

FCC Radio Test Report

FCC ID: 2ACFN-QMIRO201W

This report concerns: Original Grant

Project No. : 2004H039

Equipment: Tri-Band Mesh WiFi Satellite

Brand Name : QNAP

Test Model : QMiro-201W

Series Model : /

Applicant: QNAP Systems, Inc.

Address : 2F,No.22,Zhongxing Road,Xizhi Distrit., New Taipei City, 221,Taiwan

Manufacturer: QNAP Systems, Inc.

Address : 2F,No.22,Zhongxing Rd,Xizhi Dist., New Taipei City,221,Taiwan

Factory : CIG Shanghai Co., Ltd., Shanghai Branch.

Address : F/2,3 Building 1,No. 505 Jiangyue Road, Minhang District,

Shanghai, P.R. China

Date of Receipt : May. 15, 2020

Date of Test : May. 15, 2020~Jun. 19, 2020

Issued Date : Sep. 04, 2020

Report Version : R00

Test Sample : Engineering Sample No.: SH20200528127 for radiated; SH2020051457

for conducted; SH2020051457-1 for adapter

Standard(s) : FCC Part15, Subpart C (15.247)

ANSI C63.10-2013

KDB 558074 D01 15.247 Meas Guidance v05r02

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

Prepared by : Allen Wei

Approved by: Ryan Wang

ACCREDITED

Certificate # 5123.03

Add: No. 29, Jintang Road, Tangzhen Industry Park, Pudong New Area, Shanghai 201210, China

TEL: +86-021-61765666 Web: www.newbtl.com



Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, A2LA, or any agency of the U.S. Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

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	5
1 . SUMMARY OF TEST RESULTS	6
1.1 TEST FACILITY	7
1.2 MEASUREMENT UNCERTAINTY	7
1.3 TEST ENVIRONMENT CONDITIONS	7
2 . GENERAL INFORMATION	8
2.1 GENERAL DESCRIPTION OF EUT	8
2.2 DESCRIPTION OF TEST MODES	10
2.3 PARAMETERS OF TEST SOFTWARE	11
2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	12
2.5 SUPPORT UNITS	12
3 . AC POWER LINE CONDUCTED EMISSIONS TEST	13
3.1 LIMIT	13
3.2 TEST PROCEDURE	13
3.3 DEVIATION FROM TEST STANDARD	13
3.4 TEST SETUP	14
3.5 EUT OPERATING CONDITIONS	14
3.6 TEST RESULTS	14
4 . RADIATED EMISSION TEST	15
4.1 LIMIT	15
4.2 TEST PROCEDURE	16
4.3 DEVIATION FROM TEST STANDARD	16
4.4 TEST SETUP	17
4.5 EUT OPERATING CONDITIONS	18
4.6 TEST RESULT - 9 KHZ TO 30 MHZ	18
4.7 TEST RESULT - 30 MHZ TO 1000 MHZ	18
4.8 TEST RESULT - ABOVE 1000 MHZ	18
5 . BANDWIDTH TEST	19
5.1 LIMIT	19
5.2 TEST PROCEDURE	19
5.3 DEVIATION FROM STANDARD	19
5.4 TEST SETUP	19
5.5 EUT OPERATION CONDITIONS	19



Table of Contents	Page
5.6 TEST RESULTS	19
6 . MAXIMUM OUTPUT POWER	20
6.1 LIMIT	20
6.2 TEST PROCEDURE	20
6.3 DEVIATION FROM STANDARD	20
6.4 TEST SETUP	20
6.5 EUT OPERATION CONDITIONS	20
6.6 TEST RESULTS	20
7. CONDUCTED SPURIOUS EMISSION	21
7.1 LIMIT	21
7.2 TEST PROCEDURE	21
7.3 DEVIATION FROM STANDARD	21
7.4 TEST SETUP	21
7.5 EUT OPERATION CONDITIONS	21
7.6 TEST RESULTS	21
8 . POWER SPECTRAL DENSITY TEST	22
8.1 LIMIT	22
8.2 TEST PROCEDURE	22
8.3 DEVIATION FROM STANDARD	22
8.4 TEST SETUP	22
8.5 EUT OPERATION CONDITIONS	22
8.6 TEST RESULTS	22
9 . MEASUREMENT INSTRUMENTS LIST	23
10 . EUT TEST PHOTO	25
APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS	28
APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ	31
APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ	32
APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ	35
APPENDIX E - BANDWIDTH	60
APPENDIX F - MAXIMUM OUTPUT POWER	63
APPENDIX G - CONDUCTED SPURIOUS EMISSION	65
APPENDIX H - POWER SPECTRAL DENSITY	68



REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Sep. 04, 2020



1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

	FCC Part15, Subpart C (15.247)			
Standard(s) Section	Test Item	Test Result	Judgment	Remark
15.207	AC Power Line Conducted Emissions APPENDIX		N/A	
15.247(d) 15.205(a) 15.209(a)	Radiated Emissions	APPENDIX B APPENDIX C APPENDIX D	PASS	
15.247(a)(2)	Bandwidth	APPENDIX E	PASS	
15.247(b)(3)	Maximum Output Power	APPENDIX F	PASS	
15.247(d)	Conducted Spurious Emission	APPENDIX G	PASS	
15.247(e)	Power Spectral Density	APPENDIX H	PASS	
15.203	Antenna Requirement		PASS	

NOTE:

- (1) "N/A" denotes test is not applicable to this device.
- (2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.



1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No. 29, Jintang Road, Tangzhen Industry Park, Pudong New Area, Shanghai 201210, China

BTL's Test Firm Registration Number for FCC: 476765

BTL's Designation Number for FCC: CN1241

1.2 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)
SH-C01	CISPR	150 kHz ~ 30 MHz	2.70

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	Ι	3.57				
		30 MHz~200 MHz	V	4.04				
		30 MHz~200 MHz	Ι	3.76				
SH CB01	-CB01 CISPR	CICDD	CICDD	CICDD	LI CBO1 CISDD	200 MHz~1,000 MHz	V	4.24
SH-CBUT		200 MHz~1,000 MHz	Ι	3.84				
		1 GHz~18 GHz	V	4.46				
		1	1 GHz~18 GHz	Ι	4.40			
		18 GHz~40 GHz	V	3.95				
		18 GHz~40 GHz	Η	3.95				

