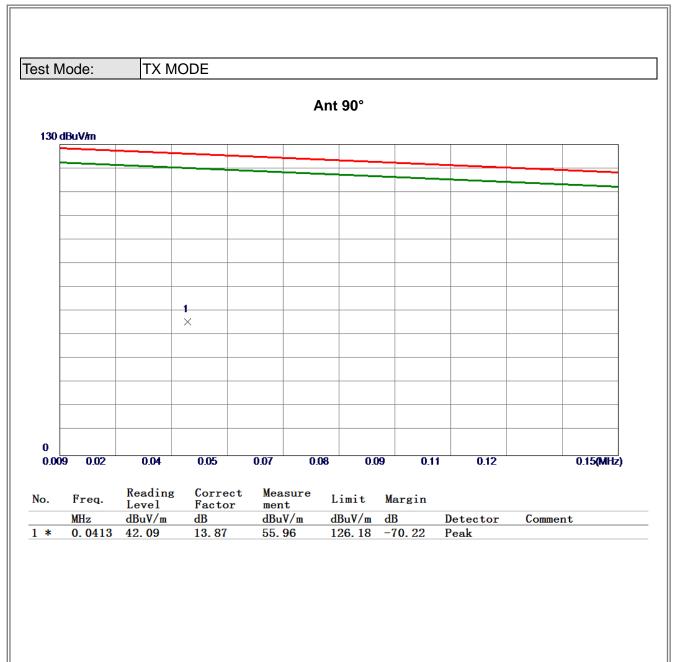






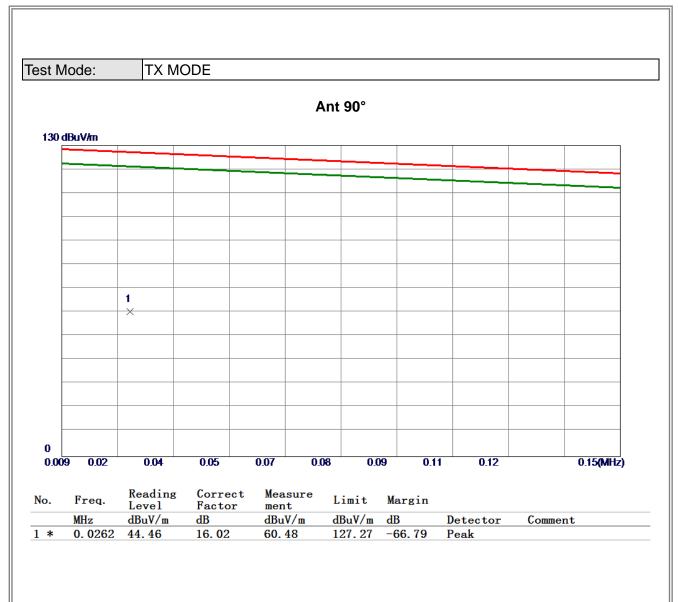












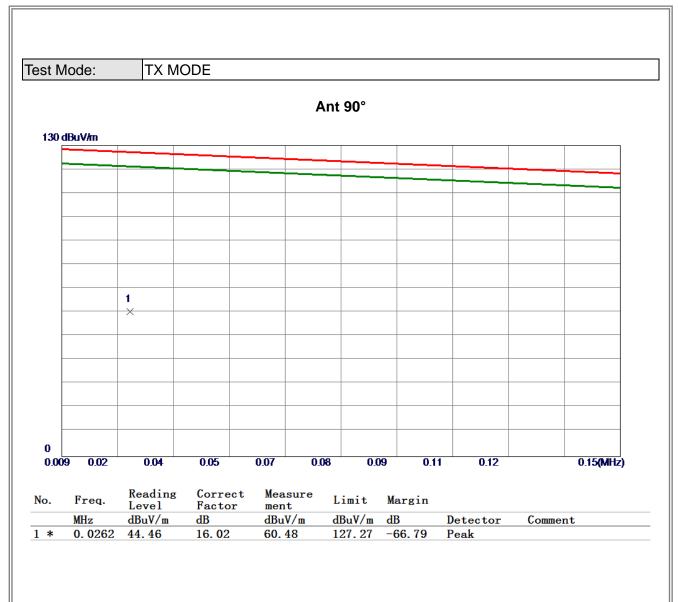






