



# **FCC Radio Test Report**

FCC ID: RWO-RZ010342

This report concerns: Original Grant

Project No. : 2003C188
Equipment : Gaming Mouse

**Brand Name** : RAZER **Test Model** : RZ01-0342

Series Model : RZ01-0342XXXX-XXXX (X can be 0-9 or A-Z)

**Applicant**: Razer Inc.

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China

Date of Receipt : Mar. 24, 2020

**Date of Test** : Mar. 25, 2020 ~ Apr. 25, 2020

**Issued Date** : Jun. 03, 2020

Report Version : R00

Test Sample : Sample No.: DG202004021 for conducted, DG202004022 for radiated.

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

ANSI C63.10-2013

FCC 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.

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IAC-MRA ACCREDITED

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**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.

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The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

#### Limitation

in determining the Pass/Fail results.

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



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# **REPORT ISSUED HISTORY**

Report Version	Description	Issued Date
R00	Original Issue.	Jun. 03, 2020



# 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

	FCC Part15, Subpart C (15.247)			
Standard(s) Section	Judgment	Remark		
15.207	AC Power Line Conducted Emissions	APPENDIX A	PASS	
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(2)

#### 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.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

#### 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 Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)
DG-C02	CISPR	150kHz ~ 30MHz	2.60

#### B. Radiated emissions Measurement:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
		9kHz ~ 30MHz	V	3.79
		9kHz ~ 30MHz	Ι	3.57
		30MHz ~ 200MHz	٧	4.88
		30MHz ~ 200MHz	Ι	4.14
DG-CB03	CB03 CISPR 200MHz ~ 1,000MHz	٧	4.62	
DG-CB03	CISER	200MHz ~ 1,000MHz	Ι	4.80
		1GHz ~ 6GHz	-	4.58
		6GHz ~ 18GHz	-	5.18
		18GHz ~ 26.5GHz	-	3.62
		26.5GHz ~ 40GHz	-	4.00

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	25°C	55%	DC 5V	Kwok Guo
Radiated Emissions-9K-30MHz	25°C	60%	DC 5V	Kwok Guo
Radiated Emissions-30 MHz to 1GHz	24°C	68%	DC 5V	Kwok Guo
Radiated Emissions-Above 1000 MHz	24°C	68%	DC 5V	Kwok Guo
Bandwidth	25°C	60%	DC 3.7V	Hayden Chen
Maximum Output Power	25°C	60%	DC 3.7V	Laughing Zhang
Conducted Spurious Emission	25°C	60%	DC 3.7V	Hayden Chen
Power Spectral Density	25°C	60%	DC 3.7V	Hayden Chen



# 2. GENERAL INFORMATION

# 2.1 GENERAL DESCRIPTION OF EUT

Equipment	Gaming Mouse
Brand Name	RAZER
Test Model	RZ01-0342
Series Model	RZ01-0342XXXX-XXXX (X can be 0-9 or A-Z)
Model Difference(s)	The system's model name is RZ01-0342XXXX-XXXX (X:Can be 0-9, or A-Z), and the system is contain a Gaming Mouse (Model name: RZ01-0342) and USB Dongle(Model name: DGRFG7)
Power Source	1# Supplied from battery.  Model: PL782144 2# Supplied from PC USB port.
Power Rating	1# DC 3.7V 700mAh 2.59Wh 2# DC 5V
Operation Frequency	2402 MHz ~ 2480 MHz
Modulation Technology	GFSK
Bit Rate of Transmitter 1Mbps, 2Mbps	
Max. Output Power	5.09 dBm (0.0032 W) For 1Mbps 5.21 dBm (0.0033 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 (MHz)	Channel	Frequency (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	PIFA	N/A	3.95



# 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 Mode <b>NOTE (1)</b>
Mode 2	TX Mode Channel 39 _2Mbps

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 2	TX Mode Channel 39 _2Mbps

Radiated emissions test - Below 1GHz	
Final Test Mode	Description
Mode 2	TX Mode Channel 39 _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 <b>NOTE (1)</b>

#### 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.
- (3) For radiated emission below 1 GHz test, the TX Mode Channel 39 \_2Mbps is found to be the worst case and recorded.



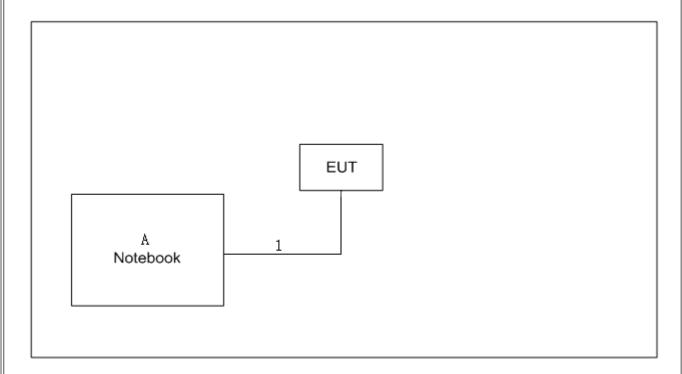
# 2.3 PARAMETERS OF TEST SOFTWARE

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	N/A		
Frequency (MHz)	2402	2440	2480
Parameters(1Mbps)	N/A	N/A	N/A
Parameters(2Mbps)	N/A	N/A	N/A



# 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	USB Cable	NO	NO	1.8m



#### 3. AC POWER LINE CONDUCTED EMISSIONS TEST

#### **3.1 LIMIT**

Fraguency of Emission (MLI)	Limit (dBµV)		
Frequency of Emission (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 Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

#### 3.2 TEST PROCEDURE

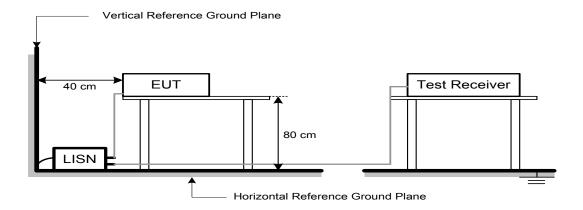
- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- 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.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

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 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 1 GHz)
- 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.

