



Test report No. : 4788873577-US-R0-V0
Page : 1 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01

RADIO TEST REPORT

Product : Newton's Meter
Model Name : NM_SERIES_A01
FCC ID : 2ATZ5-NMSERIESA01
Test Regulation : FCC 47 CFR Part 15 Subpart C (Section 15.247)
Received Date : Jun. 3, 2019
Test Date : Jun. 24, 2019 ~ Jul 22, 2019
Issued Date : Jul. 30, 2019

Applicant : Newtons Meter Pte Ltd.
#27-15, International Plaza, 10 Anson Road

Issued By : Underwriters Laboratories Taiwan Co., Ltd.
Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan



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Doc No: 17-EM-F0876 / 2.0



Test report No. : 4788873577-US-R0-V0
Page : 2 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01

REVISION HISTORY

Original Test Report No.: 4788873577-US-R0-V0

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Table Of Contents

1. Attestation of Test Results	4
2. Summary of Test Results	5
3. Test Methodology	6
4. Facilities and Accreditation	6
5. Measurement Uncertainty	7
6. Equipment under Test	8
6.1. Description of EUT	8
6.2. Channel List	9
6.3. Test Condition	9
6.4. Description Of Available Antennas	10
6.5. Test Mode Applicability and Tested Channel Detail	11
6.6. Duty cycle	12
7. Test Equipment	13
8. Description of Test Setup	15
9. Test Results	16
9.1. 6dB Bandwidth	16
9.2. Conducted output power	18
9.3. Power Spectral Density	20
9.4. Conducted Out of Band Emission	22
9.5. Radiated Spurious Emission	26
9.6. AC Power Line Conducted Emission	38
Appendix I Radiated Band Edge Measurement	48
Appendix II Radiated Spurious Emission Measurement	50



1. Attestation of Test Results

APPLICANT: Newtons Meter Pte Ltd.
#27-15, International Plaza, 10 Anson Road

MANUFACTURER Trilogy Technologies Pte Ltd.
5000 Ang Mo Kio Ave 5, #03-04, Singapore 569870

EUT DESCRIPTION: Newton's Meter

BRAND: Newton's Meter

MODEL: NM_SERIES_A01

SAMPLE STAGE: Engineering Sample

DATE of TESTED: Jun. 24, 2019 ~ Jul 22, 2019

APPLICABLE STANDARDS	
STANDARD	Test Results
FCC 47 CFR PART 15 Subpart C (Section 15.247)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Evelyn Lee
Project Handler

Date : Jul. 30, 2019

Approved and Authorized By:

Stanley Wu
Senior Project Engineer

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2. Summary of Test Results

Summary of Test Results		
FCC Clause	Test Items	Result
15.247(a)(2)	6dB Bandwidth	PASS
15.247(b)	Conducted Output Power	PASS
15.247(e)	Power Spectral Density	PASS
15.247(d)	Antenna Port Emission	PASS
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS
15.207	AC Power Conducted Emission	PASS
15.203	Antenna Requirement	PASS

Note:

1. For the Radiated Band Edge test plots were recorded in Appendix I, the Radiated Emissions test plots were recorded in Appendix II.

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3. Test Methodology

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB558074 D01 DTS Meas Guidance v05r02, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398. The full scope of accreditation can be viewed at http://accreditation.taftw.org.tw/taf/public/basic/viewApplyItems.action?unitNo=3398

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5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.

Test Item	Measurement Frequency Range	K	U(dB)
Conducted disturbance at mains terminals ports	0.15MHz ~ 30MHz	2	1.7
RF Conducted	9 kHz - 40GHz	2	1.0
Radiated disturbance below 30MHz	9 kHz - 30 MHz	2	2.2
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	2	5.3
Radiated disturbance above 1GHz	1GHz ~ 40GHz	2	4.8

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6. Equipment under Test

6.1. Description of EUT

Product	Newton's Meter
Brand Name	Newton's Meter
Model Name	NM_SERIES_A01
Operating Frequency	2402MHz ~ 2480MHz
Modulation	GFSK
Transfer Rate	Up to 1 Mbps
Number of Channel	40
Maximum Output Power	1.27 dBm
Normal Voltage	5Vdc (adapter or host equipment) 3.7Vdc for battery
Hardware Version	N/A
Software Version	N/A

Note:

1. The EUT contains following accessory devices:

Product	Brand	Model	Description
USB cable	N/A	N/A	Length: 0.2m, Shielded cable

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

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Doc No: 17-EM-F0876 / 2.0



6.2. Channel List

40 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

6.3. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	26°C / 66%RH	120Vac / 60 Hz	Jun. 25, 2019	Howard Kao
Radiated Spurious Emission	966-2	24°C / 68%RH	120Vac / 60 Hz	Jun. 25, 2019 ~ Jul. 22, 2019	Will Chen
AC power Line Conducted Emission	SR1	23°C / 60%RH	120Vac / 60 Hz	Jun. 24, 2019 ~ Jul. 22, 2019	Dylan Yang

FCC Test Firm Registration Number: 498077

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Test report No. : 4788873577-US-R0-V0
Page : 10 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01

6.4. Description Of Available Antennas

Antenna	Brand Name	Model Name	Antenna Type	Antenna Gain(dBi)
Chain(0)	N/A	N/A	PCB	1.56

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.

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Doc No: 17-EM-F0876 / 2.0



6.5. Test Mode Applicability and Tested Channel Detail

Test item	Modulation Type	Available Channel	Test Channel	Data Rate	Power Mode
Radiated Emissions (Above 1GHz)	GFSK	0 to 39	0,19,39	1.0	Adapter
Radiated Emissions (Below 1GHz)	GFSK	0 to 39	0	1.0	
AC Power Line Conducted Emission	GFSK	0 to 39	0	1.0	
Antenna Port Conducted Measurement	GFSK	0 to 39	0,19,39	1.0	
Radiated Emissions (Below 1GHz)	GFSK	0 to 39	0	1.0	NB
AC Power Line Conducted Emission	GFSK	0 to 39	0	1.0	

Note:

1. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
2. For below 1 GHz radiated emission and AC power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case.
3. For Antenna Port Conducted Measurement, this item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
4. The fundamental of the EUT was investigated in three orthogonal axes X/Y/Z, it was determined that Y axis was worst-case . Therefore, all final radiated testing was performed with the EUT in Y axis.
5. For 9 kHz to 30 MHz, the loop antenna is studied in three polarization parallel/vertical/ground parallel directions, and parallel polarization has been determined to be the worst case of pre-scan radiation.
6. For above 1 GHz radiated emission test, pre-scan radiation has been determined by the Adapter mode (the worst case).

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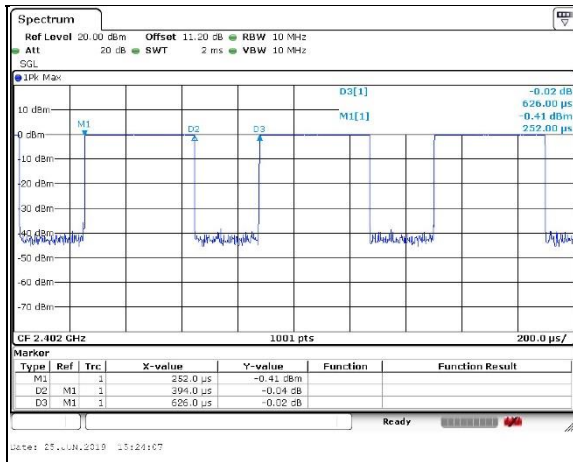
Doc No: 17-EM-F0876 / 2.0



6.6. Duty cycle

Duty cycle of test signal is < 98 %, duty factor shall be considered.

Duty cycle = $0.394 / 0.626 = 0.629$, Duty factor = $10 * \log(1/0.629) = 2.01$





7. Test Equipment

Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	Nov. 8, 2018	1 year
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	Nov. 8, 2018	1 year
Loop Antenna	ETS lindgren	6502	00213440	Dec. 11, 2018	1 year
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	Jan. 14, 2019	1 year
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	Jan. 25, 2019	1 year
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	Jan.16, 2019	1 year
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	Jan. 30, 2019	1 year
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	Jan. 29, 2019	1 year
Preamplifier (18-40GHz)	EMCI	EMC184040SE E	980426	May 8, 2019	1 year
RF Cable (9 KHz~18 GHz)	UltraPhase & EMC Instrument	A1K50-UP0358-A1K50-1500&EMC106-NM-SM-2500/7000	170111-4&170219/170102	Jan. 29, 2019	1 year
RF Cable (18 GHz~40 GHz)	UltraPhase	K1K50-UP0264-K1K50-2500/2500/600	170214-2/170214-6/170111-1	Jan. 29, 2019	1 year

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Doc No: 17-EM-F0876 / 2.0



Test report No. : 4788873577-US-R0-V0
Page : 14 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01

Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
Antenna Port Conducted Measurement					
Spectrum Analyzer	Keysight	N9010A	MY56070834	Nov. 8, 2018	1 year
Spectrum Analyzer	Rohde & Schwarz	FSV40	101490	Sep. 25, 2018	1 year
Pulse Power Sensor	Anrisu	MA2411B	1531202	Dec. 17, 2018	1 year
Power Meter	Anrisu	ML2495A	1645002	Dec. 17, 2018	1 year
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	Nov. 14, 2018	1 year
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	Aug. 5, 2018	1 year
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	Aug. 2, 2018	1 year
Cables	Huber+Suhner	RG 214/U	FCC-BCICF-4_RF	Jan. 29, 2019	1 year

UL Software		
Description	Name	Version
Radiated measurement	EZ EMC	1.1.4.2
Conducted measurement	Keysight.TestSystem	1.0.0.0
AC power Line Conducted Emission	EZ EMC	1.1.4.2

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8. Description of Test Setup

Support Equipment

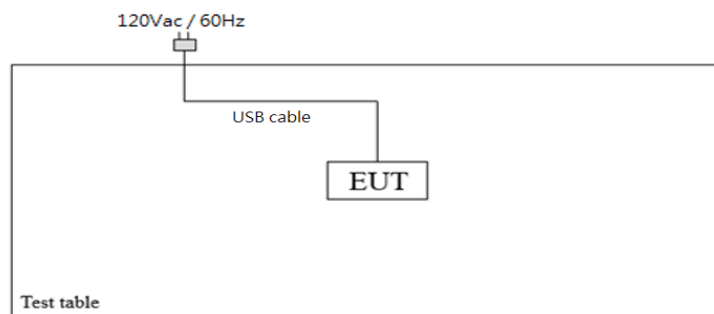
Equipment	Brand Name	Model Name	S/N	Remark
Notebook	DELL	Latitude E5470	3JFKWF2	N/A
Switching Adapter	hTC	TC P900-US	79H00130-01M	Input: 100-240Vac, 50/60Hz, 200mA Output: 5Vdc, 1.5A

Test Setup

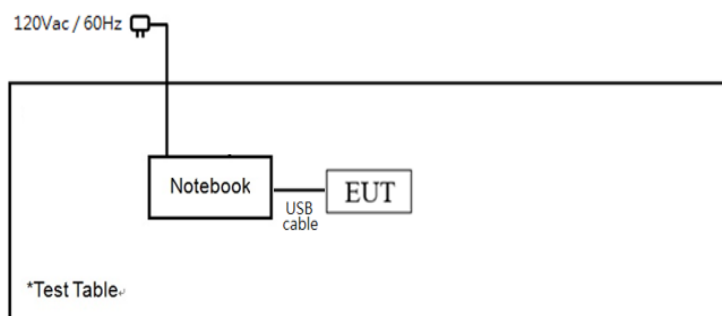
Controlled using a bespoke application (Teraterm469) on a test Notebook. The application was used to enable a continuous transmission mode and to select the test channels, data rates, modulation schemes and power setting as required.

Setup Diagram for Test

Adapter Mode



NB Mode



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9. Test Results

9.1. 6dB Bandwidth

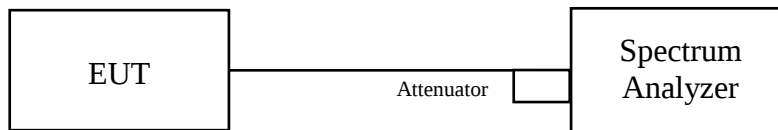
Requirements

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure

- Set resolution bandwidth (RBW) = 100kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

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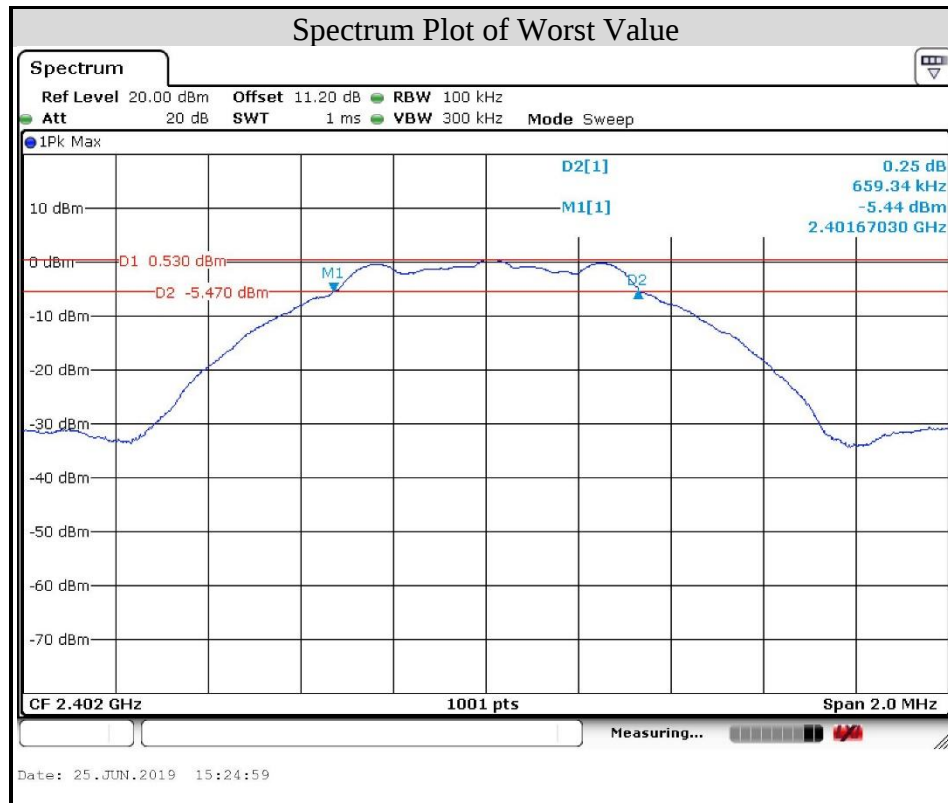
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Doc No: 17-EM-F0876 / 2.0



Test Data

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.6593	0.5	Pass
19	2440	0.6613	0.5	Pass
39	2480	0.6713	0.5	Pass



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Doc No: 17-EM-F0876 / 2.0



9.2. Conducted output power

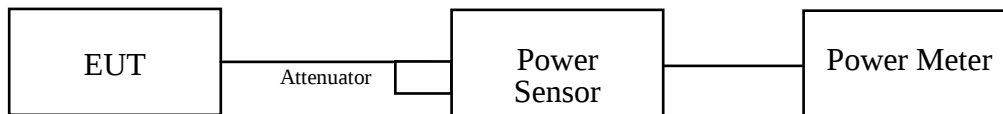
Requirements

For systems using digital modulation in the 2400-2483.5 MHz bands: 1 Watt.

Test Procedure

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Test Setup



The loss between RF output port of the EUT and the input port of the Power Meter has been taken into consideration.

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Doc No: 17-EM-F0876 / 2.0



Test report No. : 4788873577-US-R0-V0
Page : 19 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01

Test Data

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	1.06	0.25	30	Pass
19	2440	1.28	1.07	30	Pass
39	2480	1.34	1.27	30	Pass

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9.3. Power Spectral Density

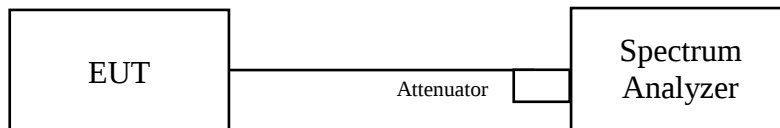
Requirements

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz.

Test procedure

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq 3 \times \text{RBW}$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

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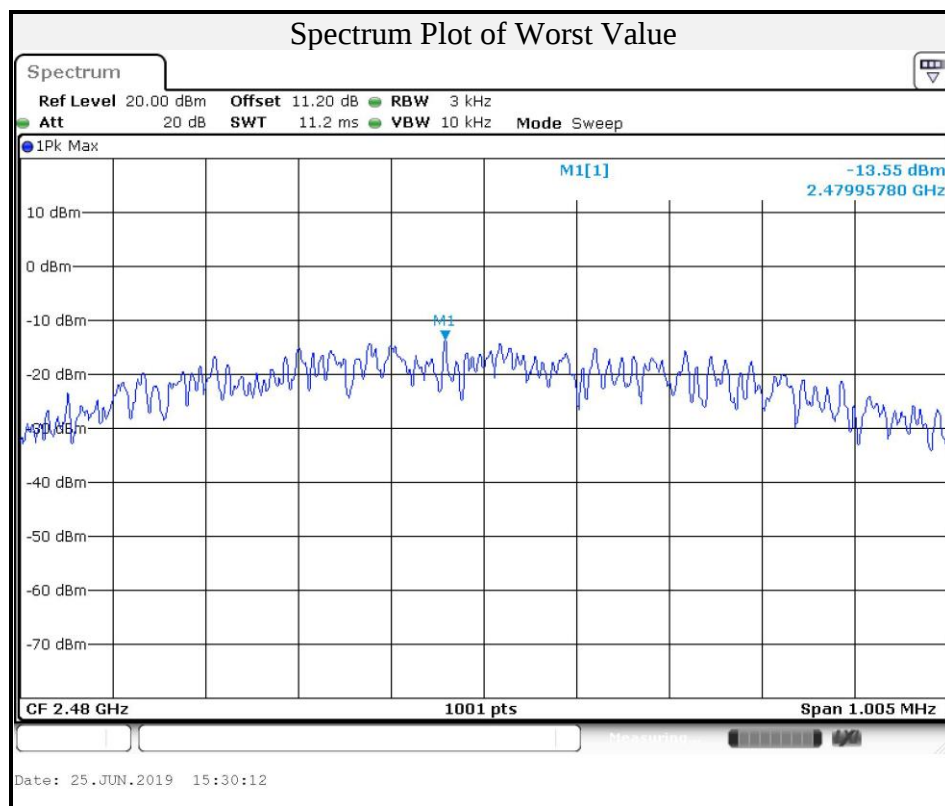
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Test Data

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	2402	-14.95	8	Pass
19	2440	-15.10	8	Pass
39	2480	-13.55	8	Pass



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Doc No: 17-EM-F0876 / 2.0



9.4. Conducted Out of Band Emission

Requirements

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b) (3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209 (a) is not required.

