



FCC Radio Test Report

FCC ID: G95-UIW4020A

This report concerns: Original Grant

: 1904C199

Project No.
Equipment
Test Model
Series Model
Applicant
Address

: SET TOP BOX : UIW4020WOW : UIW4020TLU, UIW4020COG : Technicolor Connected Home USA LLC : 5030 Sugarloaf Parkway Building 6 Lawrenceville Georgia United States

Date of Receipt	: Apr. 29, 2019
Date of Test	: Apr. 30, 2019 ~ May 30, 2019
Issued Date	: Jun. 21, 2019
Tested by	: BTL Inc.

Testing Engineer

hay Cai)

Technical Manager

Authorized Signatory

(Steven Lu)

Ethan Ma)



No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China. TEL: +86-769-8318-3000 FAX: +86-769-8319-6000

> ac-MR/ ACCREDITED hilahi

> > Certificate #5123.02

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BTL's laboratory quality assurance procedures are in compliance with the ISO/IEC 17025 requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

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.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.





Table of Contents	Page
REPORT ISSUED HISTORY	6
1. GENERAL SUMMARY	7
2 . SUMMARY OF TEST RESULTS	8
2.1 TEST FACILITY	9
2.2 MEASUREMENT UNCERTAINTY	9
3 . GENERAL INFORMATION	10
3.1 GENERAL DESCRIPTION OF EUT	10
3.2 TEST MODES	13
3.3 PARAMETERS OF TEST SOFTWARE	15
3.4 DUTY CYCLE	17
3.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	19
3.6 SUPPORT UNITS	19
4 . AC POWER LINE CONDUCTED EMISSIONS TEST	20
4.1 LIMIT	20
4.2 TEST PROCEDURE	20
4.3 DEVIATION FROM TEST STANDARD	20
	21
4.5 EUT OPERATION CONDITIONS	21
4.6 EUT TEST CONDITIONS	21
4.7 TEST RESULTS	21
5 . RADIATED EMISSIONS TEST	22
5.1 LIMIT	22
5.2 TEST PROCEDURE 5.3 DEVIATION FROM TEST STANDARD	23 23
5.4 TEST SETUP	23 23
5.5 EUT OPERATION CONDITIONS	25
5.6 EUT TEST CONDITIONS	25
5.7 TEST RESULTS - 9 KHZ to 30 MHZ	25
5.8 TEST RESULTS - 30 MHz TO 1000 MHz	25
5.9 TEST RESULTS - ABOVE 1000 MHz	25
6 . BANDWIDTH TEST	26
6.1 LIMIT	26





Table of Contents	Page
6.2 TEST PROCEDURE	26
6.3 TEST PROCEDURE	26
6.4 TEST SETUP	27
6.5 EUT OPERATION CONDITIONS	27
6.6 EUT TEST CONDITIONS	27
6.7 TEST RESULTS	27
7 . MAXIMUM OUTPUT POWER TEST	28
7.1 LIMIT	28
7.2 TEST PROCEDURE	28
7.3 DEVIATION FROM STANDARD	28
7.4 TEST SETUP	29
7.5 EUT OPERATION CONDITIONS	29
7.6 EUT TEST CONDITIONS	29
7.7 TEST RESULTS	29
8 . POWER SPECTRAL DENSITY TEST	30
8.1 LIMIT	30
8.2 TEST PROCEDURE	30
8.3 DEVIATION FROM STANDARD	30
8.4 TEST SETUP	31
8.5 EUT OPERATION CONDITIONS	31
8.6 UT TEST CONDITIONS	31
8.7 TEST RESULTS	31
9 . FREQUENCY STABILITY MEASUREMENT	32
9.1 LIMIT	32
9.2 TEST PROCEDURE	32
9.3 DEVIATION FROM STANDARD	32
9.4 TEST SETUP	32
9.5 EUT OPERATION CONDITIONS	32
9.6 EUT TEST CONDITIONS	32
9.7 TEST RESULTS	32
10 . MEASUREMENT INSTRUMENTS LIST	33
11 . EUT TEST PHOTOS	35
APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS	39



Page

Table of Contents

APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ	42
APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1 GHZ	47
APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ	60
APPENDIX E - BANDWIDTH	261
APPENDIX F - MAXIMUM OUTPUT POWER	276
APPENDIX G - POWER SPECTRAL DENSITY	298
APPENDIX H - FREQUENCY STABILITY	348



REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Jun. 13, 2019
R01	Updated the model difference(s).	Jun. 21, 2019



1. GENERAL SUMMARY

Brand Name : Test Model : Series Model : Applicant : Manufacturer : Address : Factory : Address :	SET TOP BOX Technicolor UIW4020WOW UIW4020TLU, UIW4020COG Technicolor Connected Home USA LLC Technicolor Connected Home USA LLC 5030 Sugarloaf Parkway Building 6 Lawrenceville Georgia United States Fuhong Precision Component (Bac Giang) COMPANY Limited Dinh Tram Industrial Park, Hoang Ninh Commune, Viet Yen District, Bac Giang Province, Vietnam Postcode: 10000 Apr. 30, 2019 ~ May 30, 2019	
Test Sample :	Engineering Sample No.: D190404649 for conducted and Non Beamforming Radiated, DG19051493 for Beamforming Radiated.	
Standard(s) :	FCC Part15, Subpart E(15.407) ANSI C63.10-2013 FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 FCC KDB 662911 D01 Multiple Transmitter Output v02r01	

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-4-1904C199) 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 are only for the UNII-1 and UNII-3 part.



2. SUMMARY OF TEST RESULTS

Test	procedures	according	to	the	technical	standard	(5)	
ICSU	procedures	according	ιU	uic	lecinicai	Stanuaru	(3)	-

FCC Part15, Subpart E(15.407)					
Standard(s) Section	Test Item	Test Result	Judgement	Remark	
15.207 15.407(b)	AC Power Line Conducted Emissions	APPENDIX A	PASS		
15.407(b) 15.205(a) 15.209(a)	Radiated Emissions	APPENDIX B APPENDIX C APPENDIX D	PASS		
15.407(a) 15.407(e)	Spectrum Bandwidth	APPENDIX E	PASS		
15.407(a)	Maximum Output Power	APPENDIX F	PASS		
15.407(a)	Power Spectral Density	APPENDIX G	PASS		
15.407(g)	Frequency Stability	APPENDIX H	PASS		
15.203	Antenna Requirements		PASS		
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 become standby mode for power saving. the EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.
- (3) For UNII-1 this device was functioned as a \boxtimes Access point device \boxtimes Client device



2.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China. BTL's Test Firm Registration Number for FCC: 357015 BTL's Designation Number for FCC: CN1240

2.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)) The BTL measurement uncertainty as below table:

A. AC power line conducted emissions test:

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

B. Radiated emissions test:

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	3.82		
					30 MHz~200 MHz	Н
DG-CB03	CISPR	200 MHz~1,000 MHz	V	3.86		
DG-CB03	CISER	200 MHz~1,000 MHz	H	3.94		
		1 GHz~18 GHz	V	3.12		
		1 GHz~18 GHz	H	3.68		
		18 GHz~40 GHz	V	4.15		
		18 GHz~40 GHz	Н	4.14		