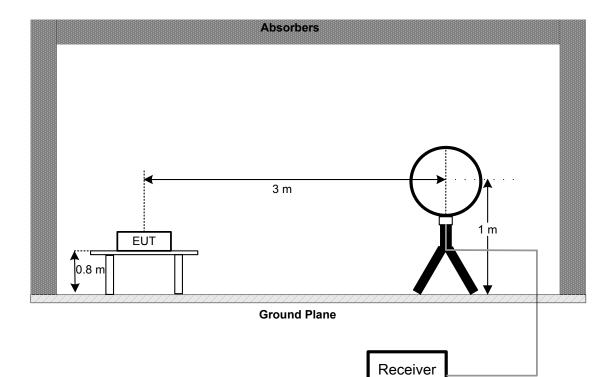
# 4.3 DEVIATION FROM TEST STANDARD

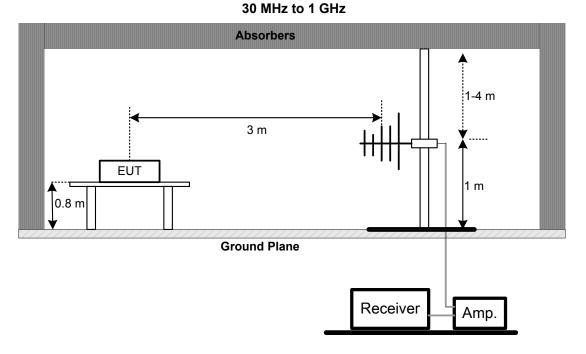
No deviation



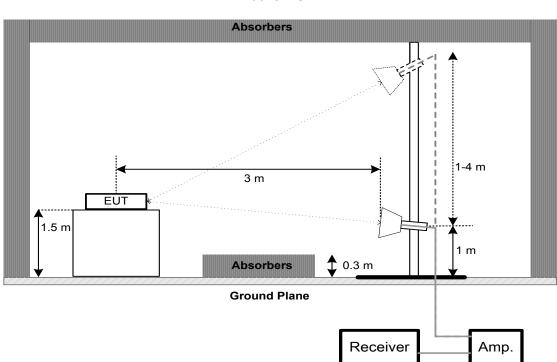
# 4.4 TEST SETUP

# 9 kHz-30 MHz









#### **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

VII = 111111					
FCC Part15, Subpart C (15.247)					
Section Test Item 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**



# 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)			
Section Test Item Limit			
15.247(b)(3) Maximum Output Power 1 watt or 30 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 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**

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

EUT	SPECTRUM
	ANALYZER

# **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	EMI Test Receiver	R&S	ESCI	100382	Feb. 28, 2021
2	LISN	EMCO	3816/2	52765	Mar. 01, 2021
3	TWO-LINE V-NETWORK	R&S	ENV216	101447	Feb. 28, 2021
4	50Ω Terminator	SHX	TF5-3	15041305	Mar. 01, 2021
5	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
6	Cable	N/A	RG223	12m	Mar. 10, 2021

	Radiated Emissions - 9 kHz to 30 MHz				
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	EM	EM-6876-1	230	Apr. 16, 2021
2	Cable	N/A	RG 213/U	N/A	May 31, 2020
3	EMI Test Receiver	R&S	ESCI	100895	Feb. 28, 2021
4	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	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 09, 2021
2*	Amplifier	HP	8447D	2944A09673	Aug. 11, 2021
3	Receiver	Agilent	N9038A	MY52130039	Aug. 03, 2020
4	Cable	emci	LMR-400(30MHz-1 GHz)(8m+5m)	N/A	May 25, 2020
5	Controller	CT	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 Emissions - Above 1 GHz				
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Guide Antenna	ETS	3115	75846	Mar. 19, 2021
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 23, 2020
3	Amplifier	Agilent	8449B	3008A02584	Aug. 03, 2020
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 07, 2021
5	Receiver	Agilent	N9038A	MY52130039	Aug. 03, 2020
6	Controller	CT	SC100	N/A	N/A
7	Controller	MF	MF-7802	MF780208416	N/A
8	Cable	mitron	RWLP50-4.0A-KJ-S MSM-12M	N/A	Nov. 25, 2020
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A



	Bandwidth & Maximum Output Power &				
	Power S	pectral Density & .	Antenna Conducted	Spurious Emission	
Item	Item Kind of Equipment Manufacturer Type No. Serial No. Calibrated until				Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 03, 2020

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

"\*" calibration period of equipment list is three year.

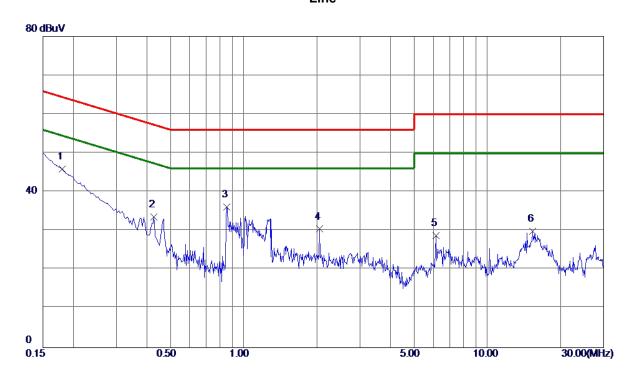
Except \* item, all calibration period of equipment list is one year.



APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS



# Line

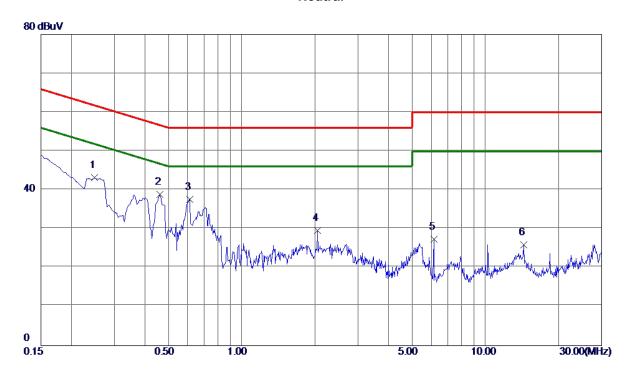


No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1 *	0.1796	36. 04	9.85	45.89	64.50	-18.61	Peak	
2	0.4290	23.63	9. 93	33. 56	57.27	-23.71	Peak	
3	0.8520	26. 20	9. 99	36. 19	<b>56.00</b>	-19.81	Peak	
4	2.0490	20. 39	10.09	30. 48	<b>56.00</b>	-25. 52	Peak	
5	6. 1440	18.41	10.41	28. 82	60.00	-31. 18	Peak	
6	15. 3150	19. 03	10. 91	29. 94	60.00	-30.06	Peak	

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



# Neutral



No.	Freq.	Keading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0. 2490	33. 15	9. 98	43. 13	61.79	-18.66	Peak	
2 *	0.4605	28.77	10. 12	38. 89	<b>56.68</b>	-17.79	Peak	
3	0.6134	27.49	10. 18	37.67	<b>56.00</b>	-18. 33	Peak	
4	2.0490	19. 22	10.42	29.64	<b>56.00</b>	-26. 36	Peak	
5	6. 1440	16. 64	10.75	27. 39	60.00	-32.61	Peak	
6	14. 3340	14.76	11. 10	25. 86	60.00	-34. 14	Peak	

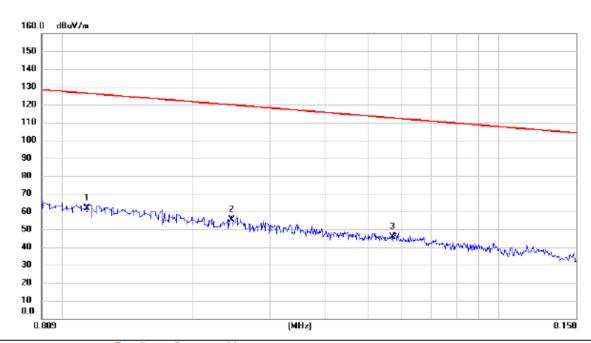
- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.