Test procedure

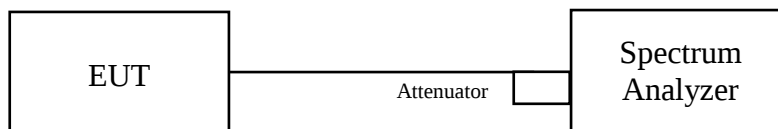
Measurement Procedure REF

1. Set the RBW = 100 kHz.
2. Set the VBW $\geq$ 300 kHz.
3. Set the span to 1.5 times the DTS bandwidth.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

Measurement Procedure OOBE

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

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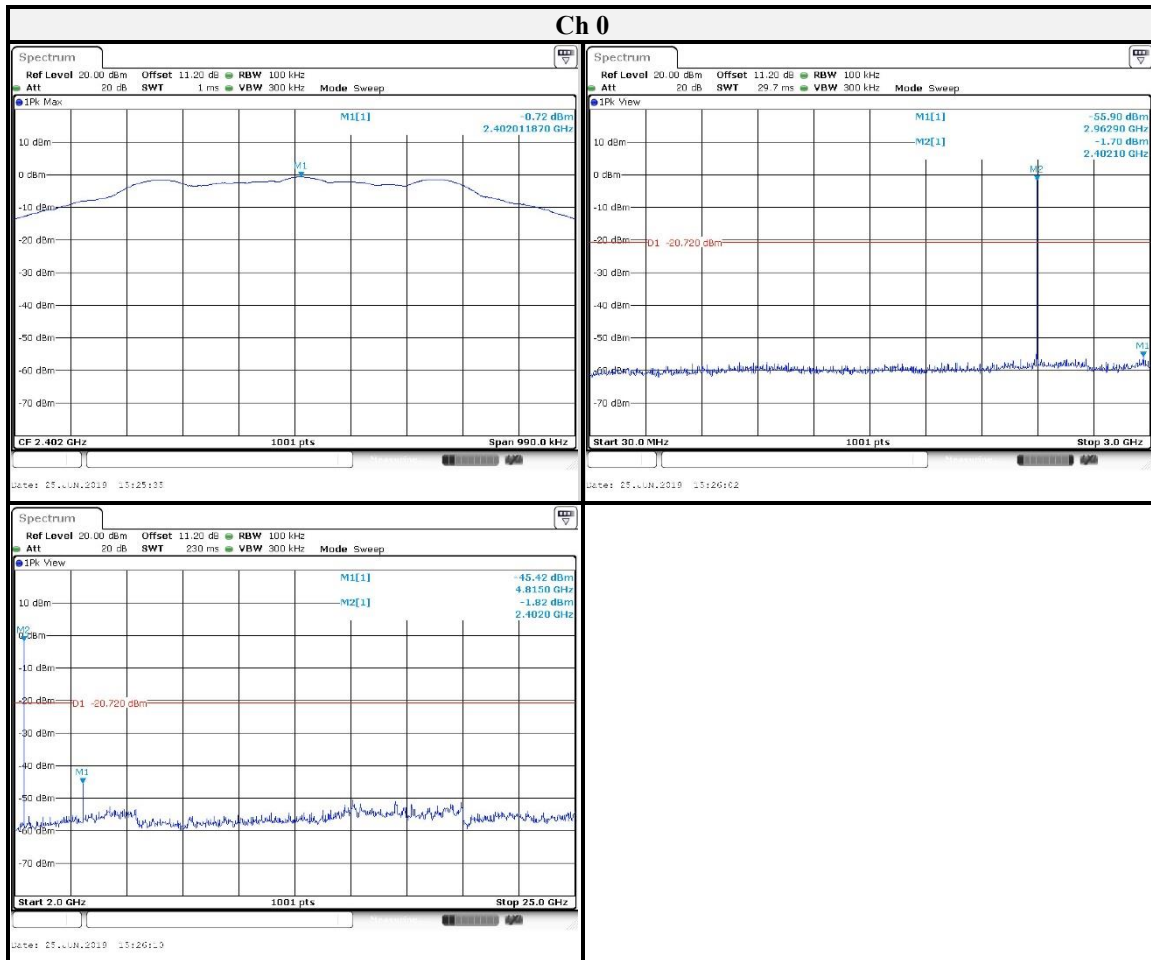
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Doc No: 17-EM-F0876 / 2.0



Test report No. : 4788873577-US-R0-V0
Page : 23 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01

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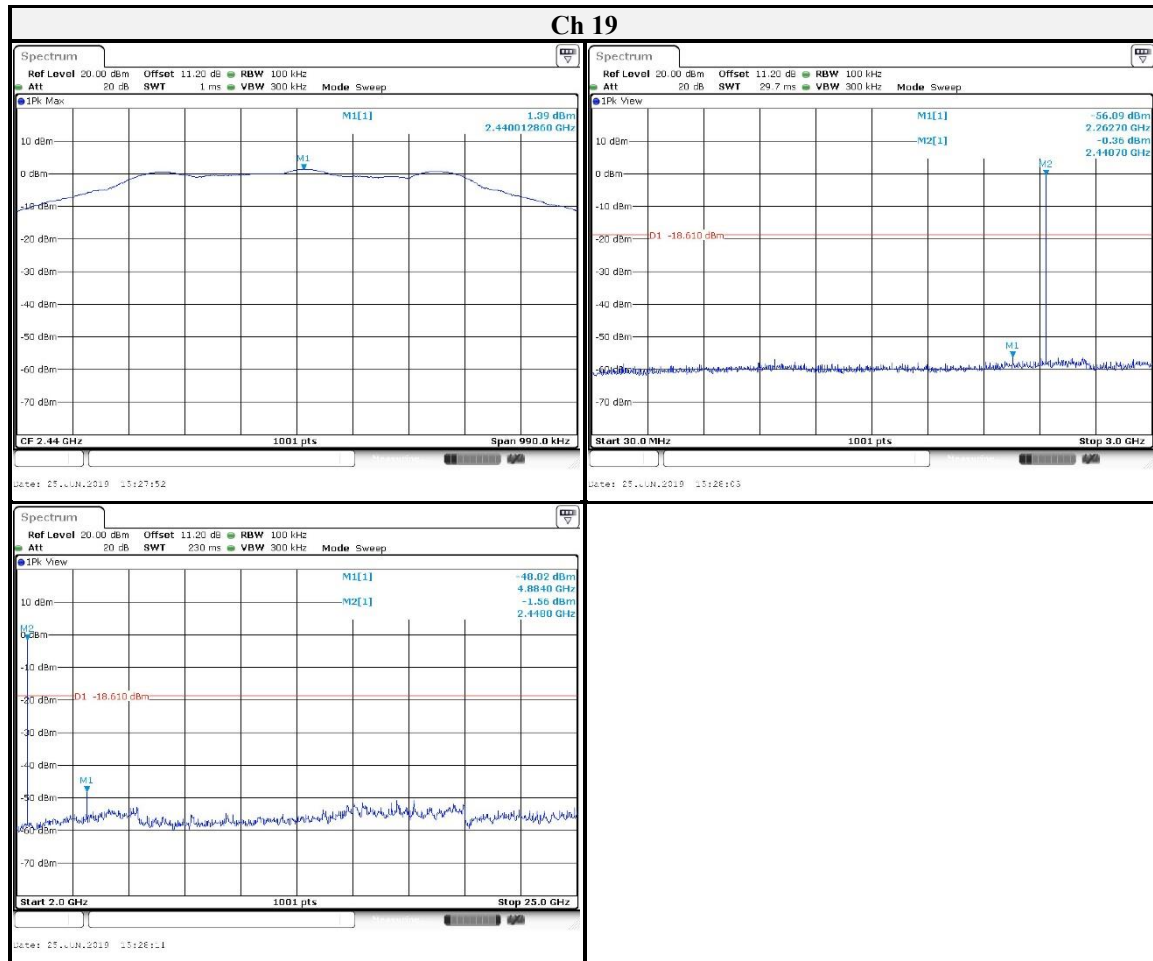
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 2.0