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



3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	SET TOP BOX		
Brand Name	Technicolor		
Test Model	UIW4020WOW		
Series Model	UIW4020TLU, UIW4020COG		
Model Difference(s)	Only differ in housing color, P	SU color and label.	
	Conducted		
S/N	Non Beamforming Radiated	293930019126800075	
	Beamforming Radiated	293930019126800031	
Power Source	Supplied from AC/DC adapter Brand/Model: MOSO/MSA-C		
Power Rating	I/P: 100-120V~50-60Hz 0.6A	max O/P: 12V1.5A	
Operation Frequency	UNII-1: 5150 MHz~5250 MHz UNII-3: 5725 MHz~5850 MHz		
Modulation Type	OFDM		
Bit Rate of Transmitter	Up to 1733 Mbps	0.570 \M/\	
Maximum Conducted Output Power for UNII-1 _Non Beamforming	IEEE 802.11a: 25.53 dBm (0.3573 W) IEEE 802.11n (HT20): 23.63 dBm (0.2307 W) IEEE 802.11n (HT40): 18.01 dBm (0.0632 W) IEEE 802.11ac (VHT20): 23.58 dBm (0.2280 W) IEEE 802.11ac (VHT40): 16.08 dBm (0.0406 W) IEEE 802.11ac (VHT80): 15.16 dBm (0.0328 W)		
Maximum Conducted Output Power for UNII-3 _Non Beamforming	IEEE 802.11a: 26.06 dBm (0.4036 W) IEEE 802.11n (HT20): 26.77 dBm (0.4753 W) IEEE 802.11n (HT40): 26.01 dBm (0.3990 W) IEEE 802.11ac (VHT20): 26.67 dBm (0.4645 W) IEEE 802.11ac (VHT40): 26.19 dBm (0.4159 W) IEEE 802.11ac (VHT80): 24.71 dBm (0.2958 W)		
Maximum Conducted Output Power for UNII-1 _Beamforming	IEEE 802.11n (HT20): 23.62 dBm (0.2301 W) IEEE 802.11n (HT40): 18.98 dBm (0.0791 W) IEEE 802.11ac (VHT20): 23.58 dBm (0.2280 W) IEEE 802.11ac (VHT40): 18.09 dBm (0.0644 W) IEEE 802.11ac (VHT80): 20.75 dBm (0.1189 W)		
Maximum Conducted Output Power for UNII-3 _Beamforming	IEEE 802.11n (HT20): 26.77 dBm (0.4753 W) IEEE 802.11n (HT40): 26.81 dBm (0.4797 W) IEEE 802.11ac (VHT20): 27.00 dBm (0.5012 W) IEEE 802.11ac (VHT40): 26.78 dBm (0.4764 W) IEEE 802.11ac (VHT80): 26.09 dBm (0.4064 W)		
Hardware Version	FGR build		
Software Version	KERNEL: 4.9.141-1-6pre #13 SMP Tue Jan 22 17:06:52 CET 2019 ANDROID : 9 Sapphire-E-1.16		
PCB Version	FGR Apex/015		



Note:

BIL

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

2. Channel List:

IEEE 802.11a IEEE 802.11n (HT20) IEEE 802.11ac (VHT20)		IEEE 802.11n (HT40) IEEE 802.11ac (VHT40)		IEEE 802.11ac (VHT80)		
UNI	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					

IEEE 802.11a IEEE 802.11n (HT20) IEEE 802.11ac (VHT20)		IEEE 802.11n (HT40) IEEE 802.11ac (VHT40)		IEEE 802.11ac (VHT80)	
UNII-3		UNII-3		UNII-3	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755	155	5775
153	5765	159	5795		
157	5785				
161	5805				
165	5825				

3. Antenna Specification:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	PIFA	N/A	5.2
2	N/A	N/A	PIFA	N/A	5.25
3	N/A	N/A	PIFA	N/A	5.2
4	N/A	N/A	PIFA	N/A	4.17

Note:

This EUT supports MIMO 4X4, any transmit signals are correlated with each other.So,

(1) For CDD 1S4T Non Beamforming, directional gain = 5.25dBi

(2) For CDD 1S4T Beamforming, directional gain = 8.11dBi

the UNII-1 output power limit is 30-8.11+6=27.89,

the UNII-3 output power limit is 30-8.11+6=27.89,

the UNII-1 power spectral density limit is 17-8.11+6=14.89,

the UNII-3 power spectral density limit is 30-8.11+6=27.89.



4. Table for Antenna Configuration:

Operating Mode TX Mode	1TX	4TX
IEEE 802.11a	V (Ant. 2)	-
IEEE 802.11n (HT20)	-	V (Ant. 1 + Ant. 2 + Ant. 3 + Ant. 4)
IEEE 802.11n (HT40)	-	V (Ant. 1 + Ant. 2 + Ant. 3 + Ant. 4)
IEEE 802.11ac (VHT20)	-	V (Ant. 1 + Ant. 2 + Ant. 3 + Ant. 4)
IEEE 802.11ac (VHT40)	-	V (Ant. 1 + Ant. 2 + Ant. 3 + Ant. 4)
IEEE 802.11ac (VHT80)	-	V (Ant. 1 + Ant. 2 + Ant. 3 + Ant. 4)



3.2 TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description	
Mode 1	TX A Mode / CH36, CH40, CH48 (UNII-1)	
Mode 2	TX N (HT20) Mode / CH36, CH40, CH48 (UNII-1)	
Mode 3	TX N (HT40) Mode / CH38, CH46 (UNII-1)	
Mode 4	TX AC (VHT20) Mode / CH36, CH40, CH48 (UNII-1)	
Mode 5	TX AC (VHT40) Mode / CH38, CH46 (UNII-1)	
Mode 6	TX AC (VHT80) Mode / CH42 (UNII-1)	
Mode 7	TX A Mode / CH149,CH157,CH165 (UNII-3)	
Mode 8	TX N (HT20) Mode / CH149,CH157,CH165 (UNII-3)	
Mode 9	TX N (HT40) Mode / CH151,CH159 (UNII-3)	
Mode 10	TX AC (VHT20) Mode / CH149,CH157,CH165 (UNII-3)	
Mode 11	TX AC (VHT40) Mode / CH151,CH159 (UNII-3)	
Mode 12	TX AC (VHT80) Mode / CH155 (UNII-3)	
Mode 13	Normal Link	

Following mode(s) was (were) found to be the worst case(s) and selected for the final test.

AC power line conducted emissions test			
Final Test Mode	Description		
Mode 13	Normal Link		

	Radiated emissions test - 9kHz to 30MHz
Final Test Mode	Description
Mode 13	Normal Link

Radiated emissions test - 30MHz to 1000MHz			
Final Test Mode Description			
Mode 1	TX A Mode / CH36, CH40, CH48 (UNII-1)		
Mode 7 TX A Mode / CH149,CH157,CH165 (UNII-3)			



Radiated emissions test - Above 1GHz			
Final Test Mode	Description		
Mode 1	TX A Mode / CH36, CH40, CH48 (UNII-1)		
Mode 2	TX N (HT20) Mode / CH36, CH40, CH48 (UNII-1)		
Mode 3	TX N (HT40) Mode / CH38, CH46 (UNII-1)		
Mode 4	TX AC (VHT20) Mode / CH36, CH40, CH48 (UNII-1)		
Mode 5	TX AC (VHT40) Mode / CH38, CH46 (UNII-1)		
Mode 6	TX AC (VHT80) Mode / CH42 (UNII-1)		
Mode 7	TX A Mode / CH149,CH157,CH165 (UNII-3)		
Mode 8	TX N (HT20) Mode / CH149,CH157,CH165 (UNII-3)		
Mode 9	TX N (HT40) Mode / CH151,CH159 (UNII-3)		
Mode 10	TX AC (VHT20) Mode / CH149,CH157,CH165 (UNII-3)		
Mode 11	TX AC (VHT40) Mode / CH151,CH159 (UNII-3)		
Mode 12	TX AC (VHT80) Mode / CH155 (UNII-3)		

Conducted test				
Final Test Mode	Description			
Mode 1	TX A Mode / CH36, CH40, CH48 (UNII-1)			
Mode 2	TX N (HT20) Mode / CH36, CH40, CH48 (UNII-1)			
Mode 3	TX N (HT40) Mode / CH38, CH46 (UNII-1)			
Mode 4	TX AC (VHT20) Mode / CH36, CH40, CH48 (UNII-1)			
Mode 5	TX AC (VHT40) Mode / CH38, CH46 (UNII-1)			
Mode 6	TX AC (VHT80) Mode / CH42 (UNII-1)			
Mode 7	TX A Mode / CH149,CH157,CH165 (UNII-3)			
Mode 8	TX N (HT20) Mode / CH149,CH157,CH165 (UNII-3)			
Mode 9	TX N (HT40) Mode / CH151,CH159 (UNII-3)			
Mode 10	TX AC (VHT20) Mode / CH149,CH157,CH165 (UNII-3)			
Mode 11	TX AC (VHT40) Mode / CH151,CH159 (UNII-3)			
Mode 12	TX AC (VHT80) Mode / CH155 (UNII-3)			

Note :

- (1) For radiated emission below 1 GHz test, the IEEE 802.11a is found to be the worst case and recorded.
- (2) For radiated emission above 1 GHz test, 1GHz~26.5GHz and 26.5GHz~40GHz have been pre-tested and in this report only recorded the worst case. The remaining spurious points are all below the limit value of 20dB.
- (3) There are two kinds of shield (shield cover) in the equipment. The measurements for radiated emission were pre-tested with original shield and new shield, the worst case are original shield, only worst case was documented.