A	PPENDIX B - RAD	IATED EMISSION	N - 9 KHZ TO 30 MHZ	



# Ant 0°

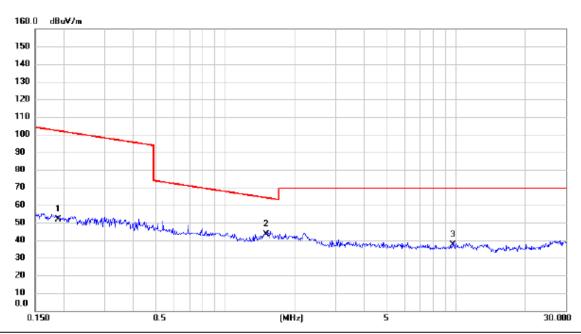


	No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
_		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
-	1	0.011	45.26	16.40	61.66	126.47	-64.81	AVG	
-	2 *	0.025	41.46	13.84	55.30	119.82	-64.52	AVG	
-	3	0.057	31.85	13.82	45.67	112.49	-66.82	AVG	

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



# Ant 0°

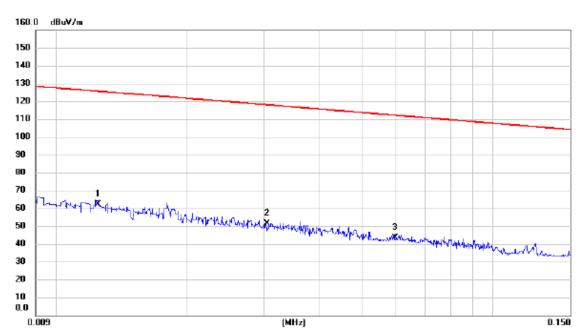


No. M	lk. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	0.189	38.09	13.60	51.69	102.06	-50.37	AVG	
2 *	1.511	31.12	12.15	43.27	64.02	-20.75	QP	
3	9.757	25.83	11.60	37.43	69.54	-32.11	QP	

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



# Ant 90°

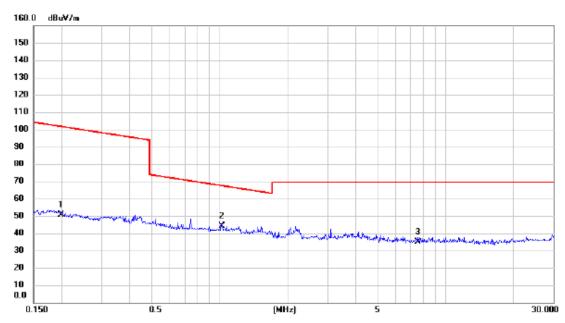


No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	0.013	45.95	16.07	62.02	125.67	-63.65	AVG	
2	0.030	37.74	13.85	51.59	117.95	-66.36	AVG	
3	0.060	29.74	13.77	43.51	112.09	-68.58	AVG	

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



# Ant 90°



No. Mk.	Freq.	Reading Level	Correct Factor	Measure ment	- Limit	Margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	0.199	36.88	13.61	50.49	101.65	-51.16	AVG	
2 *	1.021	31.52	12.49	44.01	67.42	-23.41	QP	
3	7.526	23.67	11.25	34.92	69.54	-34.62	QP	

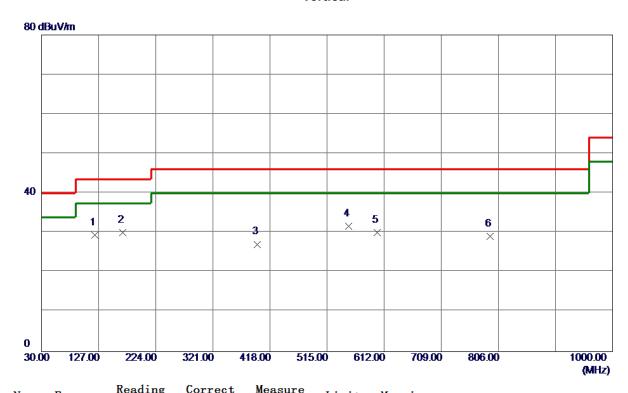
- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ



#### Vertical

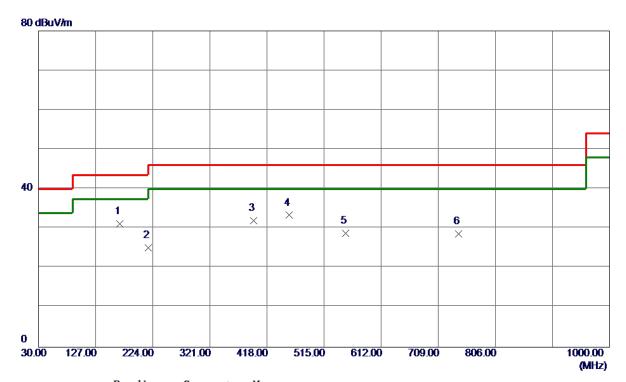


No.	Freq.	Keading Level	Factor	measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	120. 2100	42. 54	-13. 12	29.42	43.50	-14.08	Peak	
2 *	167.7400	42. 25	-12. 23	30.02	43.50	-13.48	Peak	
3	396. 6600	36. 91	-9. 79	27. 12	46.00	-18.88	Peak	
4	551.8600	39. 17	-7. 55	31.62	46.00	-14.38	Peak	
5	600. 3600	36. 18	-6. 17	30. 01	46.00	-15. 99	Peak	
6	791. 4500	32. 70	-3. 57	29. 13	46.00	-16.87	Peak	

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



# Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	167.7400	43. 38	-12. 23	31. 15	43.50	-12.35	Peak	
2	216. 2400	40. 25	-15. 15	25. 10	46.00	-20.90	Peak	
3	395. 6900	41.87	-9.82	32.05	46.00	-13.95	Peak	
4	455.8300	41.70	-8. 34	33. 36	46.00	-12.64	Peak	
5	551.8600	36. 38	<b>-7. 55</b>	28. 83	46.00	-17. 17	Peak	
6	743. 9200	32.77	-4. 15	28. 62	46.00	-17. 38	Peak	