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

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
AC Power Line Conducted Emissions	24°C	58%	AC 120V/60Hz	Vince Zong
Radiated Emissions-30 MHz to 1GHz	24°C	58%	AC 120V/60Hz	Vince Zong
Radiated Emissions-Above 1000 MHz	24°C	58%	AC 120V/60Hz	Bill Dong
Bandwidth	25°C	59%	AC 120V/60Hz	Bill Dong
Maximum Output Power & e.i.r.p.	25°C	59%	AC 120V/60Hz	Bill Dong
Conducted Spurious Emission	25°C	59%	AC 120V/60Hz	Bill Dong
Power Spectral Density	25°C	59%	AC 120V/60Hz	Vince Zong



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Tri-Band Mesh WiFi Satellite
Brand Name	QNAP
Test Model	QMiro-201W
Series Model	N/A
Model Difference(s)	N/A
Power Source	DC voltage supplied from AC/DC adapter. #1: A124-2120207U #2:ADS0248T-W120200
Power Rating	/#1: I/P:100-240V ~, 50-60Hz 0.6A O/P: 12V 2.0A 24W /#1: I/P:100-240V ~, 50-60Hz 0.6A O/P: 12V 2.0A
Operation Frequency	2402 MHz ~ 2480 MHz
Modulation Technology	GFSK
Bit Rate of Transmitter	1Mbps, 2Mbps
Max. Output Power	5.00 dBm (0.0032 W) For 1Mbps 5.06 dBm (0.0032 W) For 2Mbps

Note:

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



2. Channel List:

Channel	Frequency	Channel	Frequency
Oname	(MHz)	Chamilei	(MHz)
00	2402	20	2442
01	2404	21	2444
02	2406	22	2446
03	2408	23	2448
04	2410	24	2450
05	2412	25	2452
06	2414	26	2454
07	2416	27	2456
08	2418	28	2458
09	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	SMT	N/A	2.3



2.2 DESCRIPTION OF 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 2402MHz_CH00_1Mbps
Mode 2	TX 2440MHz_CH19_1Mbps
Mode 3	TX 2480MHz_CH39_1Mbps
Mode 4	TX 2402MHz_CH00_2Mbps
Mode 5	TX 2440MHz_CH19_2Mbps
Mode 6	TX 2480MHz_CH39_2Mbps

Following mode(s) as (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 2	TX Mode Channel 00 _2Mbps	

Radiated emissions test - Below 1GHz		
Final Test Mode	Description	
Mode 2	TX Mode Channel 00 _2Mbps	

Radiated emissions test - Above 1GHz	
Final Test Mode	Description
Mode 1	TX Mode NOTE (1)

Conducted test	
Final Test Mode	Description
Mode 1	TX Mode NOTE (1)

Note:

- (1) The measurements are performed at the high, middle, low available channels.
- (2) For radiated emission above 1 GHz test, 1GHz~26.5GHz 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.



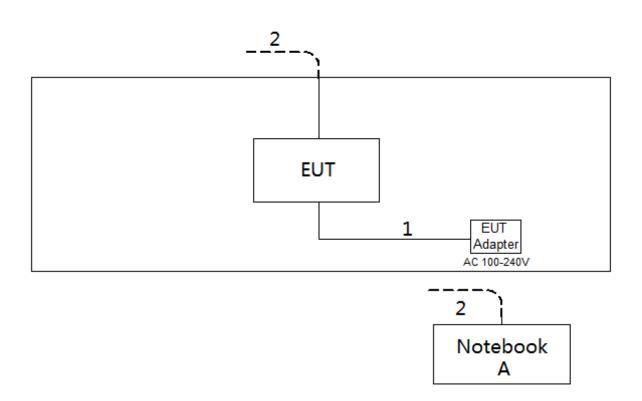
2.3 PARAMETERS OF TEST SOFTWARE

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 power parameters of BT LE

Test Software	QRCT4.0-00138		
Frequency (MHz)	2402	2440	2480
Parameters(1Mbps)	4	4	4
Parameters(2Mbps)	4	4	4



2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.5 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.
Α	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



3. AC POWER LINE CONDUCTED EMISSIONS TEST

3.1 LIMIT

Fraguency of Emission (MLIT)	Limit (dBμV)		
Frequency of Emission (MHz)	Quasi-peak	Average	
0.15 - 0.5	66 to 56*	56 to 46*	
0.50 - 5.0	56	46	
5.0 - 30.0	60	50	

Note:

- (1) The tighter limit applies at the band edges.
- (2) The 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 Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.2 TEST PROCEDURE

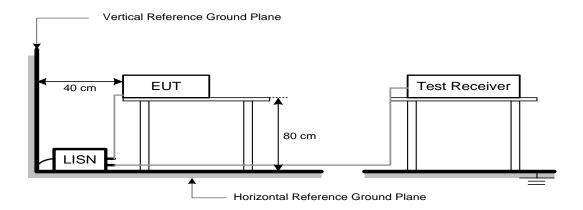
- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- 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.

3.3 DEVIATION FROM TEST STANDARD

No deviation



3.4 TEST SETUP



3.5 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.

3.6 TEST RESULTS

Please refer to the APPENDIX A.

Remark:

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



4. RADIATED EMISSION TEST

4.1 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 EMISSION MEASUREMENT (9 kHz-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 RADIATED EMISSION MEASUREMENT (Above 1000 MHz)

Frequency (MHz)	(dBuV/m at 3 m)	
Frequency (Wiriz)	Peak	Average
Above 1000	74	54

Note:

- (1) The limit for radiated test was performed according to FCC PART 15C and RSS-247.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).
- (4) The test result calculated as following: Measurement Value = Reading Level + Correct Factor Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use) Margin Level = Measurement Value - Limit Value



Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW	RBW 1 MHz VBW 3 MHz peak detector for Pk value
(Emission in restricted band) RMS detector for AV value	

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000 MHz for QP detector

4.2 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 1 GHz)
- b. The measuring distance of 3 m or 1.5m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1 GHz)
- h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- i. For the actual test configuration, please refer to the related Item -EUT Test Photos.