3.3 PARAMETERS OF TEST SOFTWARE

Non Beamforming

UNII-1					
Test Software	N/A				
Test Frequency (MHz)	5180	5200	5240		
IEEE 802.11a	18	22	23		
IEEE 802.11n (HT20)	17	17	17		
IEEE 802.11ac (VHT20)	17	17	17		
Test Frequency (MHz)	5190	5230			
IEEE 802.11n (HT40)	11	9			
IEEE 802.11ac (VHT40)	9	8			
Test Frequency (MHz)	5210				
IEEE 802.11ac (VHT80)	8				

UNII-3

Or Will O					
Test Software	N/A				
Test Frequency (MHz)	5745	5785	5825		
IEEE 802.11a	24	24	24		
IEEE 802.11n (HT20)	20	21	21		
IEEE 802.11ac (VHT20)	20	21	21		
Test Frequency (MHz)	5755	5795			
IEEE 802.11n (HT40)	20	20			
IEEE 802.11ac (VHT40)	20	20			
Test Frequency (MHz)	5775				
IEEE 802.11ac (VHT80)	19				

Beamforming

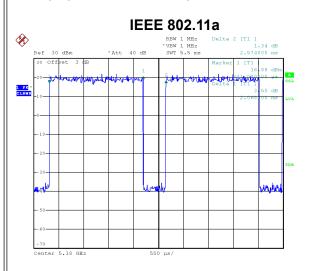
UNII-1			
Test Software	N/A		
Test Frequency (MHz)	5180	5200	5240
IEEE 802.11n (HT20)	17	17	17
IEEE 802.11ac (VHT20)	17	17	17
Test Frequency (MHz)	5190	5230	
IEEE 802.11n (HT40)	12	12	
IEEE 802.11ac (VHT40)	11	11	
Test Frequency (MHz)	5210		
IEEE 802.11ac (VHT80)	14		

UNII-3			
Test Software		N/A	
Test Frequency (MHz)	5745	5785	5825
IEEE 802.11n (HT20)	21	21	21
IEEE 802.11ac (VHT20)	21	21	21
Test Frequency (MHz)	5755	5795	
IEEE 802.11n (HT40)	20	21	
IEEE 802.11ac (VHT40)	20	20	
Test Frequency (MHz)	5775		
IEEE 802.11ac (VHT80)	20		



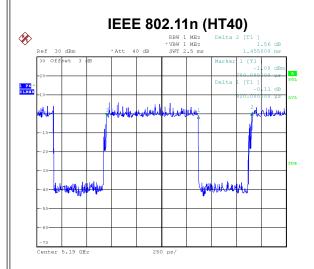
3.4 DUTY CYCLE

If duty cycle is \geq 98 %, duty factor is not required. If duty cycle is < 98 %, duty factor shall be considered.



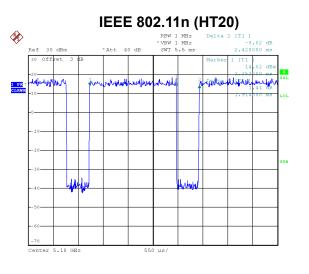
Date: 16.MAY.2019 21:12:56

Duty cycle = 2.068 ms / 2.574 ms = 80.34% Duty Factor = 10 * log(1 / 80.34%) = 0.95



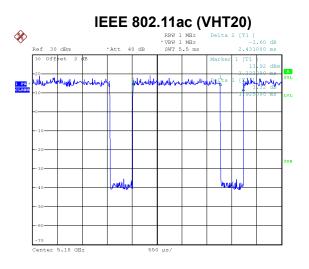
Date: 16.MAY.2019 21:15:48

Duty cycle = 0.920 ms / 1.455 ms = 63.23% Duty Factor = 10 * log(1 / 63.23%) = 1.99



Date: 16.MAY.2019 21:14:06

Duty cycle = 1.914 ms / 2.420 ms = 79.09% Duty Factor = 10 * log(1 / 79.09%) = 1.02

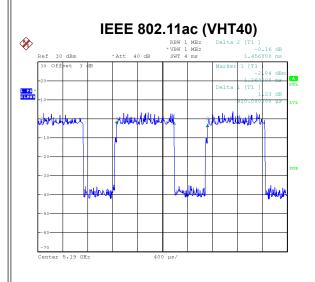


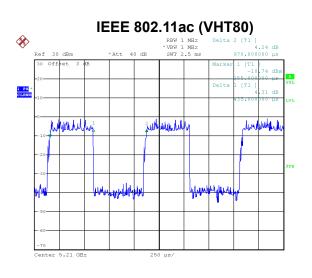
Date: 16.MAY.2019 21:14:48

Duty cycle = 1.925 ms / 2.431 ms = 79.19% Duty Factor = 10 * log(1 / 79.19%) = 1.01









Date: 16.MAY.2019 21:16:24

Duty cycle = 0.920 ms / 1.456 ms = 63.19% Duty Factor = 10 * log(1 / 63.19%) = 1.99 Date: 16.MAY.2019 21:17:27

Duty cycle = 0.435 ms / 0.970 ms = 44.85% Duty Factor = 10 * log(1 / 44.85%) = 3.48

NOTE:

For IEEE 802.11a, IEEE 802.11n (HT20) and IEEE 802.11ac (VHT20): For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1 kHz (Duty cycle < 98%).

For IEEE 802.11n (HT40) and IEEE 802.11ac (VHT40):

For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 2 kHz (Duty cycle < 98%).

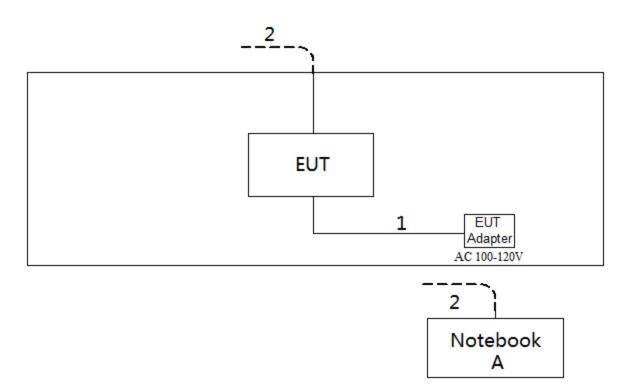
For IEEE 802.11ac (VHT80):

For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 kHz (Duty cycle < 98%).





3.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.6 SUPPORT UNITS

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.
А	Notebook	Dell	Inspiron 15-7559	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	1.5m
2	RJ45 Cable	NO	NO	10m



4. AC POWER LINE CONDUCTED EMISSIONS TEST

4.1 LIMIT

Frequency	Limit (dBµV)	
(MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

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.

The following table is the setting of the receiver

Receiver Parameter	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

4.2 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.

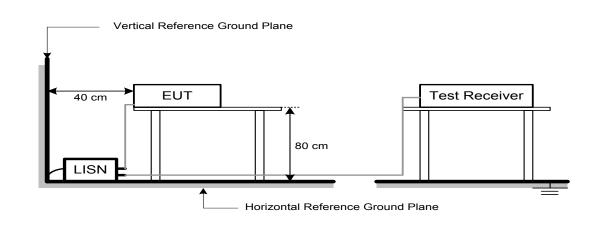
4.3 DEVIATION FROM TEST STANDARD

No deviation





4.4 TEST SETUP



4.5 EUT OPERATION 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.

4.6 EUT TEST CONDITIONS

Temperature: 26°C Relative Humidity: 54% Test Voltage: AC 120V/60Hz

4.7 TEST RESULTS

Please refer to the APPENDIX A.