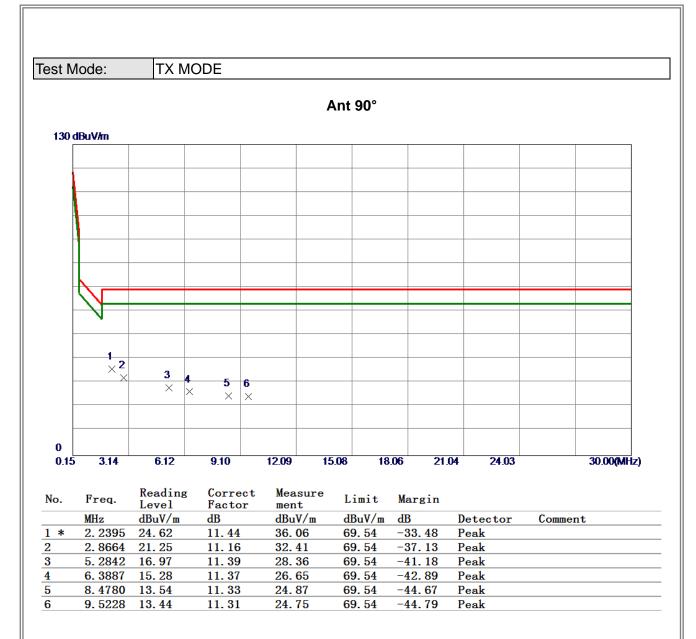












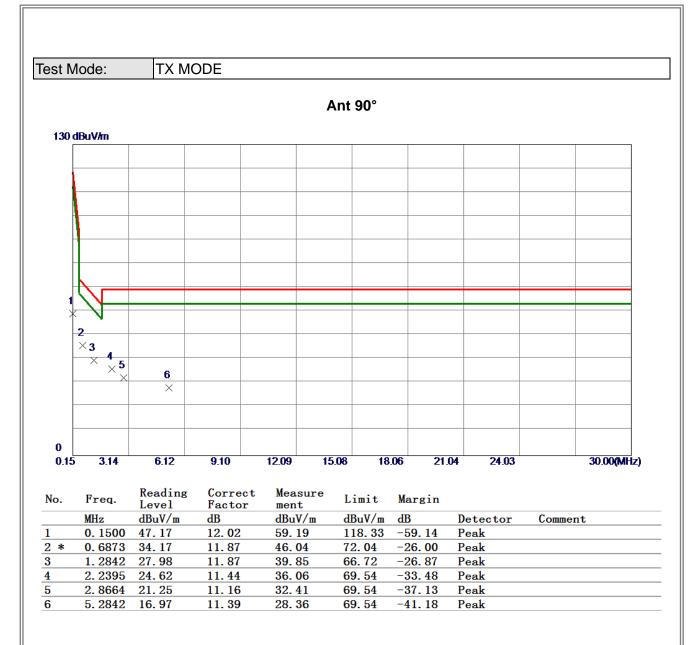