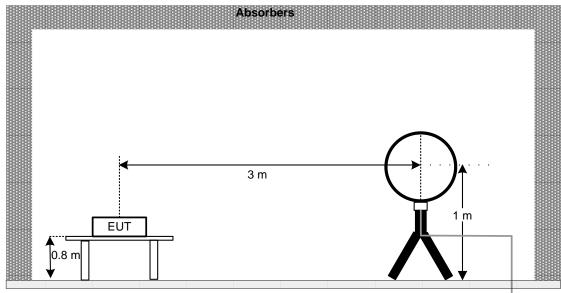
4.3 DEVIATION FROM TEST STANDARD

No deviation

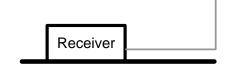


4.4 TEST SETUP

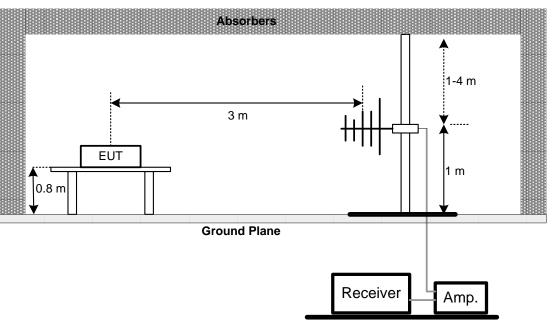
9 kHz-30 MHz



Ground Plane

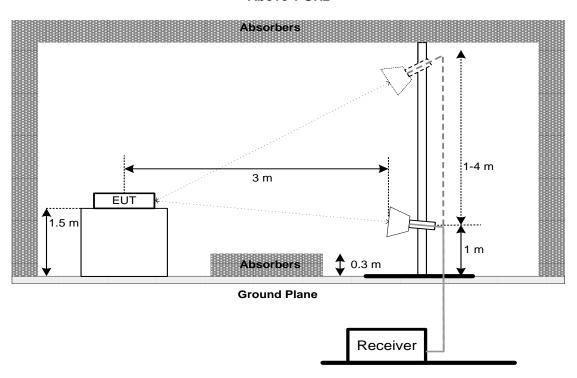


30 MHz to 1 GHz





Above 1 GHz



4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 TEST RESULT - 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.

4.7 TEST RESULT - 30 MHz TO 1000 MHz

Please refer to the APPENDIX C.

4.8 TEST RESULT - 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. BANDWIDTH TEST

5.1 LIMIT

FCC Part15, Subpart C (15.247)					
Section	Limit				
15.247(a)(2)	Bandwidth	>= 500 kHz (6 dB bandwidth)			

5.2 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: RBW= 100 kHz, VBW=300 kHz, Sweep time = 2.5 ms.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP

EUT	SPECTRUM
	ANALYZER

5.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULTS

Please refer to the APPENDIX E.



6. MAXIMUM OUTPUT POWER

6.1 LIMIT

FCC Part15, Subpart C (15.247) / RSS-247				
Section Test Item Limit				
15.247(b)(3)	Maximum Output Davier	4att ox 20 dDm		
RSS-247 5.4 (d)	Maximum Output Power	1 watt or 30 dBm		
RSS-247 5.4 (d)	Maximum e.i.r.p.	4 watt or 36 dBm		

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. The maximum conducted output power was performed in accordance with method 11.9.1.1 (for peak power) or 11.9.2.2 (for AVG power) of ANSI C63.10-2013.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

6.6 TEST RESULTS

Please refer to the APPENDIX F.



7. CONDUCTED SPURIOUS EMISSION

7.1 LIMIT

For FCC

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 Output Power limits. If the transmitter complies with the Output 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 Section 15.209(a) is not required.

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. Spectrum Setting: RBW= 100 kHz, VBW=300 kHz, Sweep time = 10 ms.

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP

EUT	SPECTRUM
	ANALYZER

7.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

7.6 TEST RESULTS

Please refer to the APPENDIX G.



8. POWER SPECTRAL DENSITY TEST

8.1 LIMIT

FCC Part15, Subpart C (15.247)				
Section Test Item Limit				
15.247(e) Power Spectral Density		8 dBm (in any 3 kHz)		

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: RBW=3 kHz, VBW=10 kHz, Sweep time = auto.

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

8.6 TEST RESULTS

Please refer to the APPENDIX H.



9. MEASUREMENT INSTRUMENTS LIST

	AC Power Line Conducted Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until		
1	Line Impedance Stabilisation Network	Schwarzbeck	NNLK 8121	8121-822	Mar. 28, 2021		
2	TWO-LINE V-NETWORK	R&S	ENV216	101340	Nov. 19, 2020		
3	Test Cable	emci	EMCRG400-BM-N M-10000	170628	Apr. 16, 2021		
4	EMI Test Receiver	R&S	ESCI	100082	Mar. 28, 2021		
5	50Ω Terminator	SHX	TF2-1G-A	17051602	Mar. 28, 2021		
6	50Ω coaxial switch	Anritsu	MP59B	6201750902	Mar. 28, 2021		
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A		

	Radiated Emissions - 9 kHz to 30 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Loop Antenna	EMCI	EMCI LPA600	275	Mar. 28, 2021	
2	EMI Test Receiver	R&S	ESCI	100082	Mar. 28, 2021	
3	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A	

	Radiated Emissions - 30 MHz to 1 GHz						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until		
1	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	719	Mar. 28, 2021		
2	Pre-Amplifier	emci	EMC9135	980400	Mar. 28, 2021		
3	MXE EMI Receiver	Keysight	N9038A	MY57150106	Mar. 28, 2021		
4	Test Cable	emci	EMC104-SM-SM-7 000	170330	Apr. 16, 2021		
5	Test Cable	emci	EMC104-SM-SM-1 000	170331	Apr. 16, 2021		
6	Test Cable	emci	EMC104-SM-NM-3 500	170621	Apr. 16, 2021		
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A		



	De Pate I Factorian Al ann 4 Olla					
			missions - Above 1	~		
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Double-Ridged Waveguide Horn Antenna	ETS-Lindgren	9120D	00206960	Mar. 28, 2021	
2	Pre-Amplifier	emci	EMC012645SE	980421	Mar. 28, 2021	
3	EXA Spectrum Analyzer	Keysight	N9010A	MY56480545	Mar. 28, 2021	
4	Test Cable	emci	EMC104-SM-SM-7 000	170330	Apr. 16, 2021	
5	Test Cable	emci	EMC104-SM-SM-1 000	170331	Apr. 16, 2021	
6	Test Cable	emci	EMC104-SM-NM-3 500	170621	Apr. 16, 2021	
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A	
8	MXE EMI Receiver	Keysight	N9038A	MY57150106	Mar. 28, 2021	
9	Double-Ridged Waveguide Horn Antenna	ETS-Lindgren	3116C	00203919	Mar. 28, 2021	
10	Pre-Amplifier	emci	EMC184045SE	980409	Mar. 28, 2021	
11	EXA Spectrum Analyzer	Keysight	N9010A	MY56480579	Mar. 28, 2021	
12	Test Cable	emci	EMC102-KM-KM-8 00	170654	Apr. 16, 2021	
13	Test Cable	emci	Super Reliable-40G-SS11- 7000	W0030860001	Apr. 16, 2021	
14	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A	

Bandwidth					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100626	Mar. 28, 2021

Maximum Output Power							
Item	Item Kind of Equipment Manufacturer Type No. Serial No. Calibrated unti						
1	Peak Power Analyze	Keysight	8990B	MY51000507	Mar. 28, 2021		
2	Wideband Power Sensor	Keysight	N9123A	MY58310003	Mar. 28, 2021		

Antenna Conducted Spurious Emissions							
Item	Item Kind of Equipment Manufacturer Type No. Serial No. Calibrated until						
1	Spectrum Analyzer	R&S	FSP40	100626	Mar. 28, 2021		

Power Spectral Density									
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until				
1	Spectrum Analyzer	R&S	FSP40	100626	Mar. 28, 2021				

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

All calibration period of equipment list is one year.