5. RADIATED EMISSIONS TEST

5.1 LIMIT

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.

LIMITS OF RADIATED EMISSIONS MEASUREMENT (9 kHz to 1000 MHz)

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/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

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

NOTE:

(1) The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength: $E = \frac{100000\sqrt{30P}}{100000\sqrt{30P}}$

 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 the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.



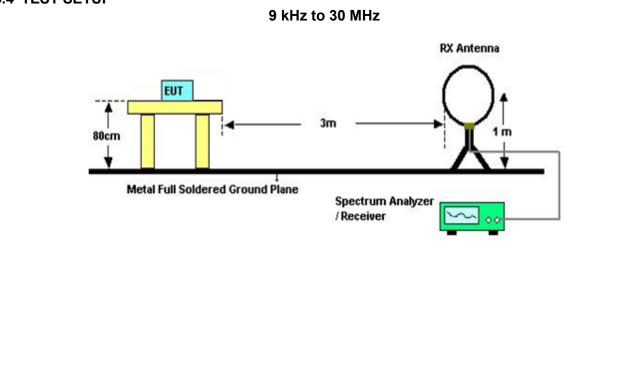
5.2 TEST PROCEDURE

- 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.

5.3 DEVIATION FROM TEST STANDARD

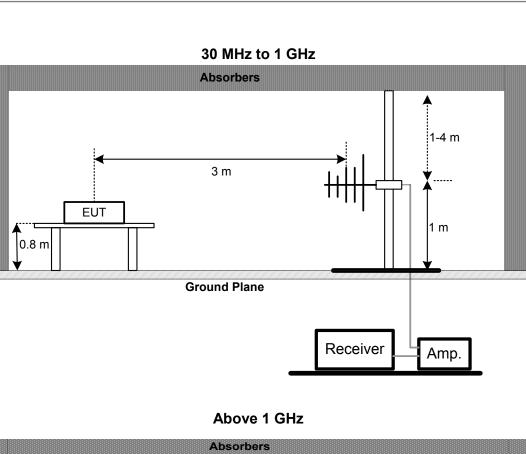
No deviation

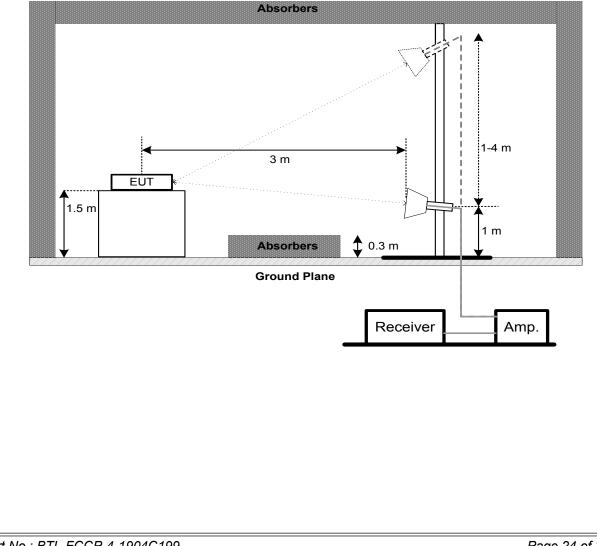
5.4 TEST SETUP















5.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.5 unless otherwise a special operating condition is specified in the follows during the testing.

5.6 EUT TEST CONDITIONS

Temperature: 24°C Relative Humidity: 68% Test Voltage: AC 120V/60Hz

5.7 TEST RESULTS - 9 KHZ to 30 MHZ

Please refer to the APPENDIX B

Remark:

- (1) Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
- (2) Limit line = specific limits (dBuV) + distance extrapolation factor.

5.8 TEST RESULTS - 30 MHz TO 1000 MHz

Please refer to the APPENDIX C.

5.9 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.



6. BANDWIDTH TEST

6.1 LIMIT

FCC Part15, Subpart E (15.407)			
Section Test Item Limit Frequency Range (MHz)			
15.407(a)	26 dB Bandwidth	-	5150-5250
15.407(e)	6 dB Bandwidth	Minimum 500 kHz	5725-5850

6.2 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 Setting:
 - For UNII-1:

Spectrum Parameter	Setting	
Attenuation	Auto	
Span Frequency	> 26 dB Bandwidth	
RBW	300 kHz (Bandwidth 20 MHz)	
K D V V	1 MHz (Bandwidth 40 MHz and 80 MHz)	
VBW	1 MHz (Bandwidth 20 MHz)	
	3 MHz (Bandwidth 40 MHz and 80 MHz)	
Detector	Peak	
Trace	Max Hold	
Sweep Time	Auto	

For UNII-3:

Spectrum Parameter	Setting
Attenuation	Auto
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 / 6 dB below carrier

6.3 TEST PROCEDURE

No deviation.





6.4 TEST SETUP

EUT	SPECTRUM
	ANALYZER

6.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

6.6 EUT TEST CONDITIONS

Temperature: 23°C Relative Humidity: 70% Test Voltage: AC 120V/60Hz

6.7 TEST RESULTS

Please refer to the APPENDIX E.



7. MAXIMUM OUTPUT POWER TEST

7.1 LIMIT

FCC Part15, Subpart E (15.407)					
Section	Section Test Item Limit				
15.407(a)	Conducted Output Power	AP device: 1 Watt (30 dBm) Client device: 250 mW (24 dBm)	5150-5250		
		1 Watt (30dBm)	5725-5850		

Note:

a. For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

7.2 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 Setting

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
Тгасе	Trace average at least 100 traces in power averaging(rms) mode.
Sweep Time	auto

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

7.3 DEVIATION FROM STANDARD

No deviation.





7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

7.6 EUT TEST CONDITIONS

Temperature: 23°C Relative Humidity: 70% Test Voltage: AC 120V/60Hz

7.7 TEST RESULTS

Please refer to the APPENDIX F.



8. POWER SPECTRAL DENSITY TEST

8.1 LIMIT

FCC Part15, Subpart E (15.407)				
Section	Frequency Range (MHz)			
15.407(a)	Power Spectral Density	AP device: 17 dBm/MHz Client device: 11 dBm/MHz	5150-5250	
		30 dBm/500 kHz	5725-5850	

8.2 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 Setting

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	= 1 MHz.
VBW	≥ 3 MHz.
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 v02r01, section II.F.5., it is acceptable to set RBW at 1 MHz and VBW at 3 MHz if the spectrum analyzer does not have 500 kHz RBW.
- The value measured with RBW=1 MHz is to be added with 10log(500 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.

8.3 DEVIATION FROM STANDARD

No deviation.





8.4 TEST SETUP

EUT	SPECTRUM	
	ANALYZER	

8.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

8.6 UT TEST CONDITIONS

Temperature: 23°C Relative Humidity: 70% Test Voltage: AC 120V/60Hz

8.7 TEST RESULTS

Please refer to the APPENDIX H.



9. FREQUENCY STABILITY MEASUREMENT

9.1 LIMIT

FCC Part15, Subpart E (15.407)					
Section	Test Item	Limit	Frequency Range (MHz)		
15.407(g)	Frequency Stability	Specified in the user's manual	5150-5250		
	- 1 7 7	- F	5725-5850		

9.2 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 Setting:

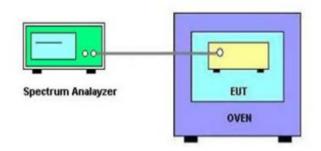
Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Entire absence of modulation emissions
Spain Frequency	bandwidth
RBW	10 kHz
VBW	30 kHz
Sweep Time	Auto

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

9.3 DEVIATION FROM STANDARD

No deviation.

9.4 TEST SETUP



9.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

9.6 EUT TEST CONDITIONS

Temperature: 23°C Relative Humidity: 70% Test Voltage: AC 120V/60Hz

9.7 TEST RESULTS

Please refer to the APPENDIX I.