Test report No. : 4788873577-US-R0-V0
Page : 24 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01



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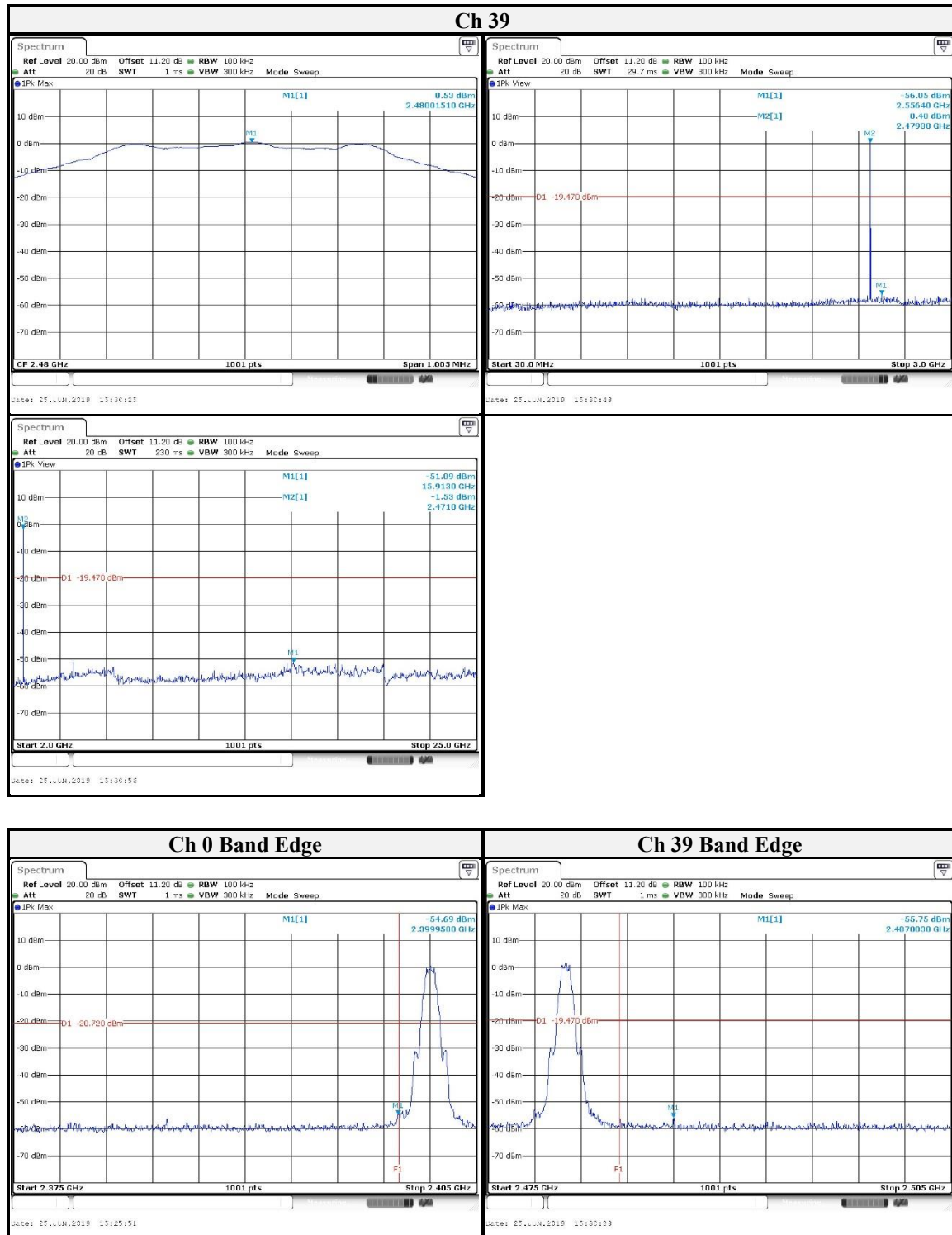
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Page : 25 of 50
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9.5. Radiated Spurious Emission

Requirements

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequency(MHz)	Field strength (microvolts/meter)	Measurement distance (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

NOTE:

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

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Test Procedures

[For 9 kHz ~ 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

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Note:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.

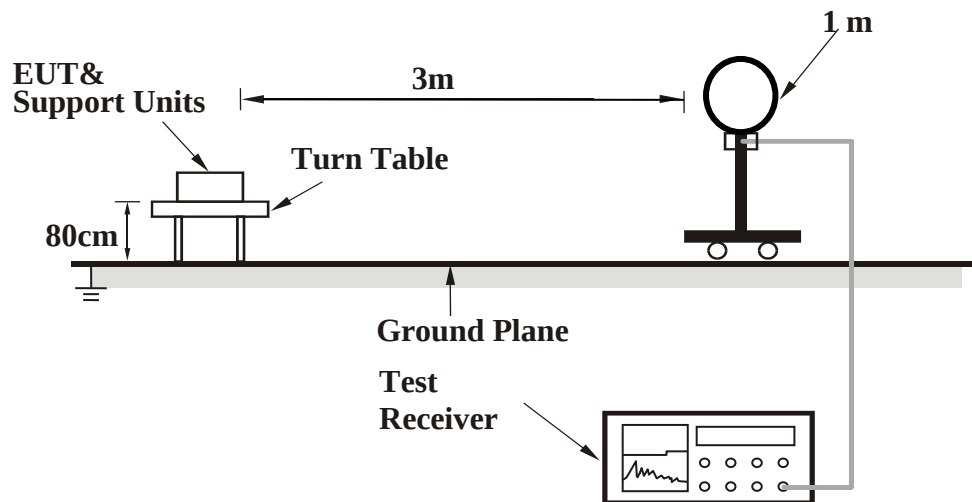
Configuration	Average	
	RBW	VBW
Bluetooth LE	1MHz	3 kHz

Note: Refer to section 6.6 for duty cycle.

- All modes of operation were investigated and the worst-case emissions are reported.

Test Setup

<Frequency Range 9 kHz ~ 30 MHz>



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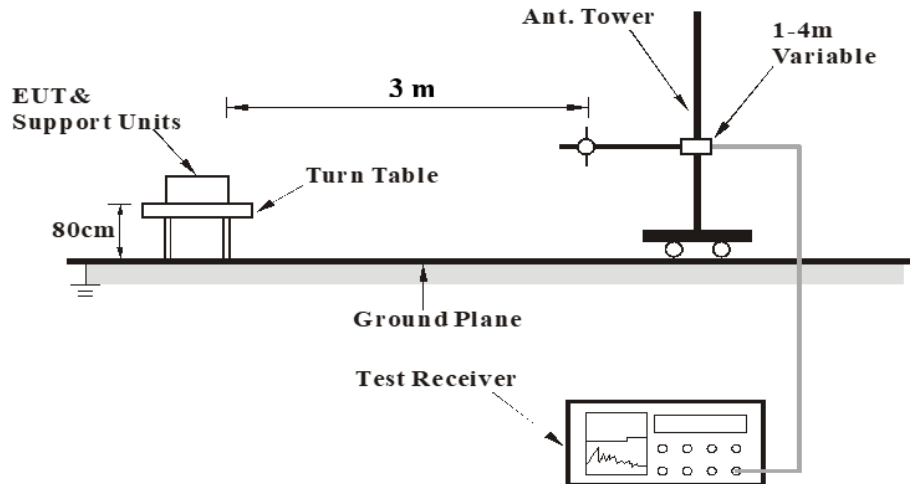
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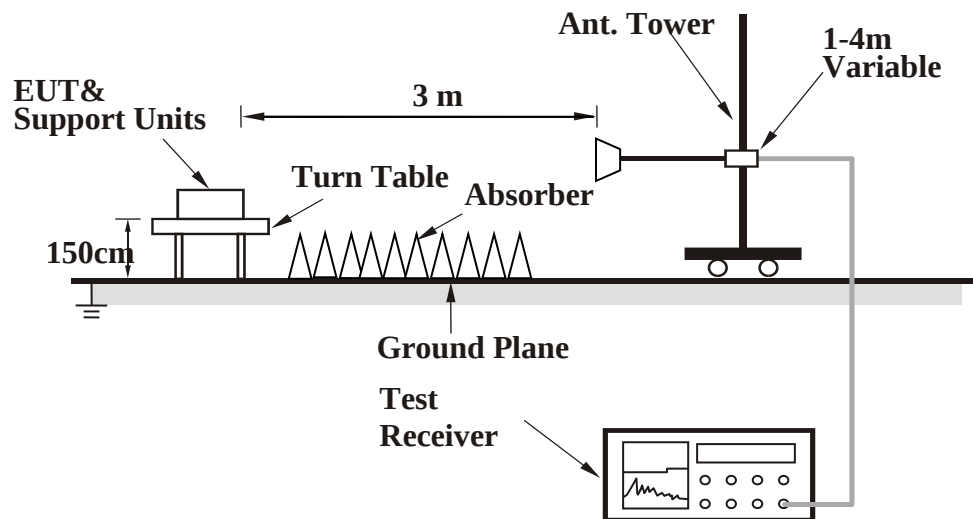
Doc No: 17-EM-F0876 / 2.0



<Frequency Range 30 MHz ~ 1 GHz >



<Frequency Range above 1 GHz>



For the actual test configuration, please refer to the Setup Configurations.