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

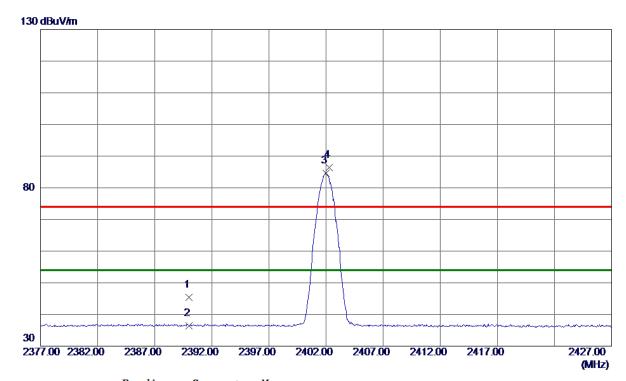


APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ



Test Mode: TX 2402 MHz \_CH00\_1Mbps

### Vertical



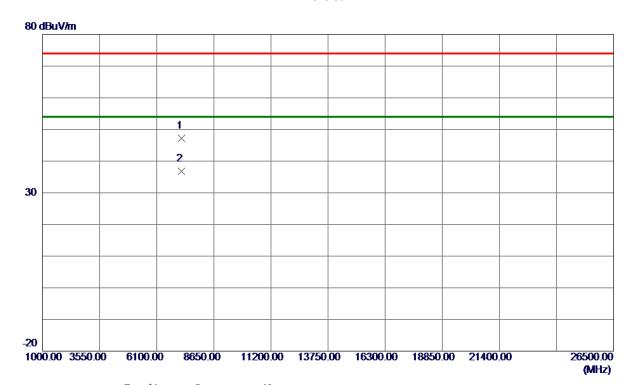
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2390.0000	38. 52	6.89	45. 41	74.00	-28. 59	Peak	
2	2390.0000	29. 54	6.89	36. 43	54.00	-17. 57	AVG	
3 *	2402.0000	77.71	6. 88	84. 59	54.00	30. 59	AVG	No Limit
4	2402. 3000	79. 52	6.88	86. 40	74.00	12.40	Peak	No Limit

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



Test Mode: TX 2402 MHz \_CH00\_1Mbps

# Vertical



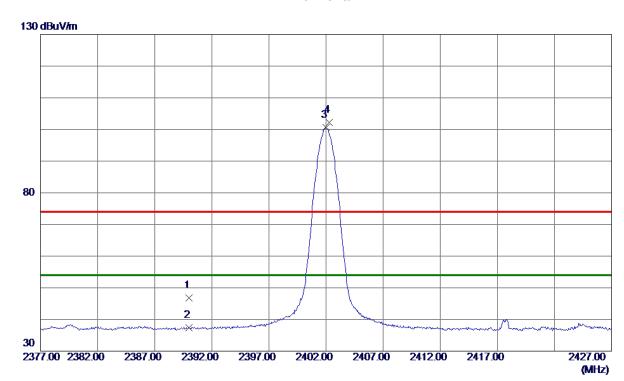
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	7206.6000	38. 04	9. 16	47. 20	74.00	-26.80	Peak	
2 *	7206. 7500	27. 57	9. 16	36. 73	54.00	-17. 27	AVG	

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



Test Mode: TX 2402 MHz \_CH00\_1Mbps

# Horizontal



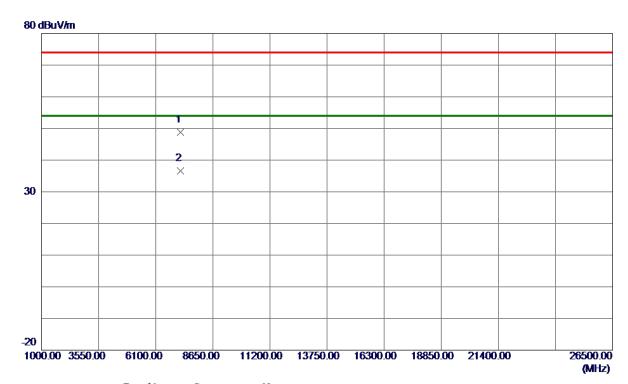
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2390.0000	39. 99	6. 89	46.88	74.00	-27. 12	Peak	
2	2390.0000	30.44	6. 89	37. 33	54.00	-16. 67	AVG	
3 *	2402.0000	93. 68	6. 88	100. 56	54.00	46. 56	AVG	No Limit
4	2402. 3000	95. 40	6.88	102. 28	74.00	28. 28	Peak	No Limit

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



Test Mode: TX 2402 MHz \_CH00\_1Mbps

# Horizontal



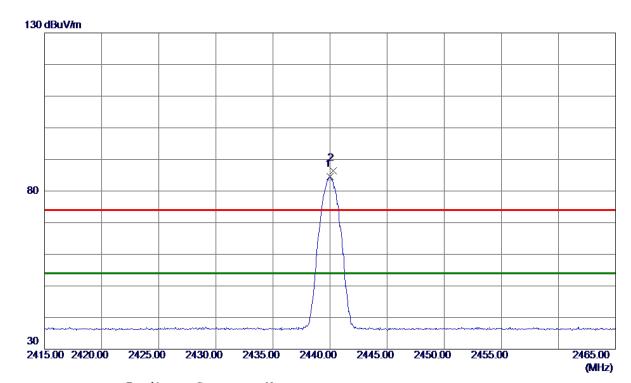
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	7205. 5100	39.65	9. 16	48.81	74.00	-25. 19	Peak	
2 *	7205. 6200	27. 52	9. 16	36. 68	54.00	-17.32	AVG	

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



TX 2440 MHz \_CH19\_1Mbps Test Mode:

# Vertical



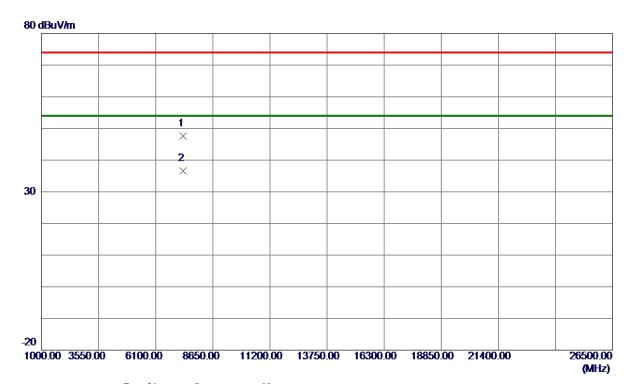
N	lo.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
		MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2440.0000	77. 69	6.84	84. 53	54.00	30. 53	AVG	No Limit
2		2440. 2500	79. 53	6.84	86. 37	74.00	12. 37	Peak	No Limit