10. MEASUREMENT INSTRUMENTS LIST

AC Dower Line Conducted Emissions						
AC Power Line Conducted Emissions						
Item		Manufacturer	Type No.	Serial No.	Calibrated until	
1	EMI Test Receiver	R&S	ESCI	100382	Mar. 10, 2020	
2	LISN	EMCO	3816/2	52765	Mar. 10, 2020	
3	50ohm Terminator	SHX	TF5-3	15041305	Mar. 10, 2020	
4	Artificial-Mains Network	SCHWARZBECK	NSLK 8127	8127685	Mar. 10, 2020	
5	TRANSIENT LIMITER	EM	EM-7600	772	Mar. 10, 2020	
6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A	
7	Cable	N/A	RG223	12m	Mar. 12, 2020	
			ssions - 9 kHz to 3			
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Loop Antenna	EM	EM-6876-1	230	Jan. 15, 2020	
2	Cable	N/A	RG 213/U	C-102	Jun. 01, 2019	
3	EMI Test Receiver	R&S	ESCI	100895	Mar. 10, 2020	
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A	
	Conward	I			<u> </u>	
		Radiated Emi	ssions - 30 MHz to	1 GHz		
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 09, 2020	
2		HP				
	Amplifier		8447D	2944A09673	Aug. 11, 2019	
3	Receiver	Agilent	N9038A	MY52130039	Aug. 11, 2019	
4	Cable	emci	LMR-400(30MHz- 1GHz)(8m+5m)	N/A	May 24, 2020	
5	Controller	СТ	SC100	N/A	N/A	
6	Controller	MF	MF-7802	MF780208416	N/A	
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A	
		Radiated En	nissions - Above 1	GHz		
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Double Ridged Guide Antenna	ETS	3115	75789	Mar. 09, 2020	
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 30, 2019	
3	Amplifier	Agilent	8449B	3008A02333	Mar. 10, 2020	
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 10, 2020	
5	Receiver	Agilent	N9038A	MY52130039	Aug. 11, 2019	
6	Controller	CT	SC100	N/A	N/A	
7	Controller	MF	MF-7802	MF780208416	N/A	
8	Cable	mitron	B10-01-01-12M	18072744	Jul. 30, 2019	
	Measurement		EZ-EMC	N/A	N/A	





	Bandwidth					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019	
		Maxim	um Output Power	r		
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019	
		Powe	r Spectral Density	,		
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019	
Frequency Stability						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019	
2	Precision Oven Tester	Bell	BTH-50C	20170306001	Mar. 10, 2020	

Remark: "N/A" denotes no model name, serial no. or calibration specified. All calibration period of equipment list is one year.