Test Data

Above 1GHz Data

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	1 GHz ~ 26.5 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2362.140	49.95	-7.69	42.26	74.00	-31.74	peak
-	2390.000	48.24	-7.60	40.64	74.00	-33.36	peak
@	2402.000	102.63	-7.58	95.05	-	-	peak
-	2483.500	47.51	-7.63	39.88	74.00	-34.12	peak
-	2362.087	41.28	-7.69	33.59	54.00	-20.41	AVG
-	2390.000	36.14	-7.60	28.54	54.00	-25.46	AVG
@	2402.040	102.55	-7.58	94.97	-	-	AVG
-	2483.500	36.05	-7.63	28.42	54.00	-25.58	AVG
*	4804.000	44.34	-3.09	41.25	74.00	-32.75	peak
#	7206.000	40.06	3.56	43.62	75.05	-31.43	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2378.013	49.64	-7.64	42.00	74.00	-32.00	peak
-	2390.000	47.88	-7.60	40.28	74.00	-33.72	peak
@	2402.000	98.61	-7.58	91.03	-	-	peak
-	2483.500	47.32	-7.63	39.69	74.00	-34.31	peak
-	2362.140	38.11	-7.69	30.42	54.00	-23.58	AVG
-	2390.000	35.76	-7.60	28.16	54.00	-25.84	AVG
@	2402.000	97.82	-7.58	90.24	-	-	AVG
-	2362.140	38.11	-7.69	30.42	54.00	-23.58	AVG
*	4804.000	44.37	-3.09	41.28	74.00	-32.72	peak
#	7206.000	39.32	3.56	42.88	71.03	-28.15	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

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Doc No: 17-EM-F0876 / 2.0



Test report No. : 4788873577-US-R0-V0
Page : 31 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01

EUT Test Condition		Measurement Detail	
Channel	Channel 19	Frequency Range	1 GHz ~ 26.5 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2341.927	49.11	-7.67	41.44	74.00	-32.56	peak
-	2390.000	47.75	-7.60	40.15	74.00	-33.85	peak
@	2440.000	101.72	-7.70	94.02	-	-	peak
-	2483.500	49.40	-7.63	41.77	74.00	-32.23	peak
-	2350.060	36.04	-7.72	28.32	54.00	-25.68	AVG
-	2390.000	35.85	-7.60	28.25	54.00	-25.75	AVG
@	2440.000	101.40	-7.70	93.70	-	-	AVG
-	2483.500	35.95	-7.63	28.32	54.00	-25.68	AVG
*	4880.000	43.90	-3.02	40.88	74.00	-33.12	peak
*	7320.000	39.63	3.63	43.26	74.00	-30.74	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2345.647	49.18	-7.69	41.49	74.00	-32.51	peak
-	2390.000	49.02	-7.60	41.42	74.00	-32.58	peak
@	2440.000	98.57	-7.70	90.87	-	-	peak
-	2483.500	48.64	-7.63	41.01	74.00	-32.99	peak
-	2373.320	35.90	-7.65	28.25	54.00	-25.75	AVG
-	2390.000	35.73	-7.60	28.13	54.00	-25.87	AVG
@	2440.000	97.79	-7.70	90.09	-	-	AVG
-	2483.500	35.92	-7.63	28.29	54.00	-25.71	AVG
*	4880.000	43.75	-3.02	40.73	74.00	-33.27	peak
*	7320.000	39.12	3.63	42.75	74.00	-31.25	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
6. The other emission levels were very low against the limit.

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EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	1 GHz ~ 26.5 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	47.52	-7.60	39.92	74.00	-34.08	peak
@	2480.020	102.03	-7.64	94.39	-	-	peak
-	2483.500	51.39	-7.63	43.76	74.00	-30.24	peak
-	2500.000	50.08	-7.58	42.50	74.00	-31.50	peak
-	2372.487	35.92	-7.66	28.26	54.00	-25.74	AVG
-	2390.000	35.76	-7.60	28.16	54.00	-25.84	AVG
@	2480.000	101.50	-7.64	93.86	-	-	AVG
-	2483.500	38.96	-7.63	31.33	54.00	-22.67	AVG
*	4960.000	43.49	-2.89	40.60	74.00	-33.40	peak
*	7440.000	39.48	3.87	43.35	74.00	-30.65	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	47.80	-7.60	40.20	74.00	-33.80	peak
@	2480.000	97.94	-7.64	90.30	-	-	peak
-	2483.500	48.86	-7.63	41.23	74.00	-32.77	peak
-	2498.460	49.10	-7.59	41.51	74.00	-32.49	peak
-	2390.000	35.71	-7.60	28.11	54.00	-25.89	AVG
@	2480.000	97.39	-7.64	89.75	-	-	AVG
-	2483.500	37.04	-7.63	29.41	54.00	-24.59	AVG
-	2486.453	36.42	-7.63	28.79	54.00	-25.21	AVG
*	4960.000	44.87	-2.89	41.98	74.00	-32.02	peak
*	7440.000	39.42	3.87	43.29	74.00	-30.71	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
6. The other emission levels were very low against the limit.

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Doc No: 17-EM-F0876 / 2.0



9 kHz ~ 30 MHz Data

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

No non-compliance noted:

KDB 414788 D01 OATS and Chamber Correlation Justification

- Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

- OATs and chamber correlation testing had been performed and chamber measured test results is the worst case test result.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

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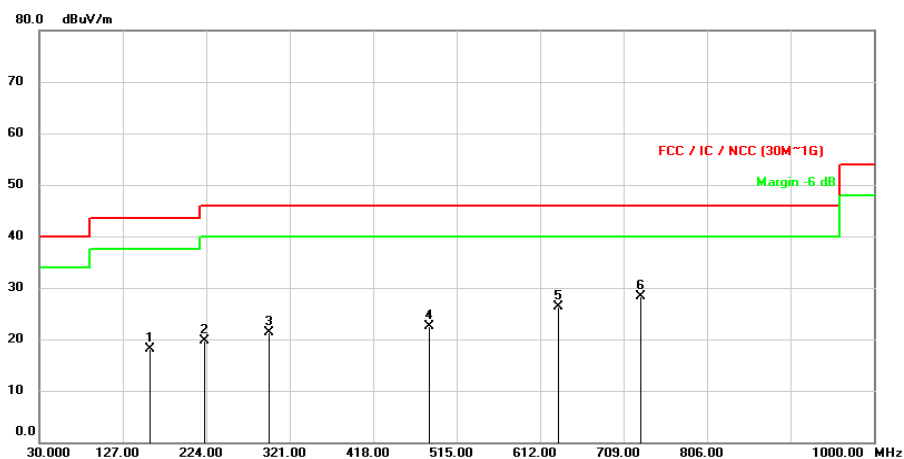


30 MHz ~ 1 GHz Data

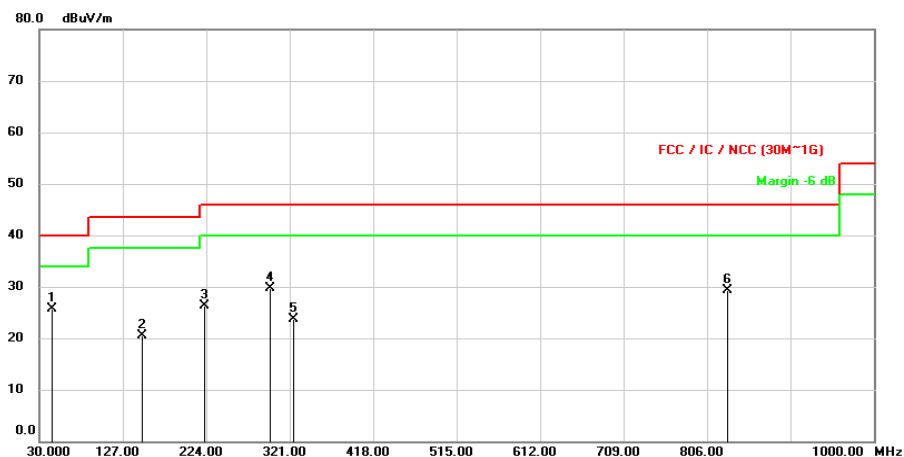
Adapter Mode

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	30 MHz ~ 1 GHz

Horizontal



Vertical



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Test report No. : 4788873577-US-R0-V0
Page : 35 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	159.0100	33.17	-15.01	18.16	43.50	-25.34	peak
-	222.0600	37.23	-17.48	19.75	46.00	-26.25	peak
-	296.7500	35.53	-14.14	21.39	46.00	-24.61	peak
-	482.9900	32.26	-9.69	22.57	46.00	-23.43	peak
-	633.3400	32.81	-6.52	26.29	46.00	-19.71	peak
-	728.4000	33.35	-5.00	28.35	46.00	-17.65	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	44.1943	40.97	-15.23	25.74	40.00	-14.26	peak
-	148.5016	35.92	-15.33	20.59	43.50	-22.91	peak
-	222.7390	43.85	-17.45	26.40	46.00	-19.60	peak
-	297.0087	43.86	-14.14	29.72	46.00	-16.28	peak
-	323.9747	37.07	-13.37	23.70	46.00	-22.30	peak
-	830.1206	32.94	-3.58	29.36	46.00	-16.64	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