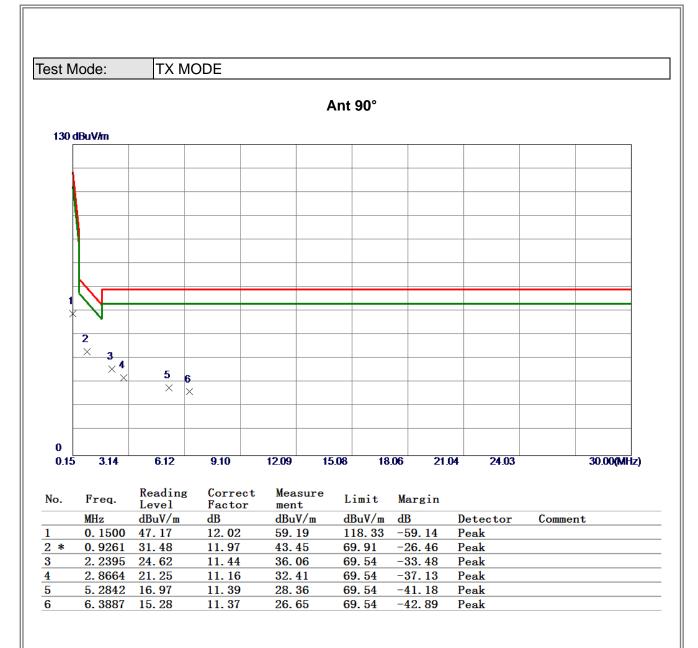












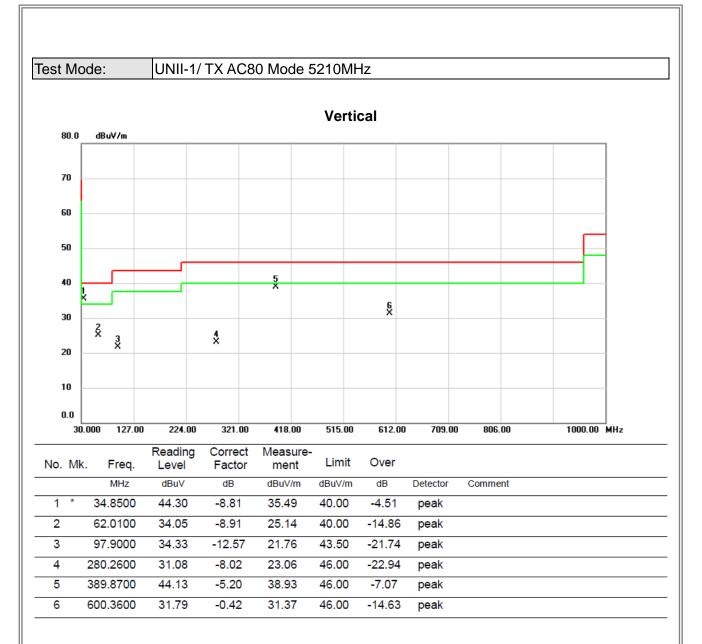




APPENDIX C - RADIATED EMISSION (30MHZ TO 1000MHZ)