11. EUT TEST PHOTOS

AC Power Line Conducted Emissions Test Photos





Report No.: BTL-FCCP-4-1904C199

Page 35 of 350 Report Version: R01

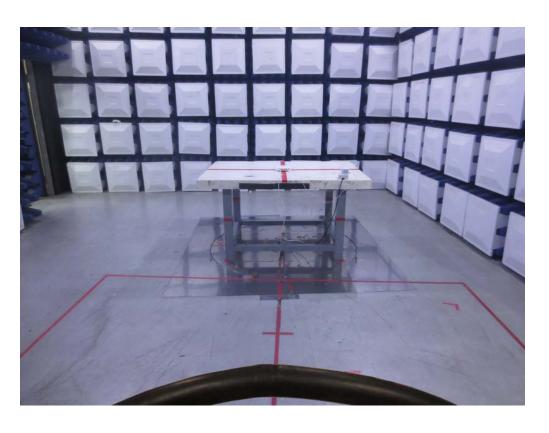




Radiated Emissions Test Photos

9 kHz to 30 MHz





Report No.: BTL-FCCP-4-1904C199





Radiated Emissions Test Photos

30 MHz to 1 GHz

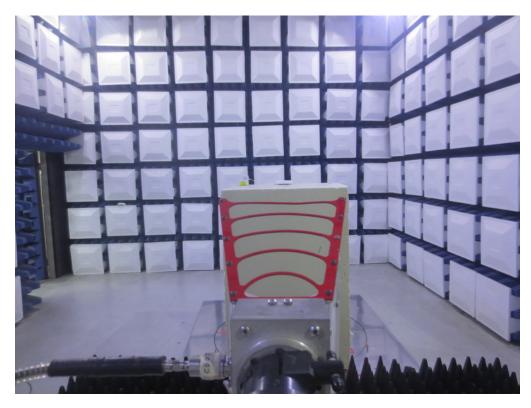


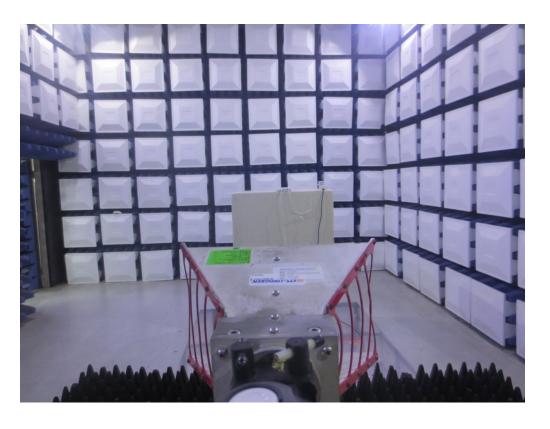




Radiated Emissions Test Photos

Above 1 GHz





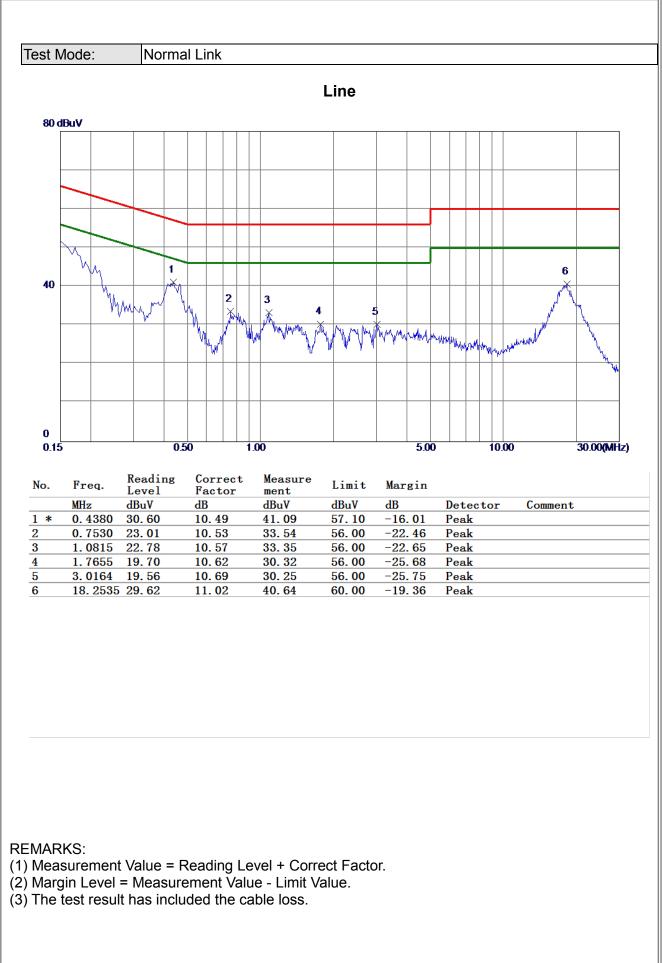
Report No.: BTL-FCCP-4-1904C199



APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS

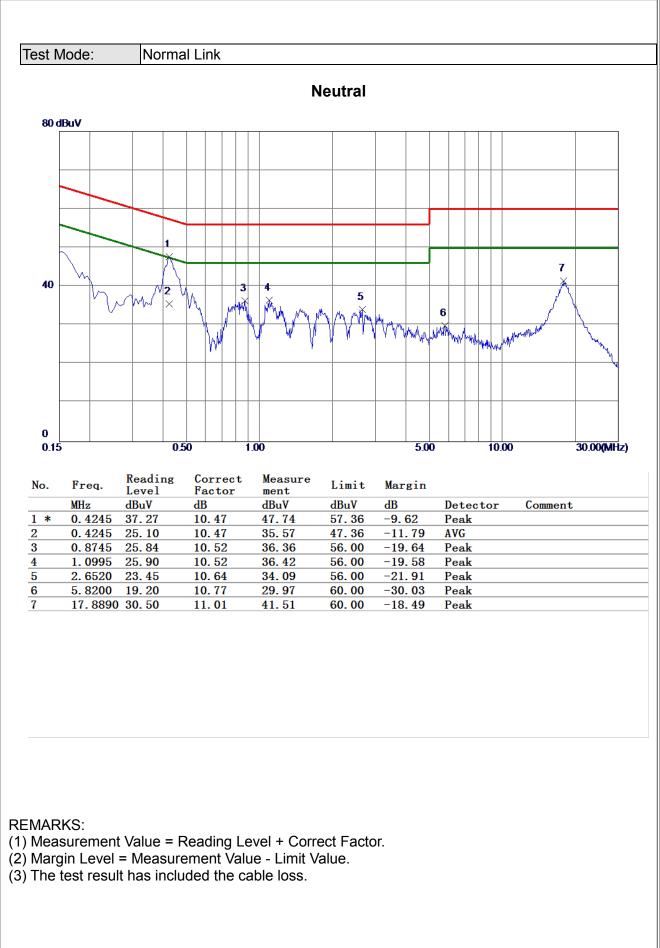
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3TL







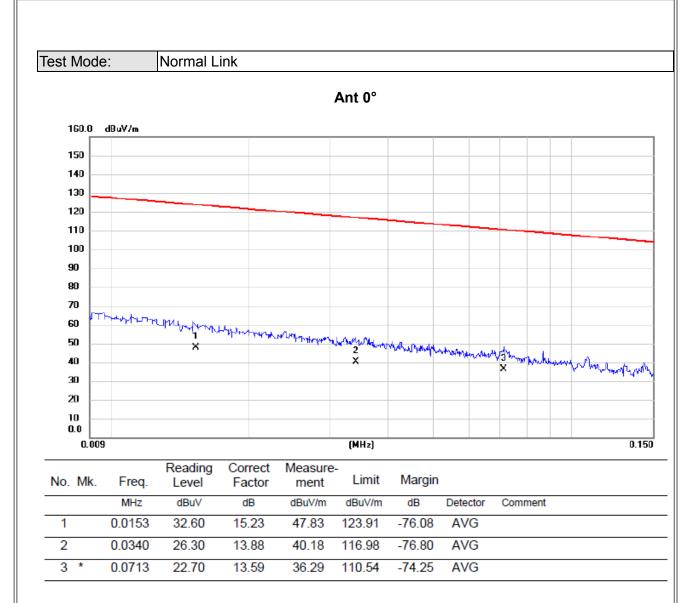


APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ

Report No.: BTL-FCCP-4-1904C199

Page 42 of 350 Report Version: R01





- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.

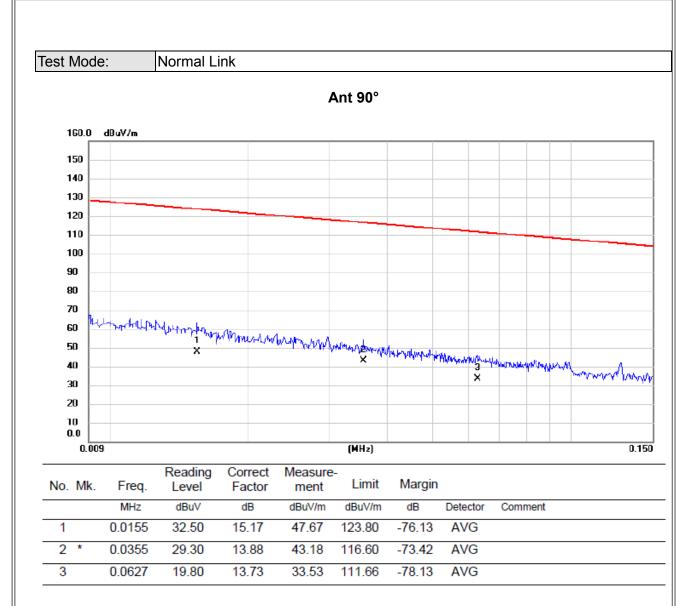
3TL



Test Mode: Normal Link Ant 0° dBuV/m 160.0 150 140 130 120 110 100 90 80 70 60 50 mound 40 Т x x 30 20 10 0.0 0.150 0.5 (MHz) 5 30.000 Reading Correct Measure-Limit Margin No. Mk. Freq. Level Factor ment MHz dBuV dB dBuV/m dBuV/m dB Detector Comment 1 0.4215 18.20 13.25 31.45 95.11 -63.66 AVG 2 * 2.2132 29.30 11.69 40.99 69.54 -28.55 QP 3 11.1977 21.50 11.62 33.12 69.54 -36.42 QP

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



Test Mode: Normal Link Ant 90° 160.0 dBuV/m 150 140 130 120 110 100 90 80 70 60 50 man n A <u>ç</u> 40 1 × 30 х 20 10 0.0 0.150 0.5 (MHz) 5 30.000 Reading Correct Measure-Freq. Limit Margin No. Mk. Level Factor ment MHz dBuV dB dBuV/m dBuV/m dB Detector Comment 1 0.4351 16.30 13.22 29.52 94.83 -65.31 AVG 2 * 2.1898 25.80 11.71 37.51 69.54 -32.03 QP 7.8934 19.00 11.31 QP 3 30.31 69.54 -39.23

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1 GHZ

Report No.: BTL-FCCP-4-1904C199

Page 47 of 350 Report Version: R01

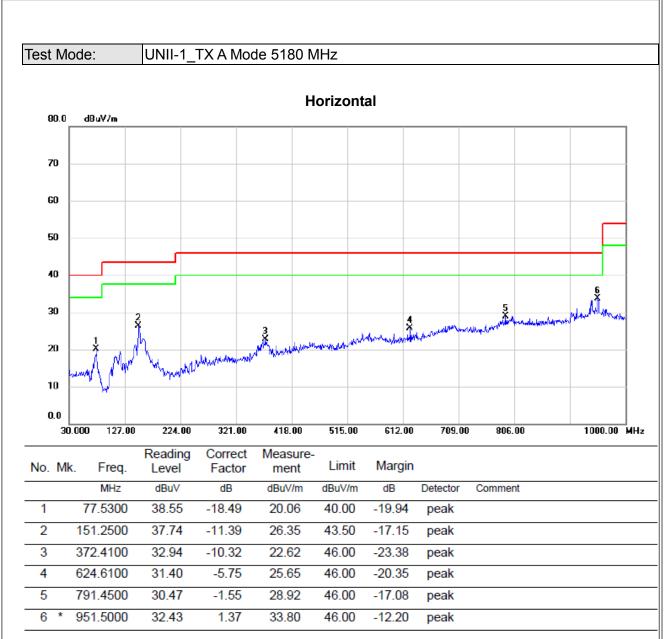
SĨL



Test Mode: UNII-1 TX A Mode 5180 MHz Vertical 80.0 dBuV/m 70 60 50 40 ۶ X 30 Ind more prover Whitehart 20 10 0.0 1000.00 MHz 30.000 127.00 224.00 321.00 418.00 515.00 612.00 709.00 806.00 Reading Correct Measure-Limit Margin No. Mk. Freq. Level Factor ment MHz dBuV dB dBuV/m dBuV/m dB Detector Comment 77.5300 45.36 -18.49 26.87 40.00 -13.13 1 peak 2 110.5100 43.32 -16.20 27.12 43.50 -16.38 peak 3 152.2200 37.74 -11.29 26.45 43.50 -17.05 peak 707.0600 28.98 -2.9226.06 46.00 -19.94 4 peak 5 812.7900 29.80 -1.24 28.56 46.00 -17.44 peak 953.4400 1.33 6 * 33.09 34.42 46.00 -11.58 peak