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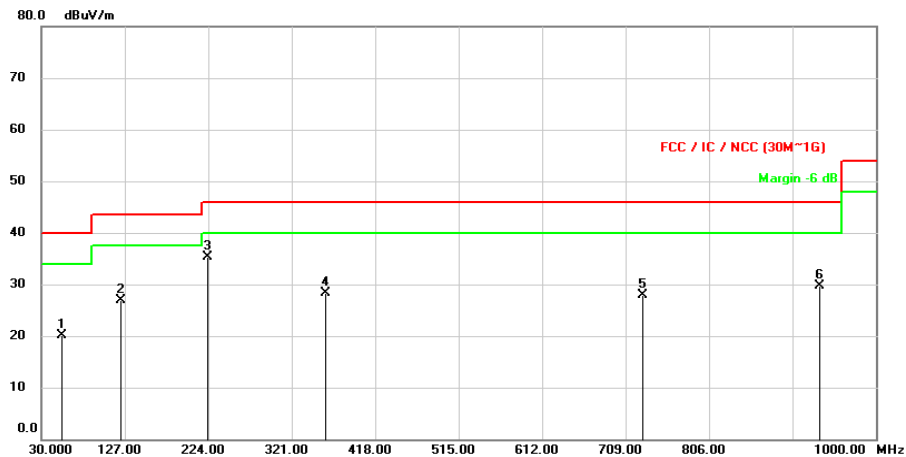
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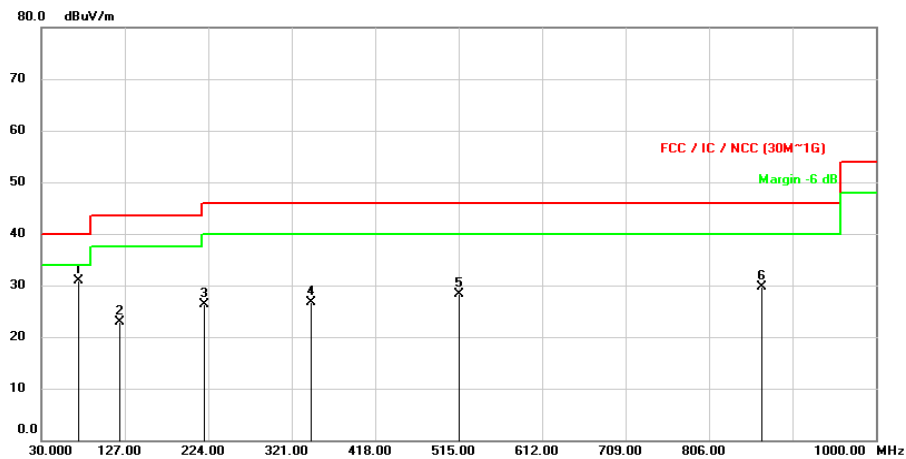
NB Mode

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	30 MHz ~ 1 GHz

Horizontal



Vertical



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Doc No: 17-EM-F0876 / 2.0



Test report No. : 4788873577-US-R0-V0
Page : 37 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	54.8320	35.20	-15.18	20.02	40.00	-19.98	peak
-	122.9260	44.52	-17.62	26.90	43.50	-16.60	peak
-	222.4157	52.83	-17.46	35.37	46.00	-10.63	peak
-	360.0263	41.03	-12.71	28.32	46.00	-17.68	peak
-	728.9820	32.88	-4.99	27.89	46.00	-18.11	peak
-	933.3287	31.64	-1.87	29.77	46.00	-16.23	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	73.1327	49.06	-18.15	30.91	40.00	-9.09	peak
-	121.0830	40.67	-17.76	22.91	43.50	-20.59	peak
-	219.0853	43.93	-17.57	26.36	46.00	-19.64	peak
-	342.5340	39.83	-13.12	26.71	46.00	-19.29	peak
-	514.5797	37.44	-9.09	28.35	46.00	-17.65	peak
-	866.6897	32.76	-3.08	29.68	46.00	-16.32	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

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9.6. AC Power Line Conducted Emission

Requirements

Frequency (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note:

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

Test Procedures

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

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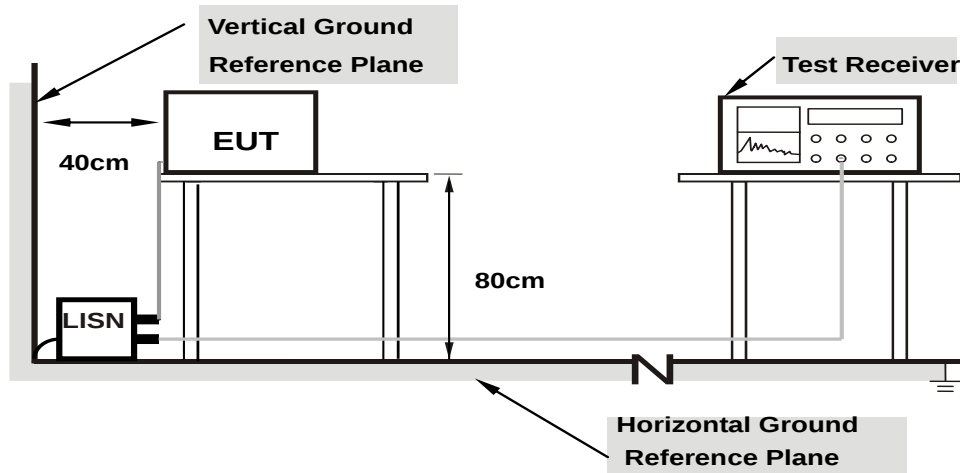
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Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the Setup Configurations.

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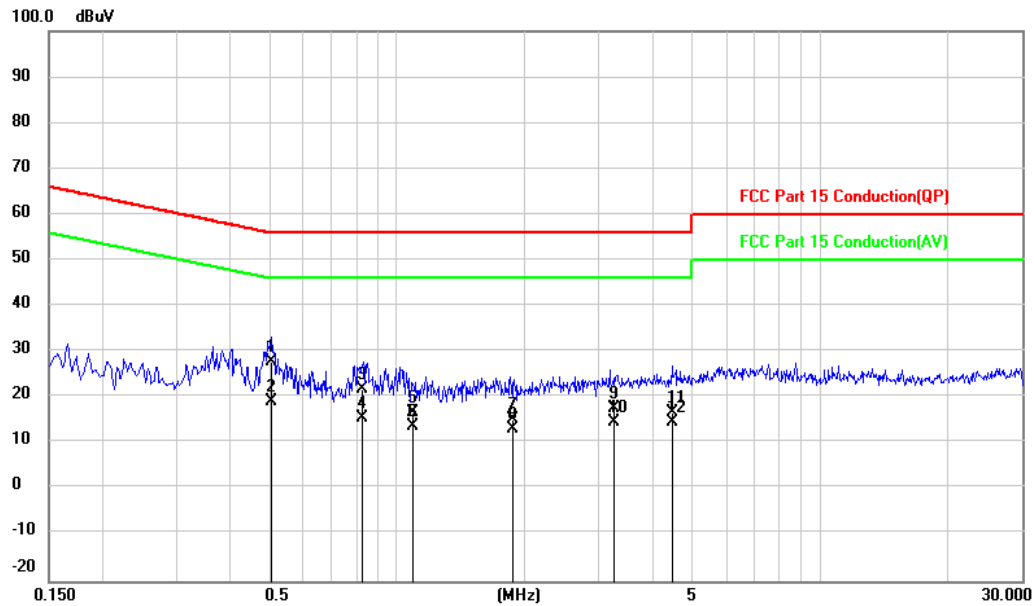


Test Data

Adapter Mode

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	150 kHz ~ 30 MHz

Phase of Power : Line (L)