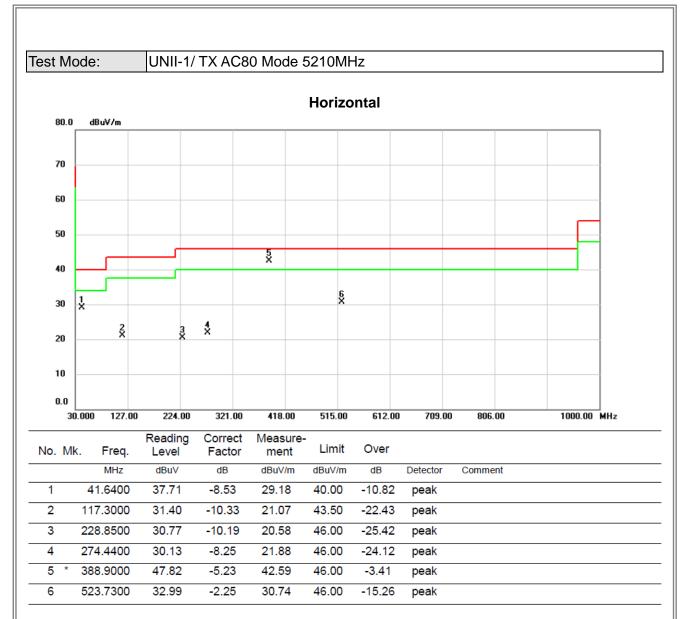






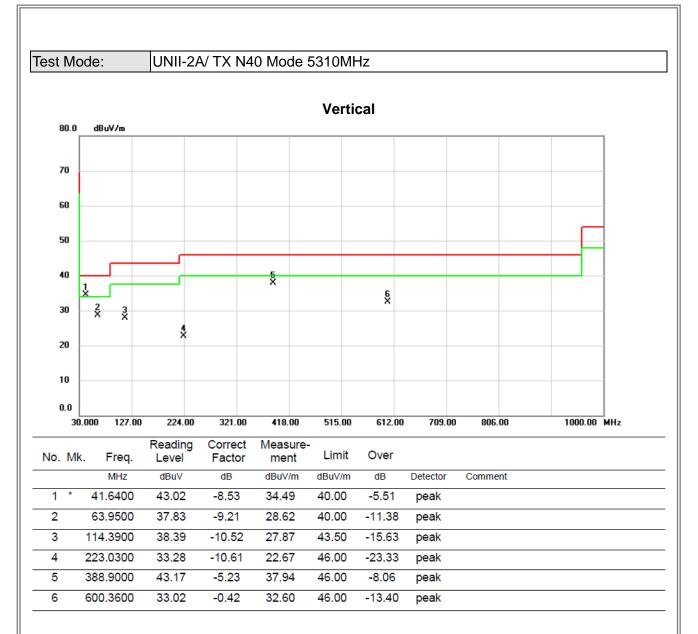






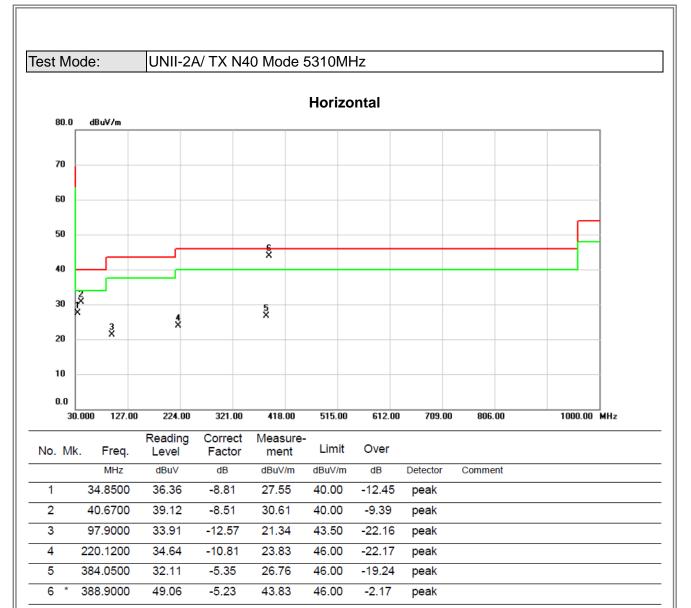






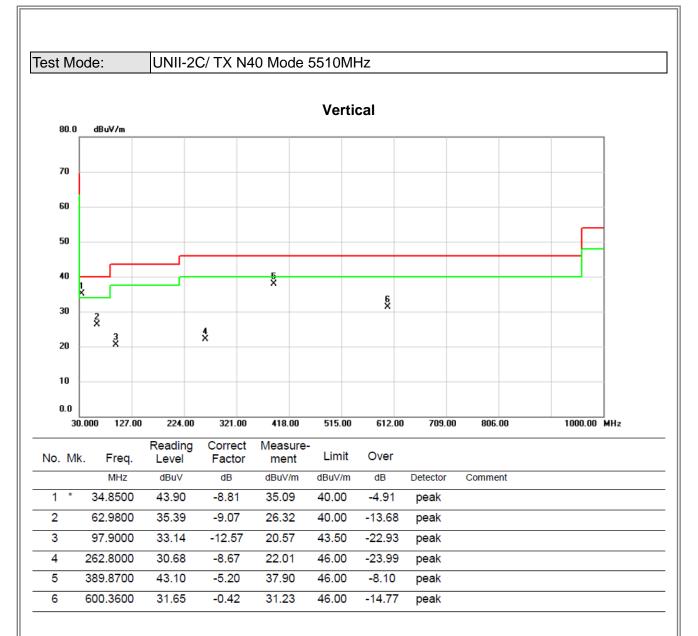