10. EUT TEST PHOTO

Conducted Emissions Test Photos







Radiated Emissions Test Photos

30 MHz to 1000 MHz

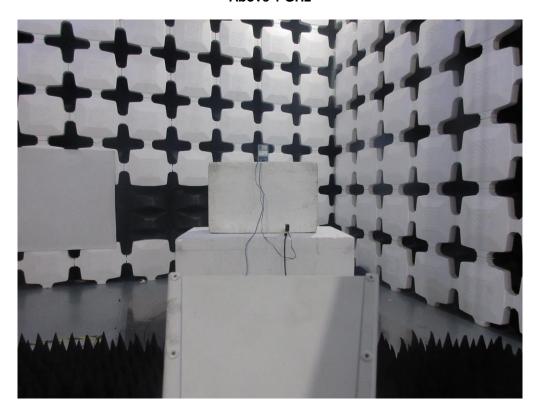






Radiated Emissions Test Photos

Above 1 GHz



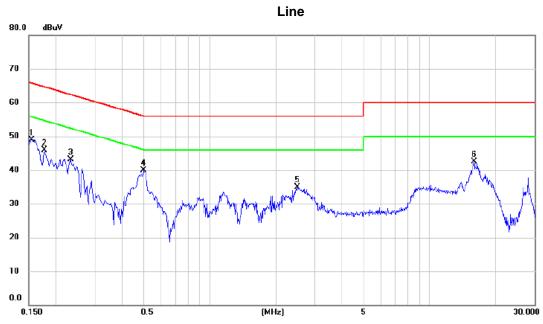




APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS



Test Mode: TX Mode Channel 00 _2Mbps

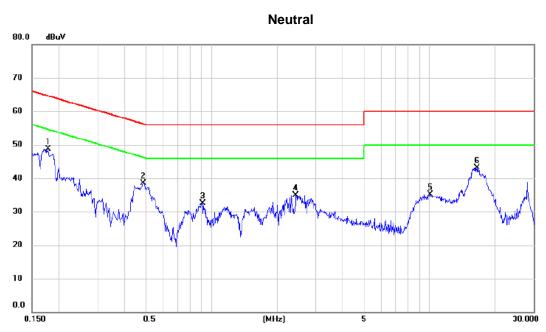


No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1544	39.16	9.73	48.89	65.76	-16.87	peak	
2	0.1770	36.11	9.76	45.87	64.63	-18.76	peak	
3	0.2328	33.29	9.79	43.08	62.35	-19.27	peak	
4 *	0.5020	29.95	9.90	39.85	56.00	-16.15	peak	
5	2.5035	25.13	9.83	34.96	56.00	-21.04	peak	
6	15.9585	32.15	10.27	42.42	60.00	-17.58	peak	

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



Test Mode: TX Mode Channel 00 _2Mbps



No. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1 *	0.1785	39.06	9.63	48.69	64.56	-15.87	peak	
2	0.4875	28.82	9.69	38.51	56.21	-17.70	peak	
3	0.9104	22.88	9.72	32.60	56.00	-23.40	peak	
4	2.4360	25.15	9.81	34.96	56.00	-21.04	peak	
5	10.0365	25.01	10.16	35.17	60.00	-24.83	peak	
6	16.4805	32.86	10.24	43.10	60.00	-16.90	peak	

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



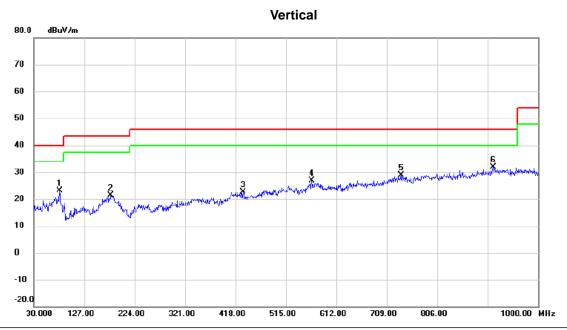
APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ Note: The measured value have enough margin over 20dB than the limit, therefore they are not reported.



APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ





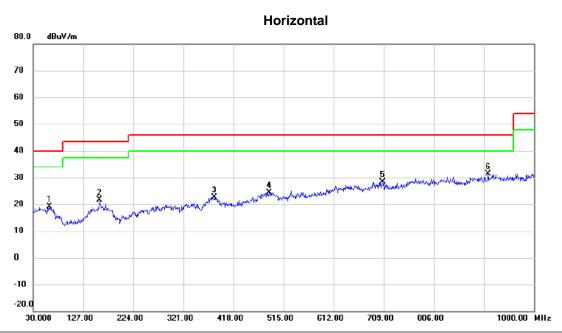


No	. M	k.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
			MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		7	9.4700	43.54	-20.38	23.16	40.00	-16.84	peak	
2	2	17	8.4100	37.99	-16.56	21.43	43.50	-22.07	peak	
3	3	43	2.5500	34.20	-11.65	22.55	46.00	-23.45	peak	
- 4		56	4.4700	35.88	-9.12	26.76	46.00	-19.24	peak	
5	,	73	6.1600	35.00	-6.09	28.91	46.00	-17.09	peak	
- 6	*	91	3.6700	36.04	-4.15	31.89	46.00	-14.11	peak	

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



Test Mode: TX Mode Channel 00 _2Mbps



No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		61.0400	36.12	-16.96	19.16	40.00	-20.84	peak	
2		159.0100	37.18	-15.52	21.66	43.50	-21.84	peak	
3		381.1400	35.63	-12.92	22.71	46.00	-23.29	peak	
4		486.8700	35.01	-10.55	24.46	46.00	-21.54	peak	
5		707.0600	35.12	-6.64	28.48	46.00	-17.52	peak	
6	*	911.7300	35.52	-4.19	31.33	46.00	-14.67	peak	