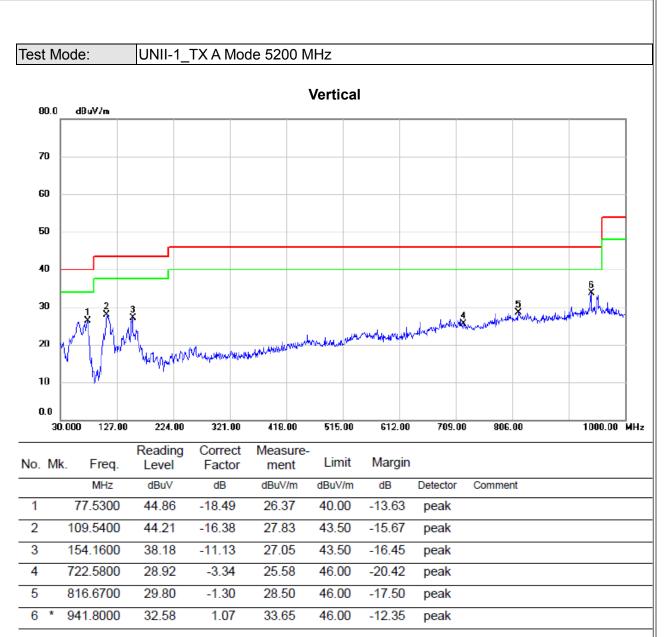
- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





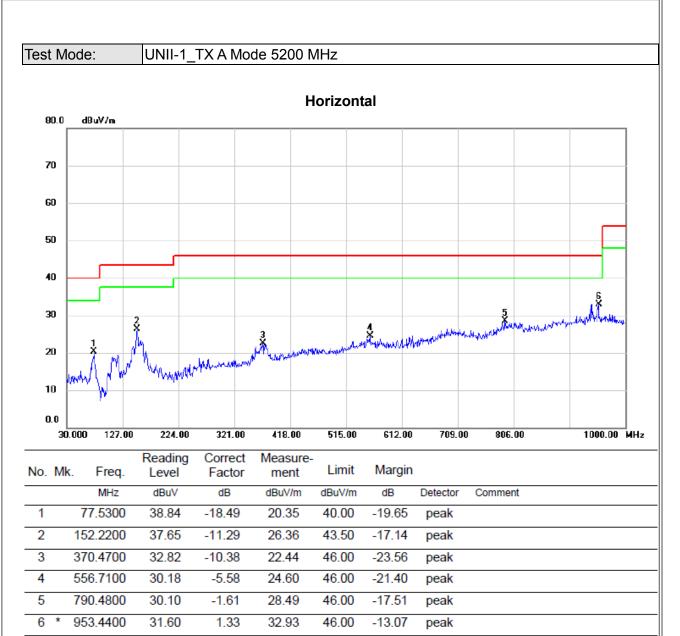
- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.

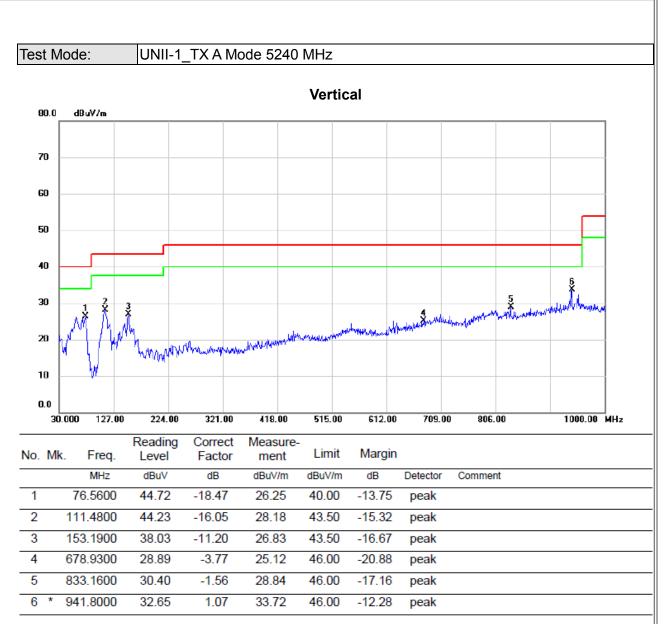




- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.

BIL





- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.

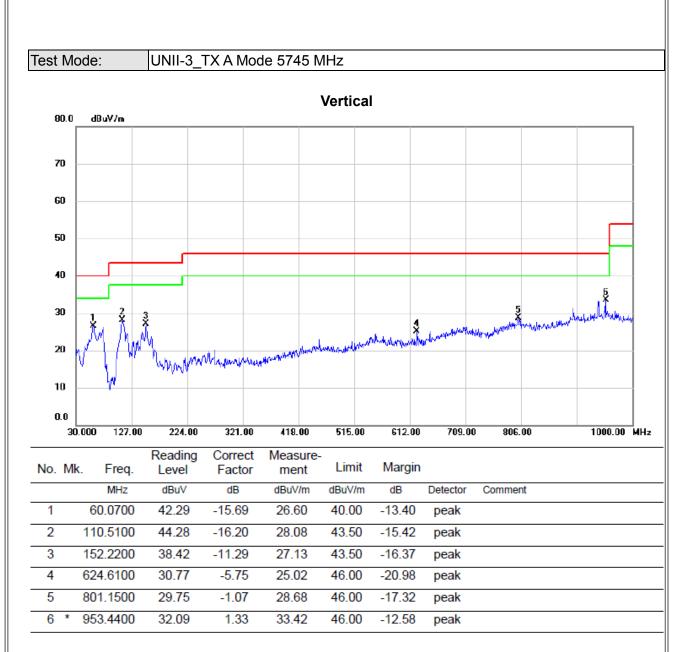


Test Mode: UNII-1 TX A Mode 5240 MHz Horizontal 80.0 dBuV/m 70 60 50 40 6× 30 Ş X Å 3 X 8 20 MANNA MANNA 10 0.0 30.000 127.00 224.00 321.00 418.00 515.00 612.00 709.00 806.00 1000.00 MHz Reading Correct Measure-Limit Margin No. Mk. Freq. Level Factor ment MHz dBuV dB dBuV/m dBuV/m dB Detector Comment 1 152.2200 36.90 -11.29 25.61 43.50 -17.89 peak 2 373.3800 32.55 -10.29 22.26 -23.74 46.00 peak 3 566.4100 29.43 -5.73 23.70 46.00 -22.30 peak 702.2100 29.32 -2.80 26.52 46.00 -19.48 4 peak 5 783.6900 30.51 -2.02 28.49 46.00 -17.51 peak 953.4400 32.37 1.33 33,70 46.00 -12.30 6 peak *

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



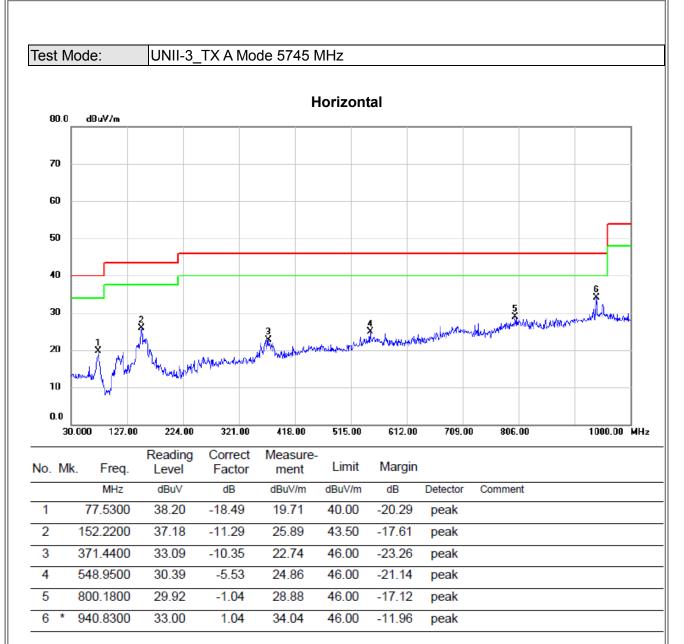




- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.

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- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.