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



Test Mode: TX 2440 MHz \_CH19\_1Mbps

# Vertical



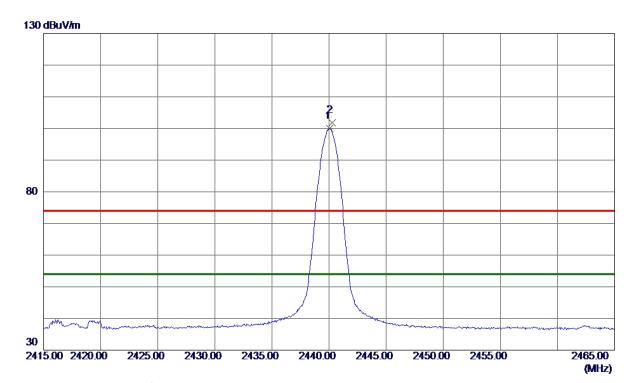
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	7318.8000	38. 24	9. 32	47. 56	74.00	-26.44	Peak	
2 *	7321. 3700	27. 33	9. 33	36. 66	54.00	<b>−17. 34</b>	AVG	

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



Test Mode: TX 2440 MHz \_CH19\_1Mbps

# Horizontal



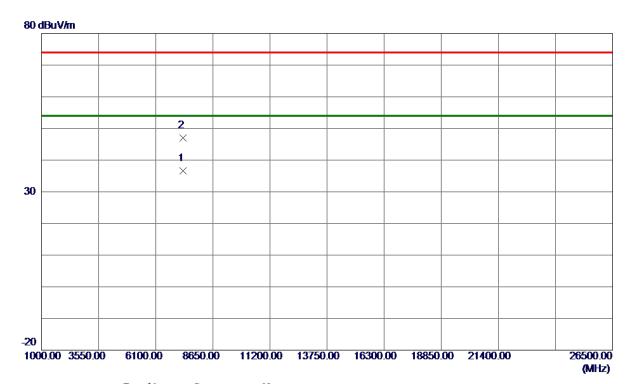
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	2440.0500	93. 11	6.84	99. 95	54.00	45.95	AVG	No Limit
2	2440. 2500	94. 90	6.84	101.74	74.00	27.74	Peak	No Limit

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



Test Mode: TX 2440 MHz \_CH19\_1Mbps

# Horizontal



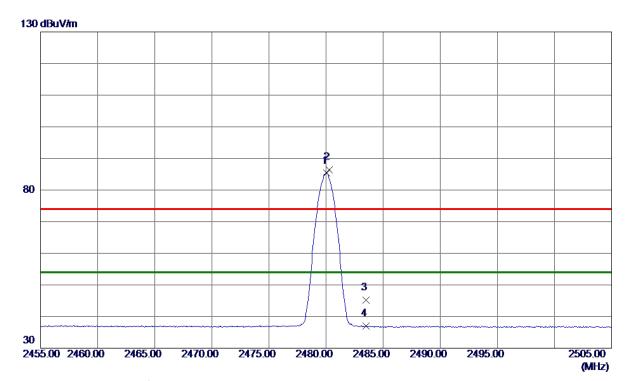
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	7316. 0300	27. 30	9. 32	36. 62	54.00	-17.38	AVG	
2	7324. 5000	37.67	9. 33	47.00	74.00	-27.00	Peak	

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



TX 2480 MHz \_CH39\_1Mbps Test Mode:

# Vertical



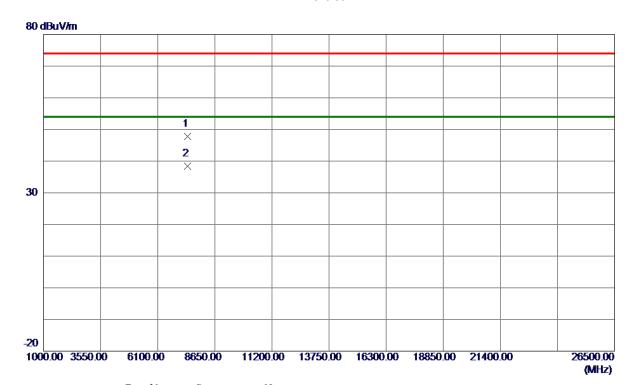
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	2480.0500	78. 50	6. 80	85. 30	54.00	31. 30	AVG	No Limit
2	2480. 2500	79.64	6. 80	86.44	74.00	12.44	Peak	No Limit
3	2483. 5000	38. 41	6. 79	45. 20	74.00	-28.80	Peak	
4	2483. 5000	30. 17	6. 79	36. 96	54.00	-17.04	AVG	

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



Test Mode: TX 2480 MHz \_CH39\_1Mbps

# Vertical



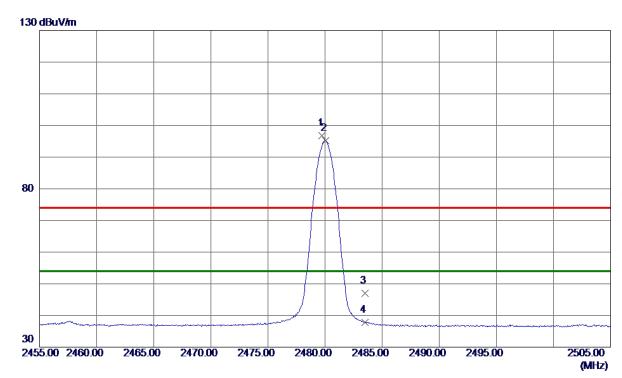
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	7436. 2200	38. 34	9.49	47.83	74.00	-26. 17	Peak	
2 *	7439. 3200	28. 85	9.49	38. 34	54.00	-15. 66	AVG	

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



Test Mode: TX 2480 MHz \_CH39\_1Mbps

# Horizontal



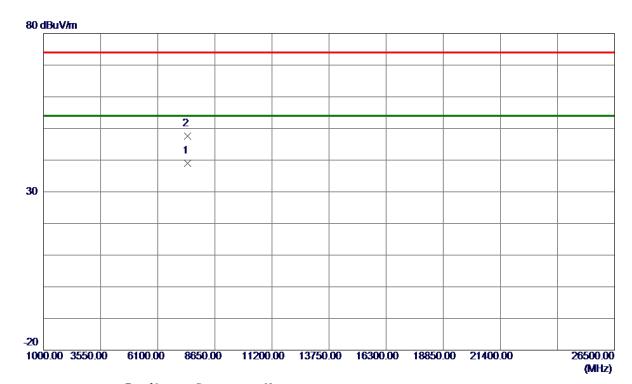
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2479.7500	90.04	6.80	96. 84	74.00	22.84	Peak	No Limit
2 *	2480.0500	88. 42	6.80	95. 22	54.00	41. 22	AVG	No Limit
3	2483. 5000	40. 27	6. 79	47.06	74.00	-26. 94	Peak	
4	2483. 5000	31. 07	6. 79	37.86	54.00	-16. 14	AVG	