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Doc No: 17-EM-F0876 / 2.0



Test report No. : 4788873577-US-R0-V0
Page : 41 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.5052	8.07	19.67	27.74	56.00	-28.26	QP
2	0.5052	-0.48	19.67	19.19	46.00	-26.81	AVG
3	0.8266	2.13	19.68	21.81	56.00	-34.19	QP
4	0.8266	-4.00	19.68	15.68	46.00	-30.32	AVG
5	1.0905	-2.94	19.68	16.74	56.00	-39.26	QP
6	1.0905	-6.05	19.68	13.63	46.00	-32.37	AVG
7	1.8720	-4.57	19.69	15.12	56.00	-40.88	QP
8	1.8720	-6.56	19.69	13.13	46.00	-32.87	AVG
9	3.2515	-2.20	19.72	17.52	56.00	-38.48	QP
10	3.2515	-5.05	19.72	14.67	46.00	-31.33	AVG
11	4.4471	-2.97	19.74	16.77	56.00	-39.23	QP
12	4.4471	-5.03	19.74	14.71	46.00	-31.29	AVG

Remarks:

1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

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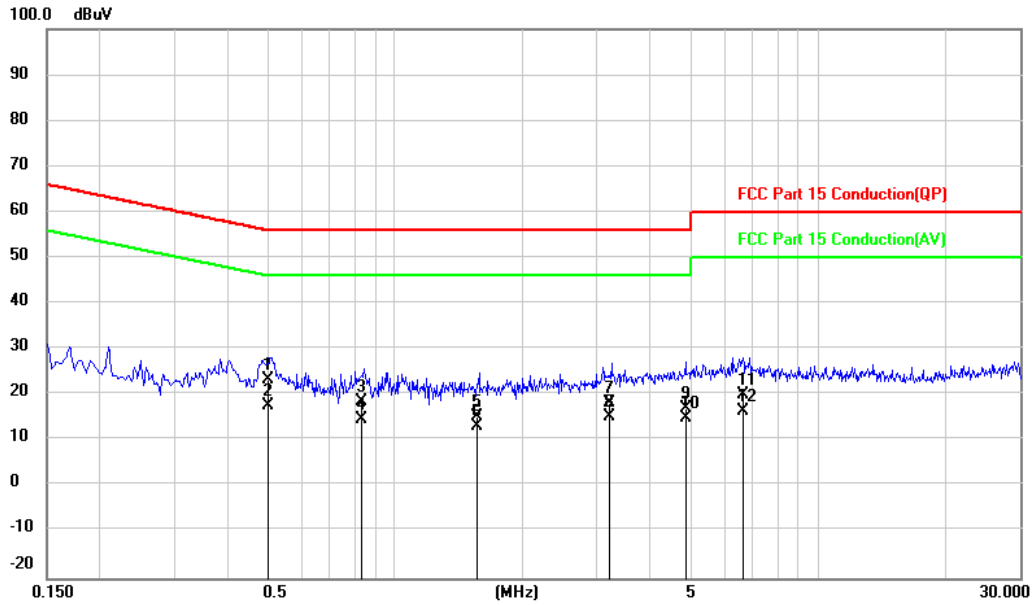
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Phase of Power : Neutral (N)



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Doc No: 17-EM-F0876 / 2.0



Test report No. : 4788873577-US-R0-V0
Page : 43 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.5002	3.56	19.67	23.23	56.00	-32.77	QP
2	0.5002	-2.09	19.67	17.58	46.00	-28.42	AVG
3	0.8317	-1.02	19.68	18.66	56.00	-37.34	QP
4	0.8317	-4.96	19.68	14.72	46.00	-31.28	AVG
5	1.5680	-4.48	19.69	15.21	56.00	-40.79	QP
6	1.5680	-6.49	19.69	13.20	46.00	-32.80	AVG
7	3.2315	-1.61	19.72	18.11	56.00	-37.89	QP
8	3.2315	-4.35	19.72	15.37	46.00	-30.63	AVG
9	4.8727	-2.79	19.77	16.98	56.00	-39.02	QP
10	4.8727	-4.81	19.77	14.96	46.00	-31.04	AVG
11	6.6774	0.15	19.80	19.95	60.00	-40.05	QP
12	6.6774	-3.27	19.80	16.53	50.00	-33.47	AVG

Remarks:

1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

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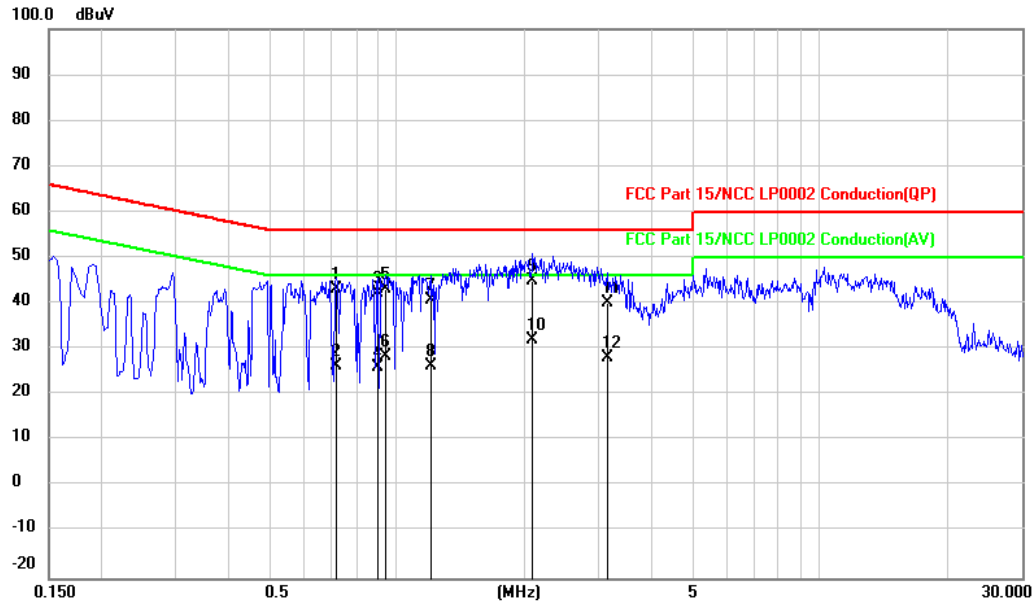
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NB Mode

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	150 kHz ~ 30 MHz

Phase of Power : Line (L)



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Test report No. : 4788873577-US-R0-V0
Page : 45 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.7180	23.45	19.68	43.13	56.00	-12.87	QP
2	0.7180	6.73	19.68	26.41	46.00	-19.59	AVG
3	0.9002	22.61	19.68	42.29	56.00	-13.71	QP
4	0.9002	6.29	19.68	25.97	46.00	-20.03	AVG
5	0.9420	23.55	19.68	43.23	56.00	-12.77	QP
6	0.9420	8.81	19.68	28.49	46.00	-17.51	AVG
7	1.1980	21.12	19.68	40.80	56.00	-15.20	QP
8	1.1980	6.56	19.68	26.24	46.00	-19.76	AVG
9	2.0968	25.20	19.69	44.89	56.00	-11.11	QP
10	2.0968	12.49	19.69	32.18	46.00	-13.82	AVG
11	3.1420	20.36	19.72	40.08	56.00	-15.92	QP
12	3.1420	8.53	19.72	28.25	46.00	-17.75	AVG

Remarks:

1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

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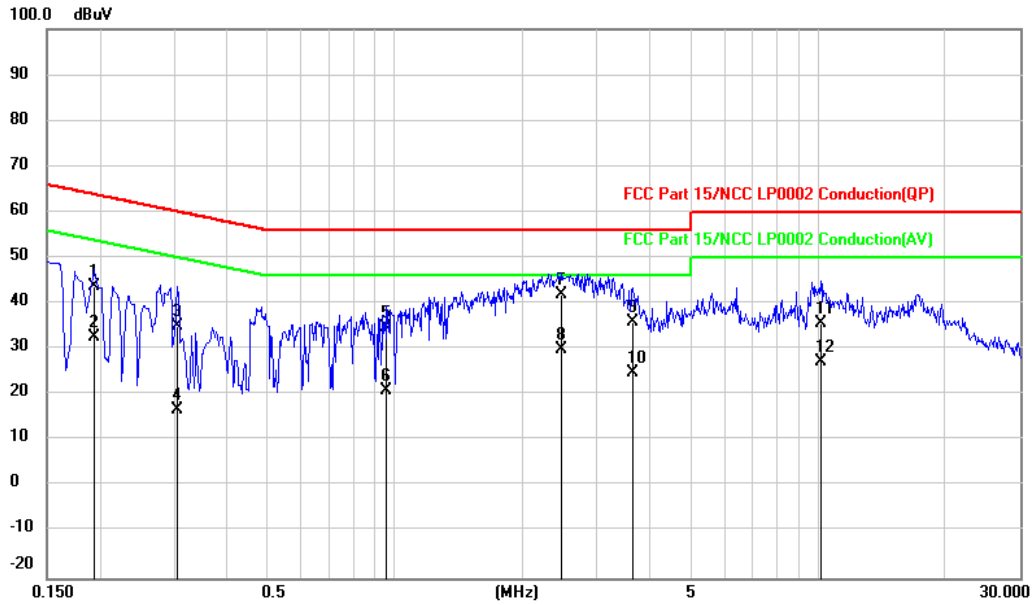
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Phase of Power : Neutral (N)