BIL



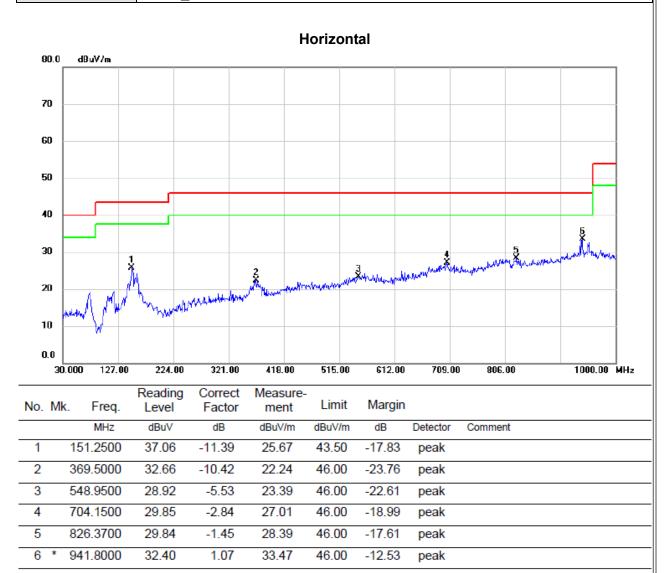
Test Mode: UNII-3 TX A Mode 5785 MHz Vertical dBuV/m 80.0 70 60 50 40 6 X 30 \$ hallow An 20 mannon 10 0.0 30.000 127.00 224.00 321.00 418.00 515.00 612.00 709.00 806.00 1000.00 MHz Reading Correct Measure-Limit No. Mk. Freq. Margin Level Factor ment MHz dBuV dB dBuV/m dBuV/m dB Detector Comment 77.5300 45.02 26.53 40.00 -18.49 -13.47 1 peak 2 112,4500 43.08 -15.89 27.19 43,50 -16.31 peak peak 3 155.1300 36.96 -11.03 25.93 43.50 -17.57 647.8900 -5.22 -19.22 4 32.00 26.78 46.00 peak 797.2700 29.93 -1.20 28.73 46.00 -17.27 5 peak 6 * 941.8000 32.76 1.07 33.83 46.00 -12.17 peak

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



Test Mode:

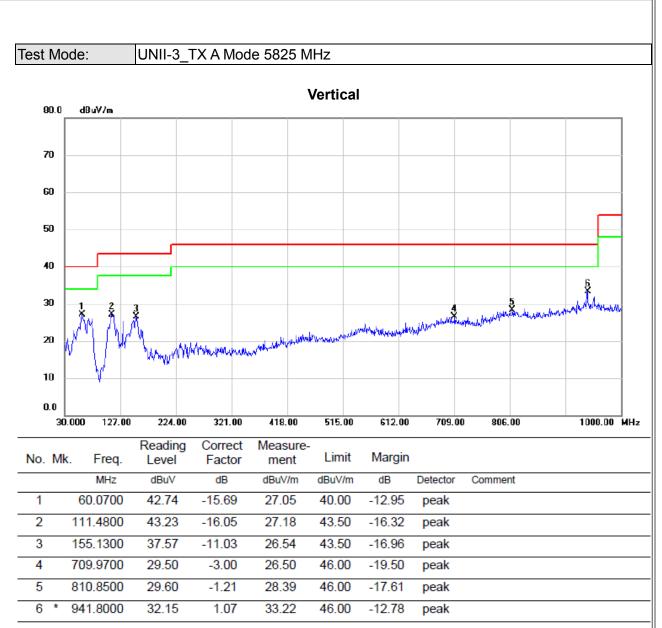
UNII-3 TX A Mode 5785 MHz



- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.

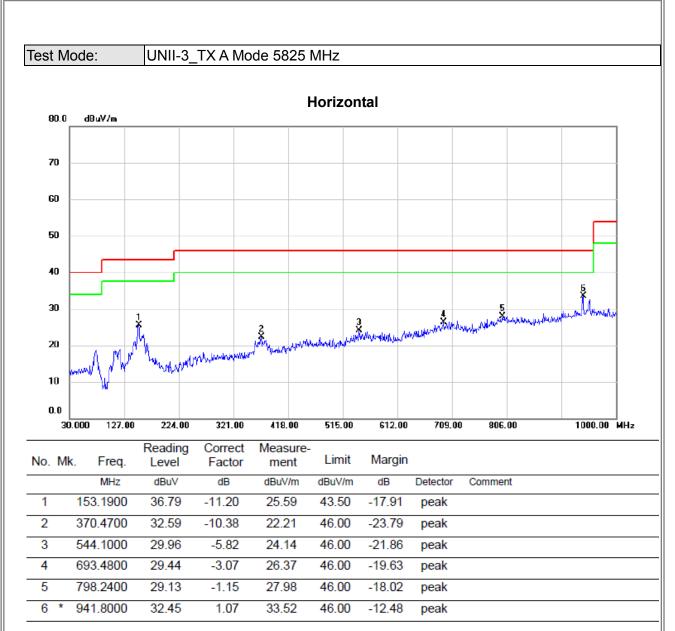
3TL





- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ



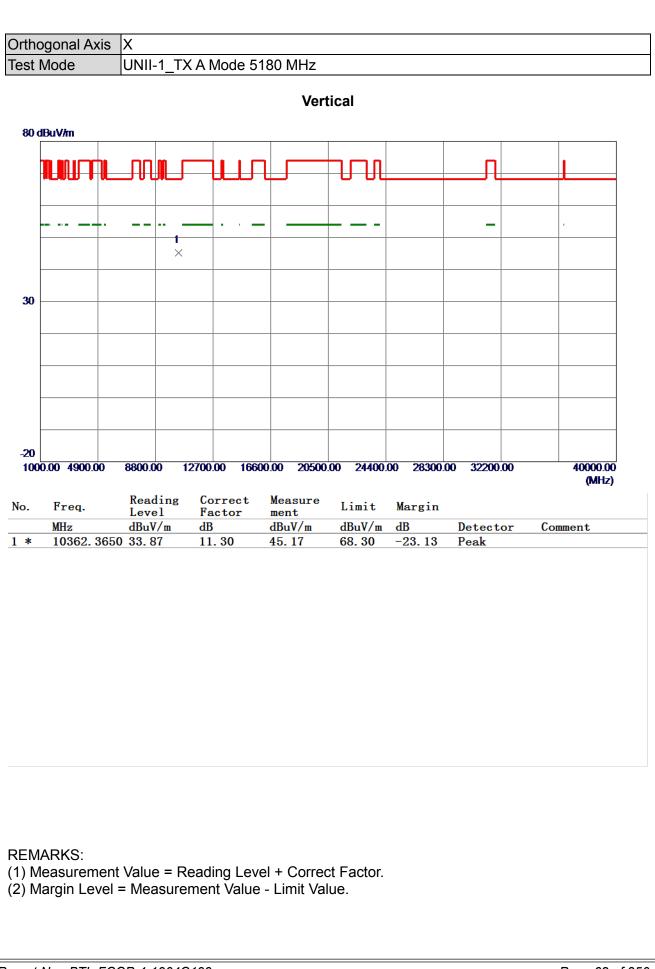


Non Beamforming

	ogonal Axis			E100 MU-				
esti	Mode		TX A Mode	5180 MHZ				
				Vei	tical			
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1300								
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30								
4930	0.00 4980.00	5030.00	5080.00 51	30.00 5180	.00 5230.	00 5280.0	0 5330.00	5430.00 (MHz)
	_	Reading	Correct	Measure				(MILZ)
No.	Freq.	Level	Factor	ment	Limit	Margin	D · · ·	
1	MHz 5150.0000	dBuV/m 45.14	dB 14. 32	dBuV/m 59.46	dBuV/m 74.00	dB −14. 54	Detector Peak	Comment
2	515 0. 000 0	32.22	14.32	46.54	54. 00	-7.46	AVG	
3* 1	5186.0000 5187.0000		<u>14.40</u> 14.40	104.59 96.83	68.30 999.00	36. 29 -902. 17	Peak AVG	No Limit No Limit
	01011.0000	02.10	11.10	00.00	000.00	002.11	nto	No Elmit
) Me	ARKS: easuremen argin Level	t Value = I = Measur	Reading Le ement Valu	vel + Corre e - Limit Va	ect Factor alue.			







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