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



Test Mode: TX 2480 MHz \_CH39\_1Mbps

# Horizontal



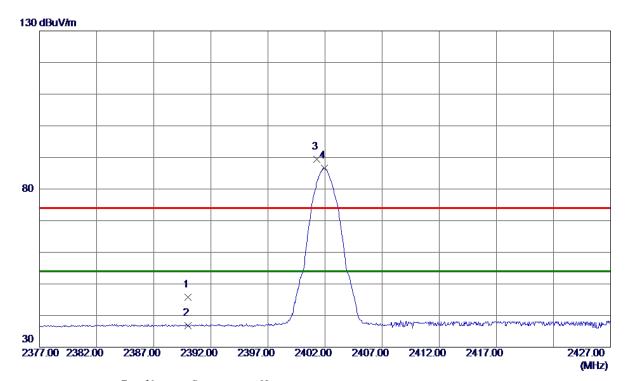
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	7440.6600	29. 59	9. 50	39. 09	54.00	-14.91	AVG	
2	7441. 2900	38. 11	9. 50	47.61	74.00	-26. 39	Peak	

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



Test Mode: TX 2402 MHz \_CH00\_2Mbps

## Vertical



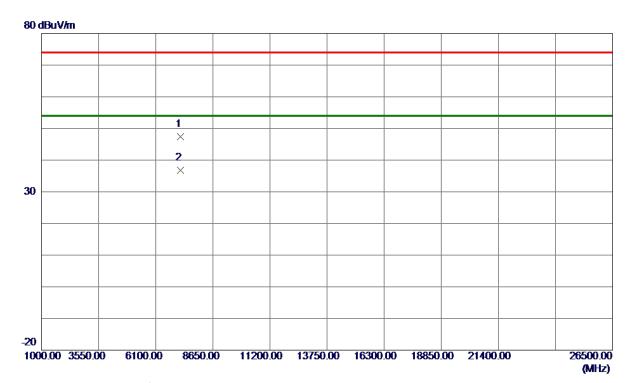
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2390.0000	38. 85	6. 89	45.74	74.00	-28. 26	Peak	
2	2390.0000	29. 91	6. 89	36. 80	54.00	-17. 20	AVG	
3	2401. 2800	82.48	6.88	89. 36	74.00	15. 36	Peak	No Limit
4 *	2401.9500	79. 72	6.88	86. 60	54.00	32.60	AVG	No Limit

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



Test Mode: TX 2402 MHz \_CH00\_2Mbps

# Vertical



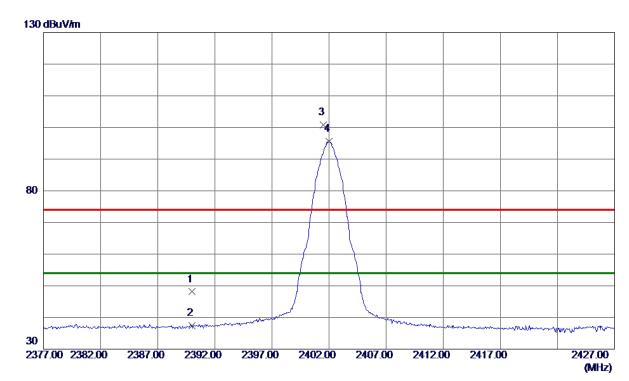
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	7205. 5600	38. 22	9. 16	47.38	74.00	-26.62	Peak	
2 *	7206. 0300	27. 62	9. 16	36. 78	54.00	-17. 22	AVG	

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



Test Mode: TX 2402 MHz \_CH00\_2Mbps

# Horizontal



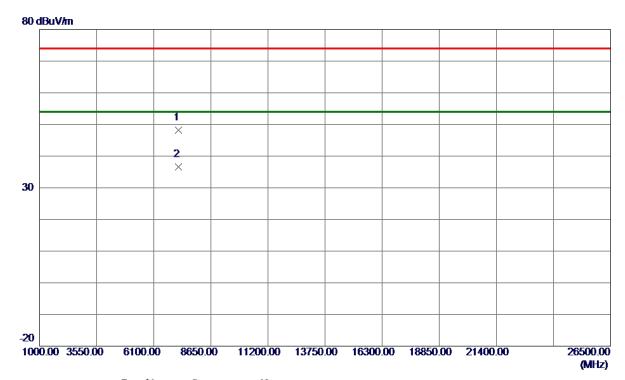
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2390.0000	41. 21	6. 89	48. 10	74.00	-25. 90	Peak	
2	2390.0000	30. 45	6. 89	37. 34	54.00	-16.66	AVG	
3	2401. 5000	93. 92	6. 88	100.80	74.00	26.80	Peak	No Limit
4 *	2402. 0000	88. 67	6. 88	95. 55	54.00	41.55	AVG	No Limit

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



Test Mode: TX 2402 MHz \_CH00\_2Mbps

# Horizontal



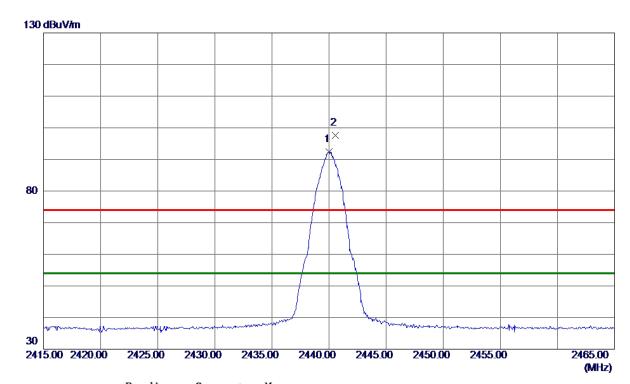
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	7203.8900	38. 99	9. 16	48. 15	74.00	-25.85	Peak	
2 *	7204. 1700	27.40	9. 16	36. 56	54.00	-17.44	AVG	

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



TX 2440 MHz \_CH19\_2Mbps Test Mode:

# Vertical



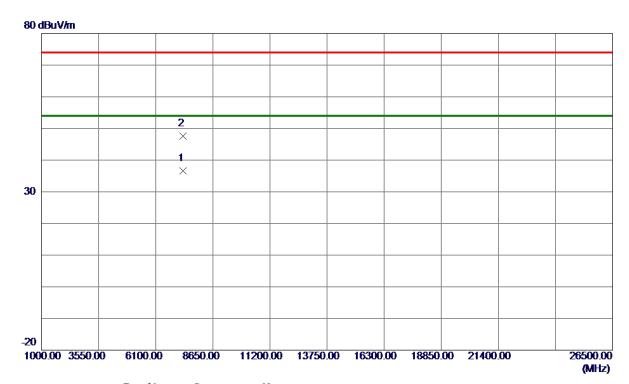
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	2440.0000	85. 59	6.84	92.43	54.00	38.43	AVG	No Limit
2	2440. 5500	90. 84	6. 84	97.68	74.00	23.68	Peak	No Limit