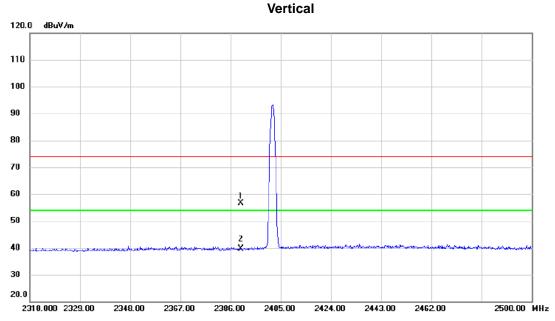
- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ



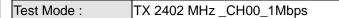


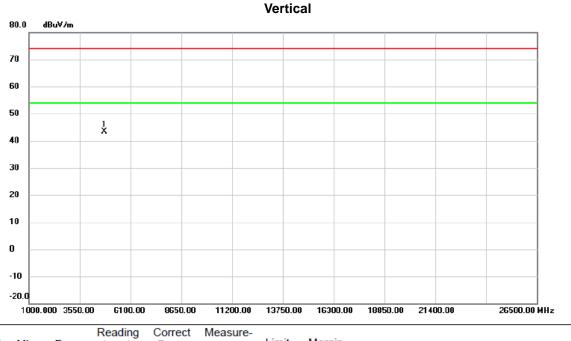


No. Mk. Freq.		Reading Level	Correct Factor	Measure- ment	Limit	Margin			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	23.33	33.36	56.69	74.00	-17.31	peak	
2	*	2390.000	6.32	33.36	39.68	54.00	-14.32	AVG	

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





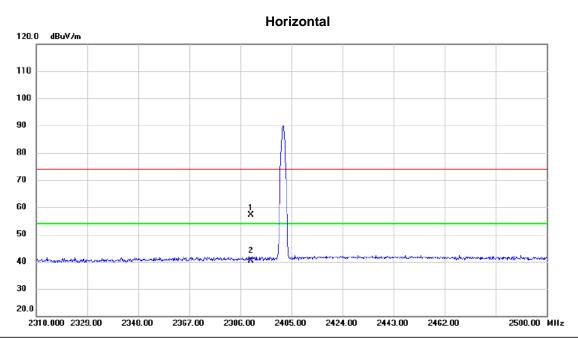


	No. M	1k.	Freq.	Level	Factor	ment	Limit	Margin		
Ī			MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
	1 *	4	804.160	56.48	-13.09	43.39	74.00	-30.61	peak	

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



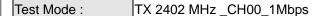
Test Mode: TX 2402 MHz _CH00_1Mbps



No.	M	k. Freq.	Reading Level		Measure- ment		Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	23.68	33.36	57.04	74.00	-16.96	peak	
2	*	2390.000	7.14	33.36	40.50	54.00	-13.50	AVG	

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







1 * 4804.063

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

-13.09

45.01

74.00

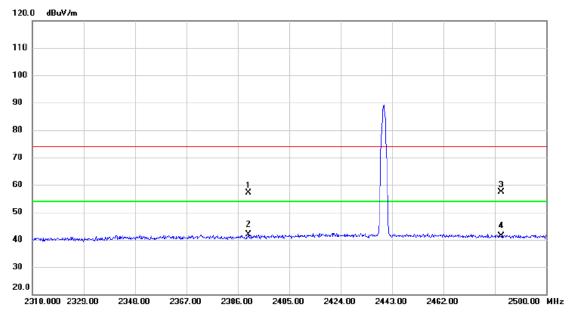
-28.99

peak

58.10



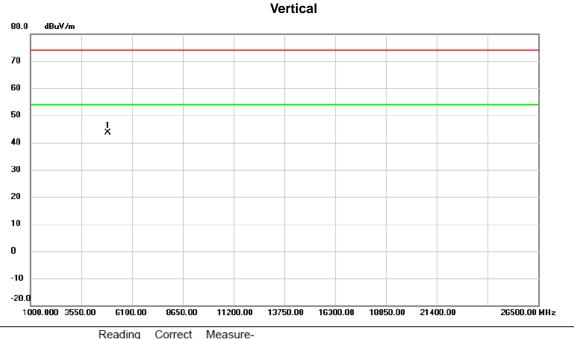
Vertical



	No.	Mi	c. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
-			MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
_	1		2390.000	23.68	33.36	57.04	74.00	-16.96	peak	
-	2	*	2390.000	8.47	33.36	41.83	54.00	-12.17	AVG	
	3		2483.500	23.54	33.76	57.30	74.00	-16.70	peak	
-	4		2483.500	7.51	33.76	41.27	54.00	-12.73	AVG	

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



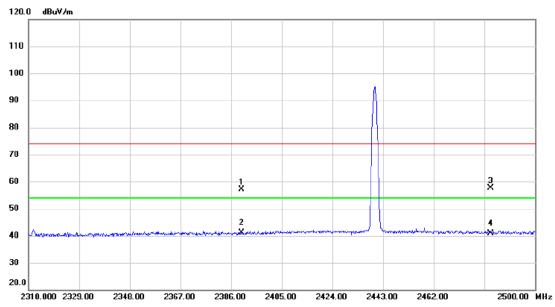


N	lo. N	۱k.	Freq.	_	Factor	ment	Limit	Margin		
			MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
	1 *	4	4880.153	56.49	-12.85	43.64	74.00	-30.36	peak	

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



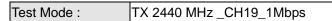
Horizontal

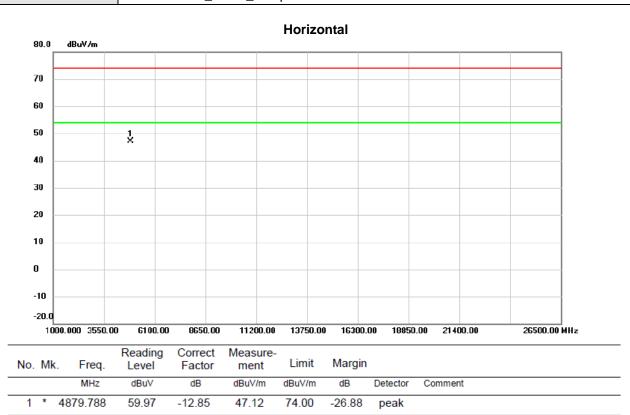


No.	М	k.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
			MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		23	90.000	23.77	33.36	57.13	74.00	-16.87	peak	
2	*	23	90.000	7.67	33.36	41.03	54.00	-12.97	AVG	
3		24	83.500	23.97	33.76	57.73	74.00	-16.27	peak	
4		24	83.500	7.02	33.76	40.78	54.00	-13.22	AVG	