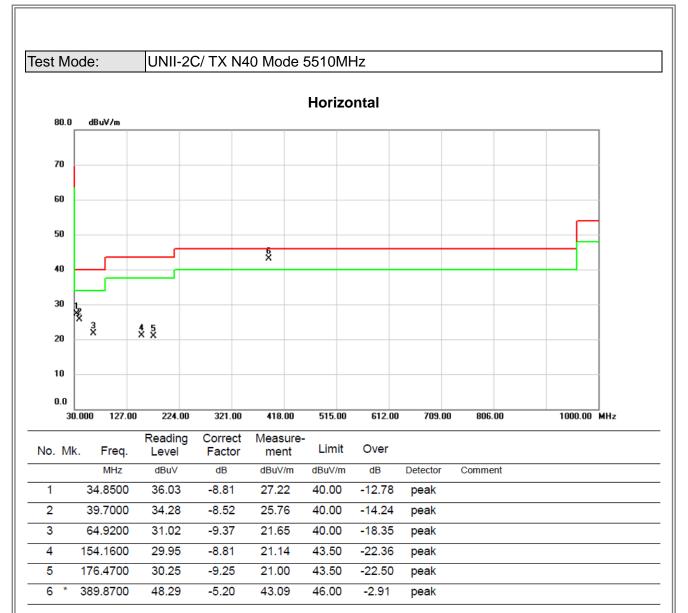






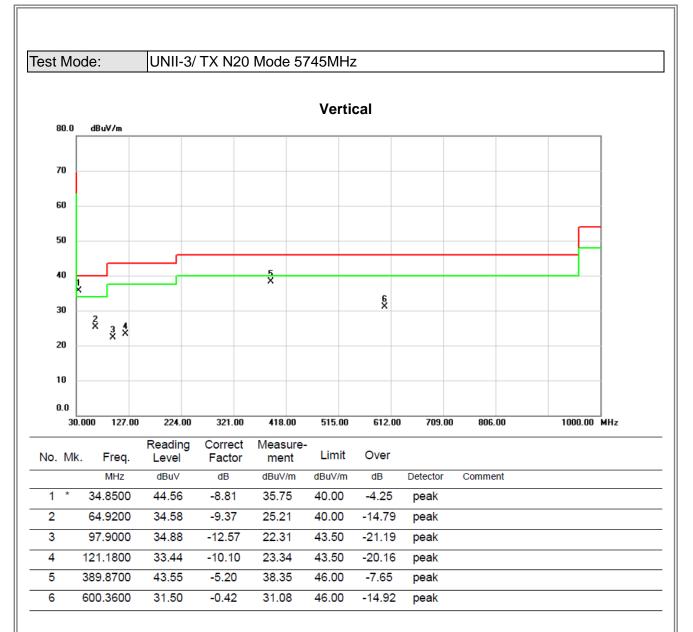






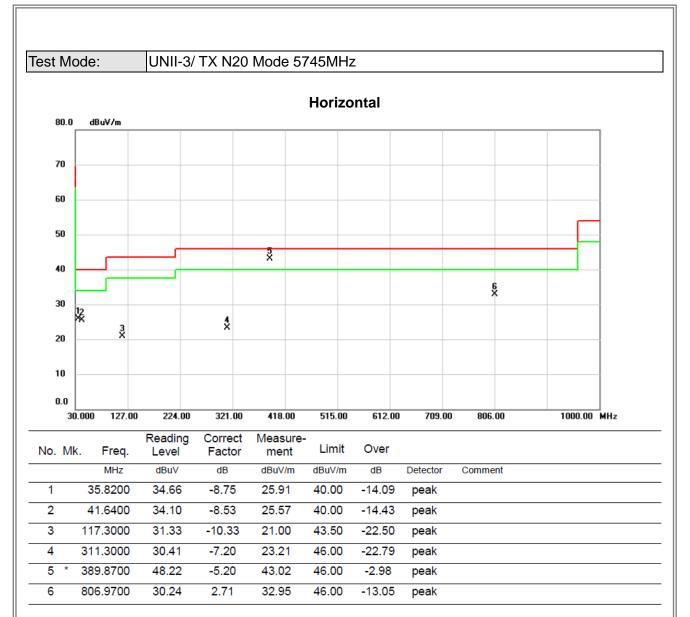














APPENDIX D - RADIATED EMISSION (ABOVE 1000MHZ)