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



Test Mode: TX 2440 MHz \_CH19\_2Mbps

# Vertical



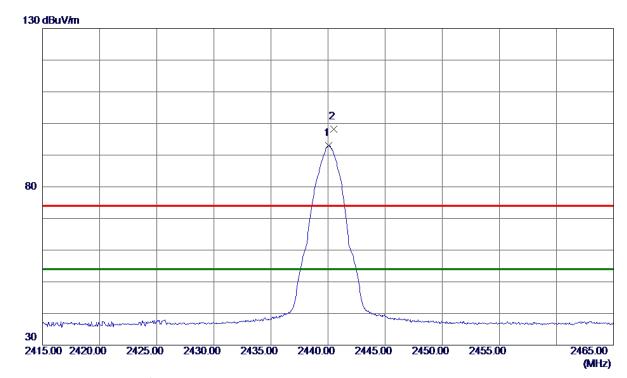
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	7315. 2700	27. 30	9. 32	36. 62	54.00	-17. 38	AVG	
2	7320. 3800	38. 27	9. 32	47. 59	74.00	-26. 41	Peak	

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



Test Mode: TX 2440 MHz \_CH19\_2Mbps

# Horizontal



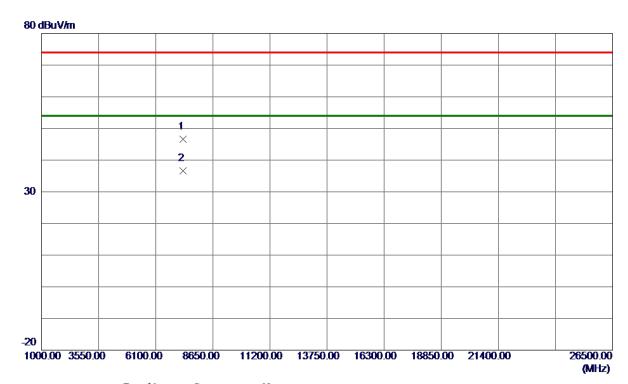
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	2440.0500	86. 16	6.84	93.00	54.00	39.00	AVG	No Limit
2	2440. 5000	91. 33	6. 84	98. 17	74.00	24. 17	Peak	No Limit

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



Test Mode: TX 2440 MHz \_CH19\_2Mbps

# Horizontal



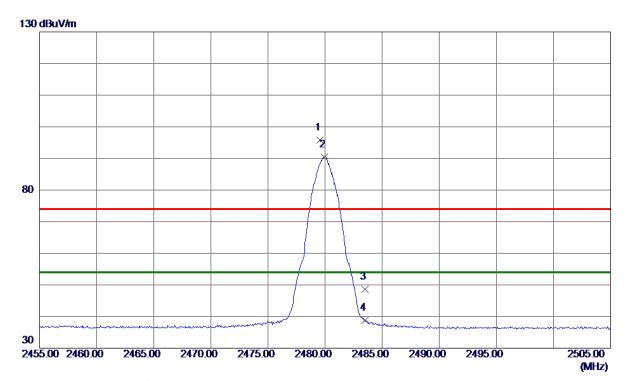
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	7315.0000	37. 35	9. 32	46. 67	74.00	-27. 33	Peak	
2 *	7315. 3300	27. 27	9. 32	36. 59	54.00	-17.41	AVG	

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



TX 2480 MHz \_CH39\_2Mbps Test Mode:

# Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2479. 5500	88. 92	6.80	95. 72	74.00	21.72	Peak	No Limit
2 *	2479.9500	83.64	6.80	90.44	54.00	36. 44	AVG	No Limit
3	2483. 5000	41.88	6. 79	48. 67	74.00	-25. 33	Peak	
4	2483. 5000	31. 98	6. 79	38. 77	54.00	-15. 23	AVG	

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



Test Mode: TX 2480 MHz \_CH39\_2Mbps

# Vertical



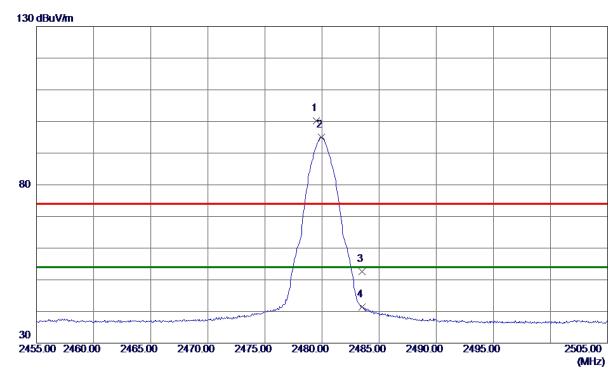
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	7438.7700	37.97	9.49	47.46	74.00	-26. 54	Peak	
2 *	7441. 2000	29. 37	9. 50	38. 87	54.00	-15. 13	AVG	

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



Test Mode: TX 2480 MHz \_CH39\_2Mbps

# Horizontal



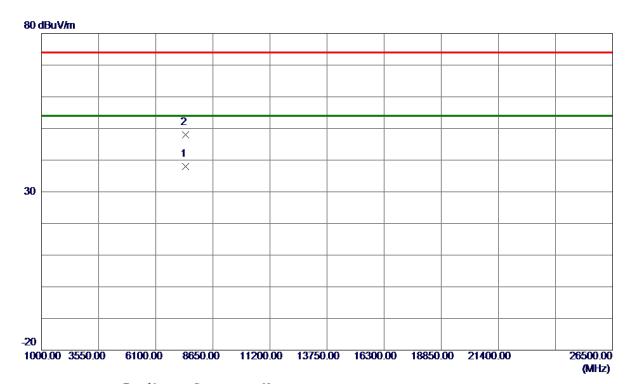
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2479. 5000	93. 47	6.80	100. 27	74.00	26. 27	Peak	No Limit
2 *	2479.9500	88. 27	6.80	95. 07	54.00	41.07	AVG	No Limit
3	2483. 5000	45. 73	6. 79	52. 52	74.00	-21.48	Peak	
4	2483. 5000	34. 52	6. 79	41. 31	54.00	-12.69	AVG	

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



Test Mode: TX 2480 MHz \_CH39\_2Mbps

# Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	7441. 1000	28. 45	9. 50	37. 95	54.00	-16.05	AVG	
2	7441. 7800	38. 44	9. 50	47.94	74.00	-26.06	Peak	

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

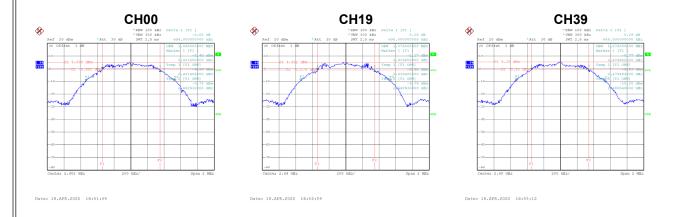


APPENDIX E - BANDWIDTH				



Test Mode: CH00, CH19, CH39 - 1Mbps

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Emission Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Test Result
00	2402	0.694	1.068	500	Pass
19	2440	0.690	1.076	500	Pass
39	2480	0.688	1.076	500	Pass