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

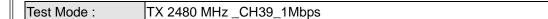


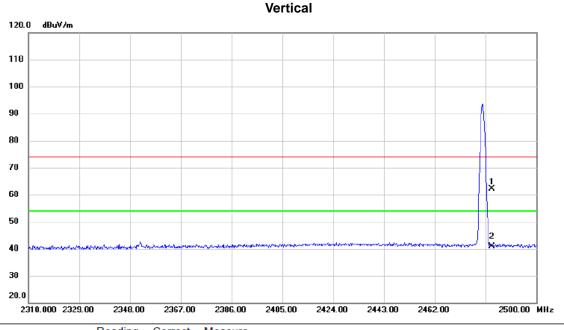




- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





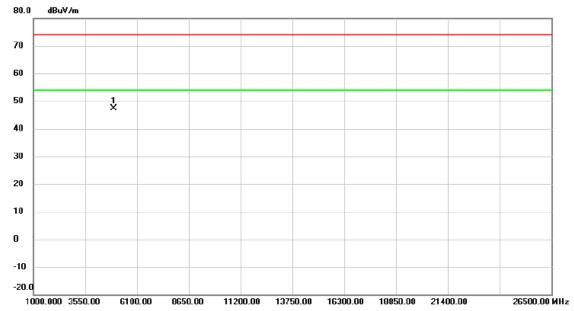


No.	Mk	c. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2483.500	28.31	33.76	62.07	74.00	-11.93	peak	
2		2483.500	7.09	33.76	40.85	54.00	-13.15	AVG	

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



Vertical

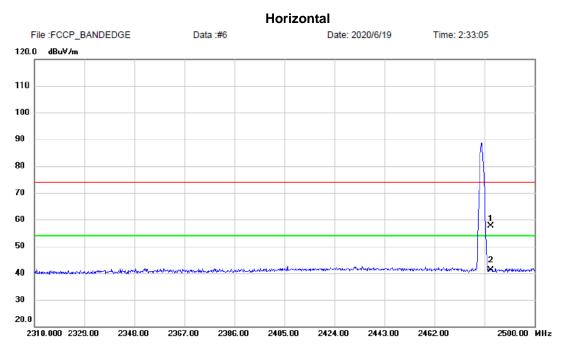


No. Mk	. Freq.			Measure- ment		Margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	4959.792	59.95	-12.61	47.34	74.00	-26.66	peak	

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



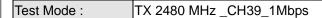




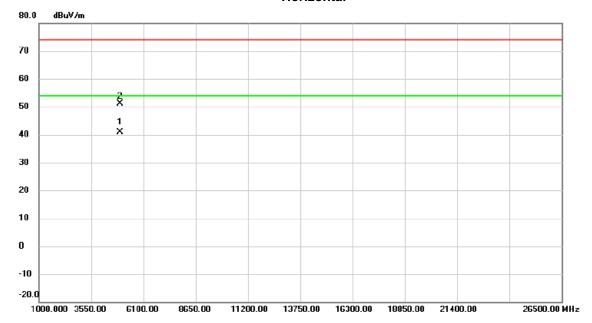
No.	М	k. Freq.	Reading Level		Measure- ment		Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2483.500	23.91	33.76	57.67	74.00	-16.33	peak	
2	*	2483.500	7.47	33.76	41.23	54.00	-12.77	AVG	

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





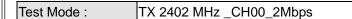
Horizontal

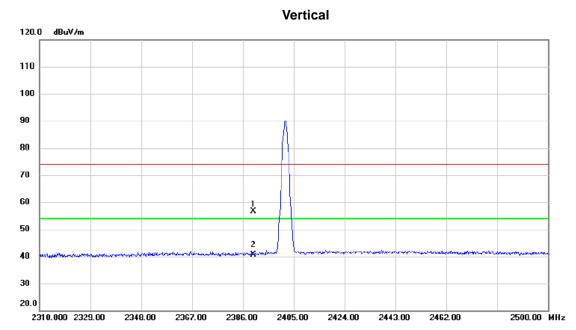


No.	MI	k. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4959.870	53.56	-12.61	40.95	54.00	-13.05	AVG	
2		4960.040	63.77	-12.60	51.17	74.00	-22.83	peak	

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



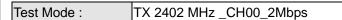


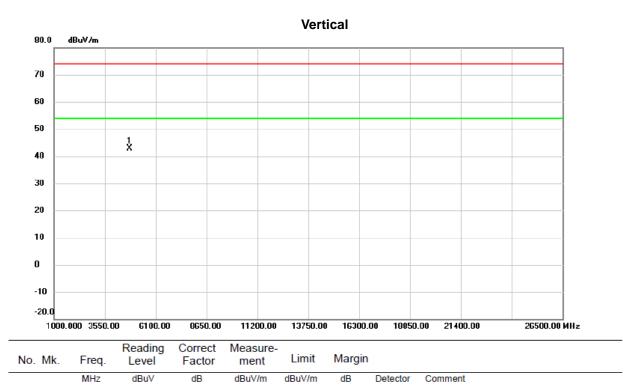


No.	Mk.	Freq.			Measure- ment		Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2	390.000	23.28	33.36	56.64	74.00	-17.36	peak	
2	* 2	390.000	7.28	33.36	40.64	54.00	-13.36	AVG	

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







1 * 4804.380

(1) Measurement Value = Reading Level + Correct Factor.

-13.09

42.96

74.00

-31.04

peak

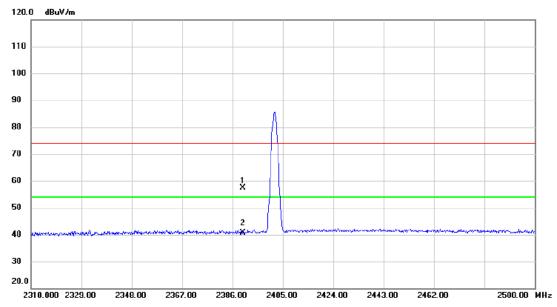
(2) Margin Level = Measurement Value - Limit Value.