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Test report No. : 4788873577-US-R0-V0
Page : 47 of 50
Issued date : Jul. 30, 2019
FCC ID : 2ATZ5-NMSERIESA01

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.1940	24.18	19.68	43.86	63.86	-20.00	QP
2	0.1940	12.84	19.68	32.52	53.86	-21.34	AVG
3	0.3060	15.33	19.67	35.00	60.08	-25.08	QP
4	0.3060	-2.88	19.67	16.79	50.08	-33.29	AVG
5	0.9579	15.02	19.68	34.70	56.00	-21.30	QP
6	0.9579	1.34	19.68	21.02	46.00	-24.98	AVG
7	2.4780	22.16	19.70	41.86	56.00	-14.14	QP
8	2.4780	10.24	19.70	29.94	46.00	-16.06	AVG
9	3.6500	16.34	19.74	36.08	56.00	-19.92	QP
10	3.6500	5.05	19.74	24.79	46.00	-21.21	AVG
11	10.1700	15.92	19.83	35.75	60.00	-24.25	QP
12	10.1700	7.36	19.83	27.19	50.00	-22.81	AVG

Remarks:

1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

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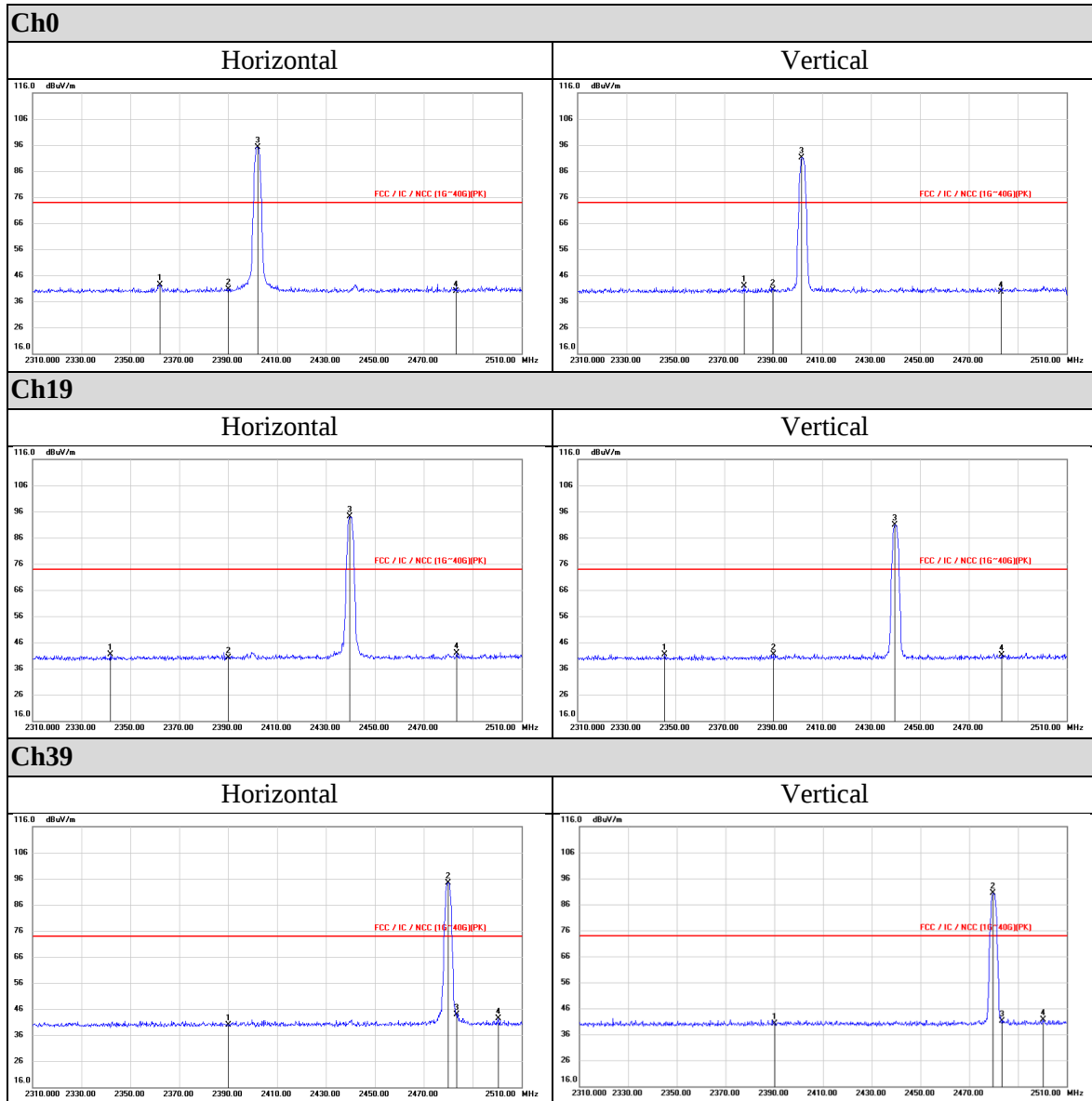
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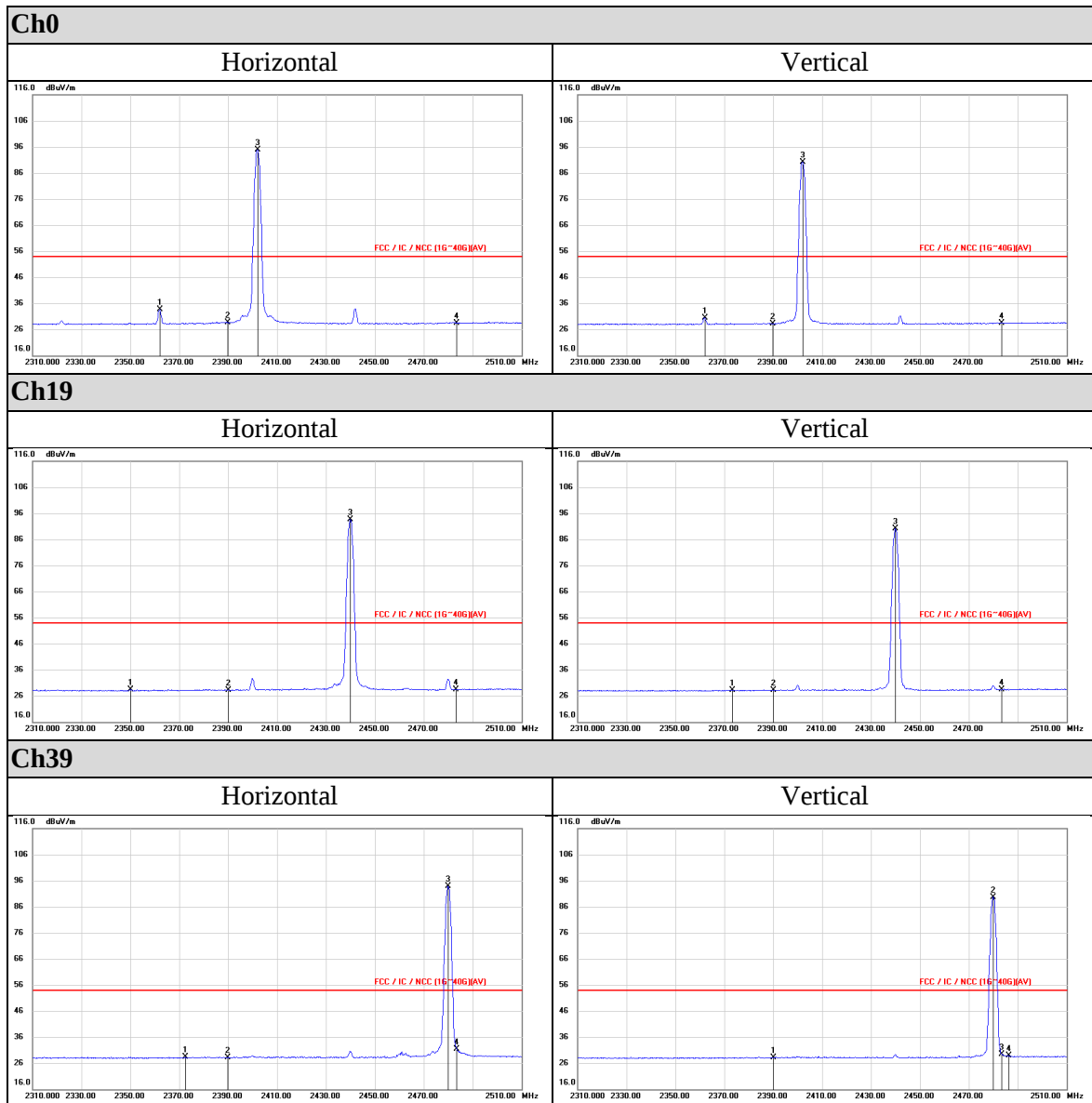
Appendix I Radiated Band Edge Measurement

Peak





Average



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Appendix II Radiated Spurious Emission Measurement