Test Mode: CH00, CH19, CH39 - 2Mbps

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Emission Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Test Result
00	2402	1.090	2.048	500	Pass
19	2440	1.080	2.048	500	Pass
39	2480	1.088	2.096	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	4.98	0.0031	30.00	1.00	Pass
2440	5.03	0.0032	30.00	1.00	Pass
2480	5.09	0.0032	30.00	1.00	Pass

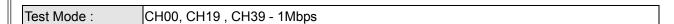
Test Mode: CH00, CH19, CH39 - 2Mbps

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	5.04	0.0032	30.00	1.00	Pass
2440	5.15	0.0033	30.00	1.00	Pass
2480	5.21	0.0033	30.00	1.00	Pass

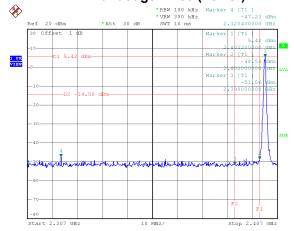


# **APPENDIX G - CONDUCTED SPURIOUS EMISSION**

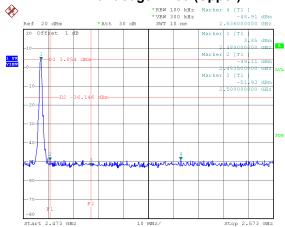




# Bandedge CH00 (Lower)

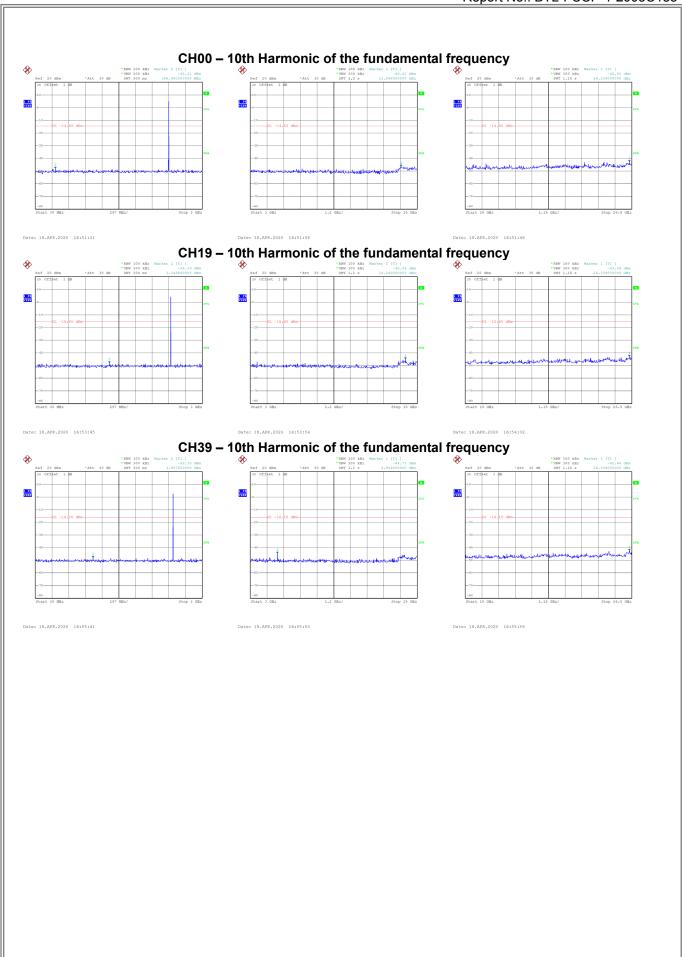


# Bandedge CH39 (Upper)

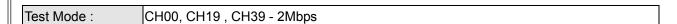


Date: 18.APR.2020 16:51:17 Date: 18.APR.2020 16:55:27

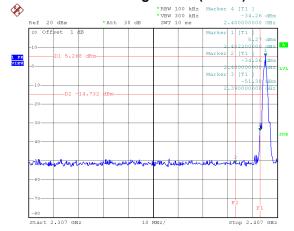




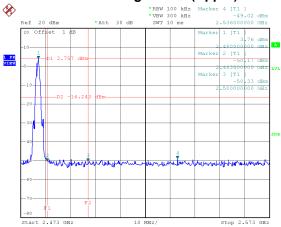




# Bandedge CH00 (Lower)

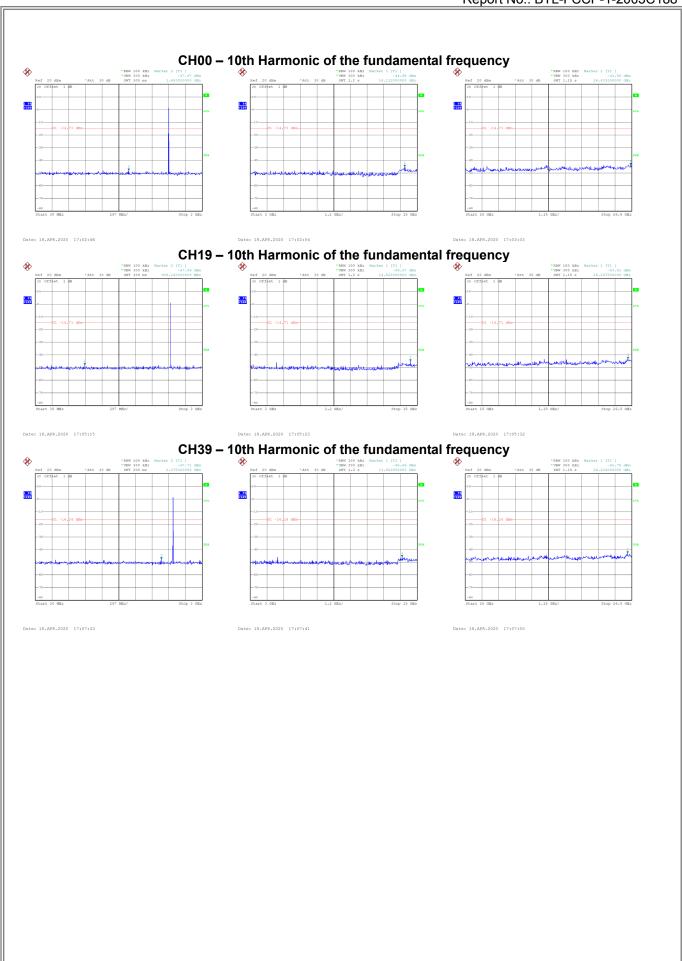


# Bandedge CH39 (Upper)



Date: 18.APR.2020 17:02:31 Date: 18.APR.2020 17:07:19







# **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	-9.31	8.00	Pass
19	2440	-10.08	8.00	Pass
39	2480	-7.25	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	-12.12	8.00	Pass
19	2440	-11.55	8.00	Pass
39	2480	-12.69	8.00	Pass