56.05



Test Mode: TX 2402 MHz _CH00_2Mbps

Horizontal

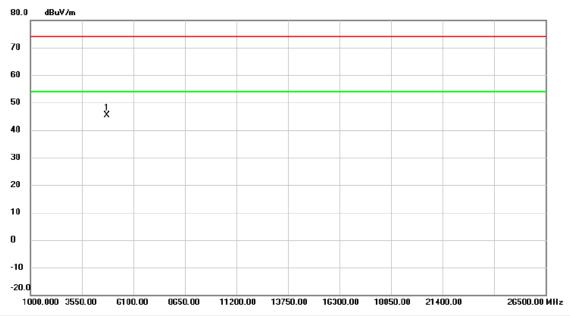


No.	MI	k. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	24.09	33.36	57.45	74.00	-16.55	peak	
2	*	2390.000	7.24	33.36	40.60	54.00	-13.40	AVG	

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



Horizontal

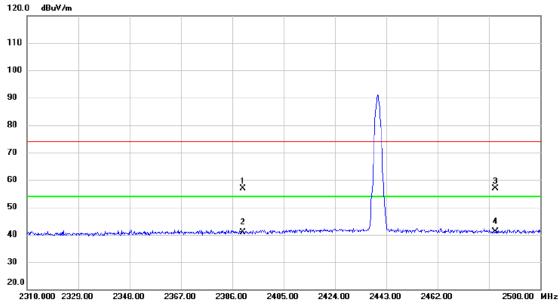


	No.	Mk	c. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
			MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
-	1	*	4804.113	58.39	-13.09	45.30	74.00	-28.70	peak	

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



Vertical

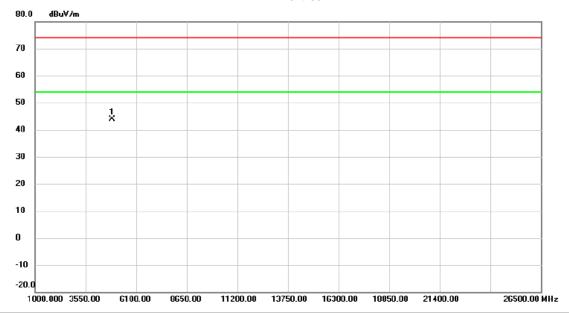


No.	Mk	. Freq.	Reading Level		Measure- ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	23.56	33.36	56.92	74.00	-17.08	peak	
2		2390.000	7.42	33.36	40.78	54.00	-13.22	AVG	
3		2483.500	23.02	33.76	56.78	74.00	-17.22	peak	
4	*	2483.500	7.47	33.76	41.23	54.00	-12.77	AVG	

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



Vertical

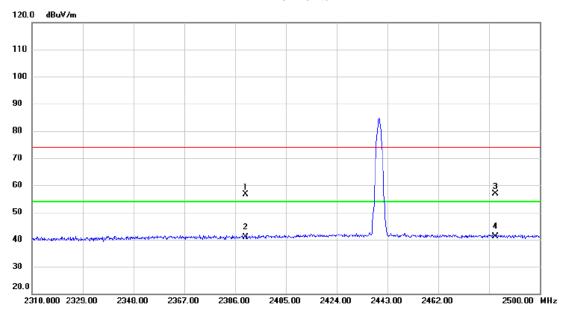


No. Mk.	Freq.			Measure- ment		Margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 * 4	4880.118	56.82	-12.85	43.97	74.00	-30.03	peak	

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



Horizontal

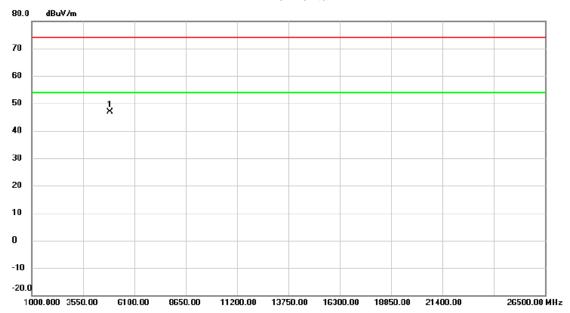


No.	M	c. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	23.29	33.36	56.65	74.00	-17.35	peak	
2		2390.000	7.40	33.36	40.76	54.00	-13.24	AVG	
3		2483.500	23.14	33.76	56.90	74.00	-17.10	peak	
4	*	2483.500	7.27	33.76	41.03	54.00	-12.97	AVG	

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



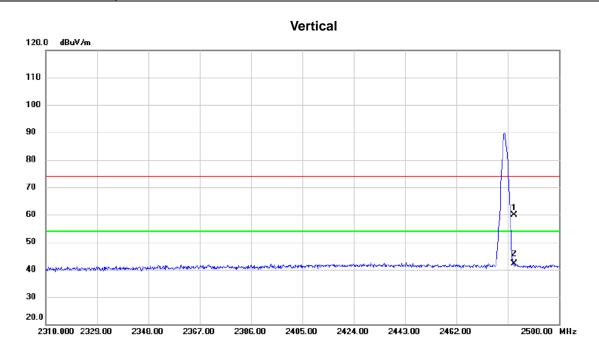
Horizontal



No. Mk	. Freq.		Correct Factor	Measure- ment		Margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	4880.028	59.82	-12.85	46.97	74.00	-27.03	peak	

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





No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2483.500	26.02	33.76	59.78	74.00	-14.22	peak	
2	*	2483.500	8.46	33.76	42.22	54.00	-11.78	AVG	

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



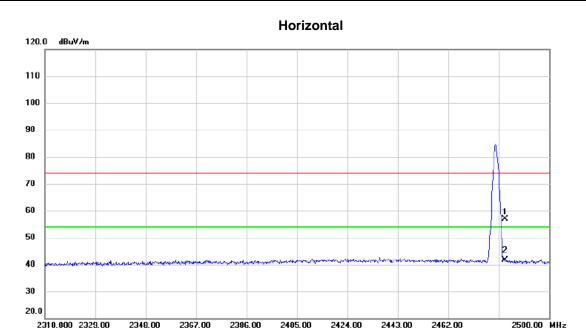
Vertical



	No.	MI	k. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
_			MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
-	1	*	4959.807	59.87	-12.61	47.26	74.00	-26.74	peak	

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



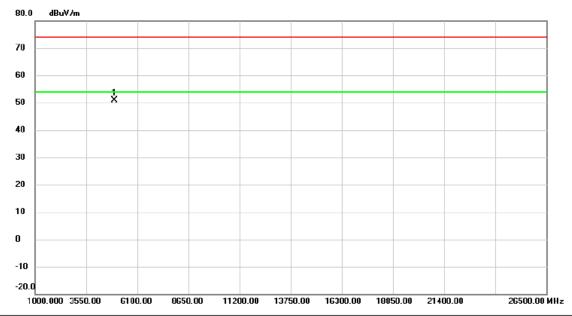


No.	MI	k. Freq.			Measure- ment		Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2483.500	23.01	33.76	56.77	74.00	-17.23	peak	
2	*	2483.500	7.80	33.76	41.56	54.00	-12.44	AVG	

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



Horizontal



	No.	М	k. Freq.	Reading Level		Measure- ment	Limit	Margin		
			MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
-	1	*	4960.083	63.56	-12.60	50.96	74.00	-23.04	peak	

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

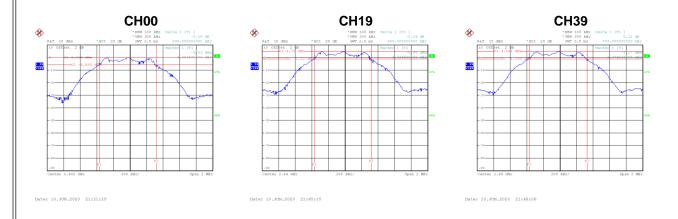


NDIX E - BANDWIDTH



Test Mode: CH00, CH19, CH39 - 1Mbps

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Test Result
00	2402	0.690	500	Pass
19	2440	0.688	500	Pass
39	2480	0.704	500	Pass





Test Mode: CH00, CH19, CH39 - 2Mbps

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Test Result
00	2402	1.146	500	Pass
19	2440	1.150	500	Pass
39	2480	1.136	500	Pass





APPENDIX F - MAXIMUM OUTPUT POWER



Test Mode: CH00, CH19, CH39 - 1Mbps

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	0.26	0.0011	30.00	1.00	Pass
2440	5.00	0.0032	30.00	1.00	Pass
2480	4.99	0.0032	30.00	1.00	Pass

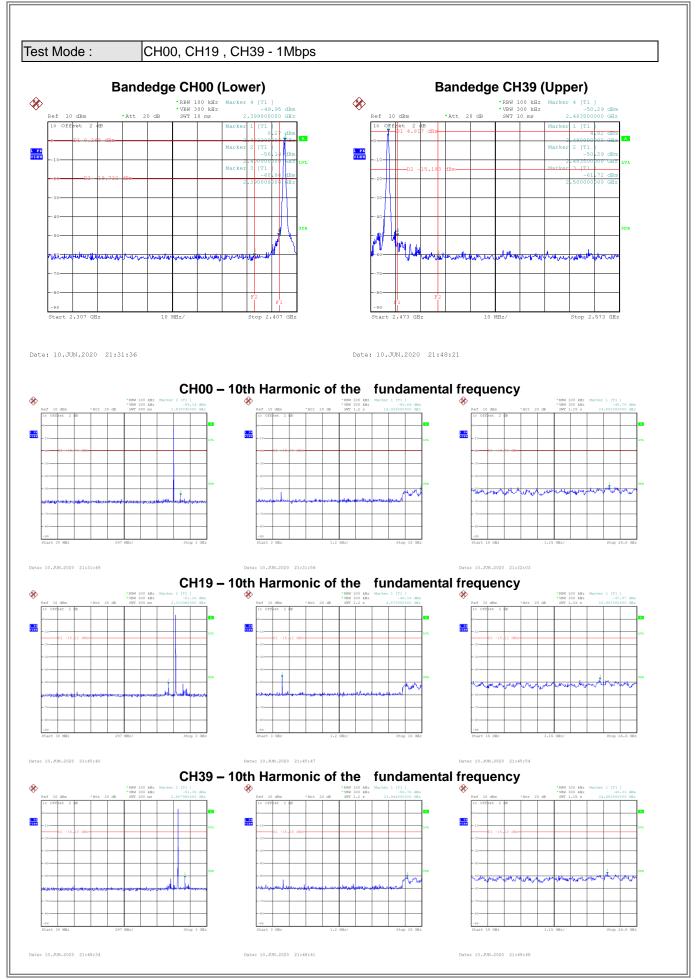
Test Mode: CH00, CH19, CH39 - 2Mbps

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	5.06	0.0032	30.00	1.00	Pass
2440	4.98	0.0031	30.00	1.00	Pass
2480	4.93	0.0031	30.00	1.00	Pass

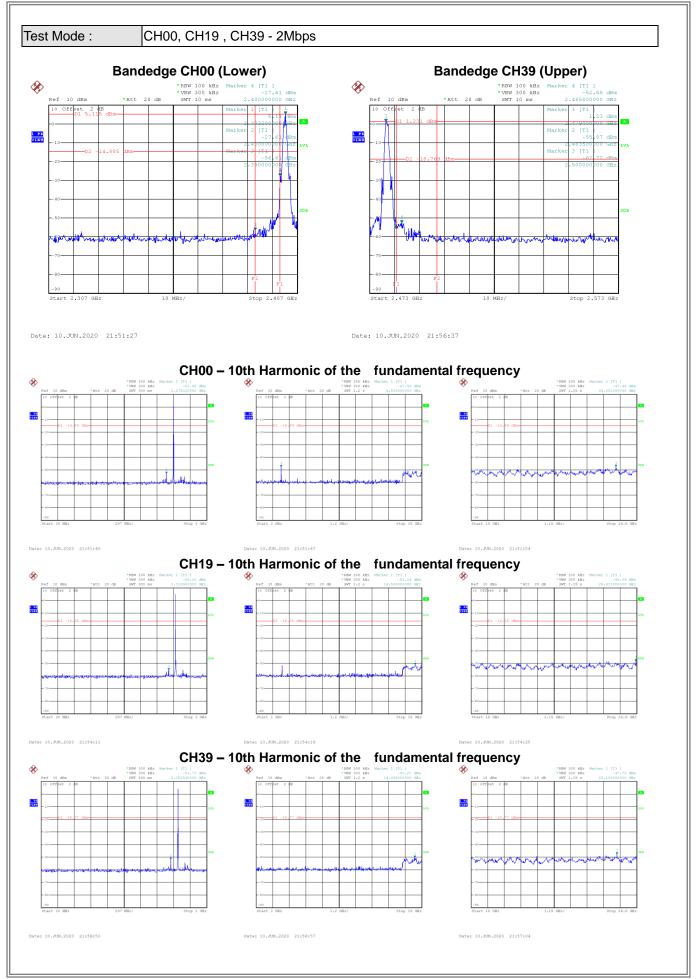


APPENDIX G - CONDUCTED SPURIOUS EMISSION











APPENDIX H - POWER SPECTRAL DENSITY



Test Mode: CH00, CH19, CH39 - 1Mbps

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Max. Limit (dBm/3 kHz)	Test Result
00	2402	-16.29	8.00	Pass
19	2440	-11.78	8.00	Pass
39	2480	-11.91	8.00	Pass





Test Mode: CH00, CH19, CH39 - 2Mbps

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Max. Limit (dBm/3 kHz)	Test Result
00	2402	-13.48	8.00	Pass
19	2440	-13.64	8.00	Pass
39	2480	-13.69	8.00	Pass

