

FCC Radio Test Report

FCC ID: RWO-RZ090310

This report concerns: ☒ Class II Change

Project No. : 2001C133
Equipment : Notebook
Brand Name : RAZER
Test Model : RZ09-0328
Series Model : N/A
Applicant : Razer Inc.
Address : 9 Pasteur, Suite 100, Irvine, CA92618, USA.
Manufacturer : Razer Inc.
Address : 9 Pasteur, Suite 100, Irvine, CA92618, USA.
Date of Receipt : Jan. 21, 2020
Date of Test : Feb. 17, 2020 ~ Apr. 08, 2020
Issued Date : Apr. 08, 2020
Report Version : R00
Test Sample : Engineering Sample No.: DG2020012240
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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Certificate #5123.02

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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).

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

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

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

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Apr. 08, 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	-----	PASS	-----
15.247(d) 15.205(a) 15.209(a)	Radiated Emission	Appendix A Appendix B	PASS	-----
15.247 (a)(1)(iii)	Number of Hopping Frequency	-----	PASS	-----
15.247 (a)(1)(iii)	Average Time Of Occupancy	-----	PASS	-----
15.247(a)(1)	Hopping Channel Separation	-----	PASS	-----
15.247(a)(1)	Bandwidth	-----	PASS	-----
15.247(a)(1)	Maximum Output Power	-----	PASS	-----
15.247(d)	Conducted Spurious Emission	-----	PASS	-----
15.203	Antenna Requirement	-----	PASS	Note(2)

Note:

- (1) "N/A" denotes test is not applicable in this test report
- (2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.
- (3) In this report only the radiated spurious emissions were evaluated and recorded. For the test results of all other test items please refer to module test report.

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. Radiated emissions test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
DG-CB03	CISPR	9kHz ~ 30MHz	V	3.79
		9kHz ~ 30MHz	H	3.57
		30MHz ~ 200MHz	V	4.88
		30MHz ~ 200MHz	H	4.14
		200MHz ~ 1,000MHz	V	4.62
		200MHz ~ 1,000MHz	H	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
Radiated Emissions-30 MHz to 1GHz	24°C	68%	AC120V/60Hz	Kwok Guo
Radiated Emissions-Above 1000 MHz	24°C	68%	AC120V/60Hz	Kwok Guo

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Notebook
Brand Name	RAZER
Test Model	RZ09-0328
Series Model	N/A
Model Difference(s)	N/A
Hardware Version	DA550-MB
Software Version	Windows 10
Power Source	1# DC Voltage supplied from AC/DC adapter. Brand / Model: RAZER / RC30-024801 2# Supplied from Li-ion battery Brand / Model: RAZER / RC30-0328
Power Rating	1# I/P: 100-240V~ 3.6A 50/60Hz O/P: 19.5V --- 11.8A 2# DC 15.4V, 4221mAh, 65Wh
Operation Frequency	2402 MHz ~ 2480 MHz
Modulation Technology	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Bit Rate of Transmitter	1 Mbps, 2 Mbps, 3Mbps


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)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

3. Table for Filed Antenna:

Ant.	Brand	P/N	Antenna Type	Connector	Gain (dBi)
1		BY5810-16-001-C	PIFA	N/A	3.69

Note: Ant 1 refers to main antenna.

2.2 DESCRIPTION OF TEST MODES

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

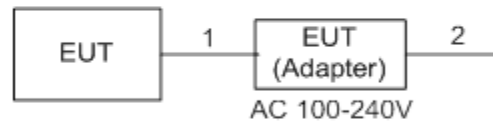
Pretest Mode	Description
Mode 1	TX Mode Channel 78_1Mbps

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

Radiated emissions test - Below 1GHz	
Final Test Mode	Description
Mode 1	TX Mode Channel 78_1Mbps

Radiated emissions test - Above 1GHz	
Final Test Mode	Description
Mode 1	TX Mode Channel 78_1Mbps

2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.4 SUPPORT UNITS

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.
-	-	-	-	-

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	2m
2	AC Cable	NO	NO	1m

3. RADIATED EMISSION TEST

3.1 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 (30 MHz -1000 MHz)

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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000 MHz)

Frequency (MHz)	(dBuV/m at 3 m)	
	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 (Emission in restricted band)	RBW 1 MHz VBW 3 MHz peak detector for Pk value 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

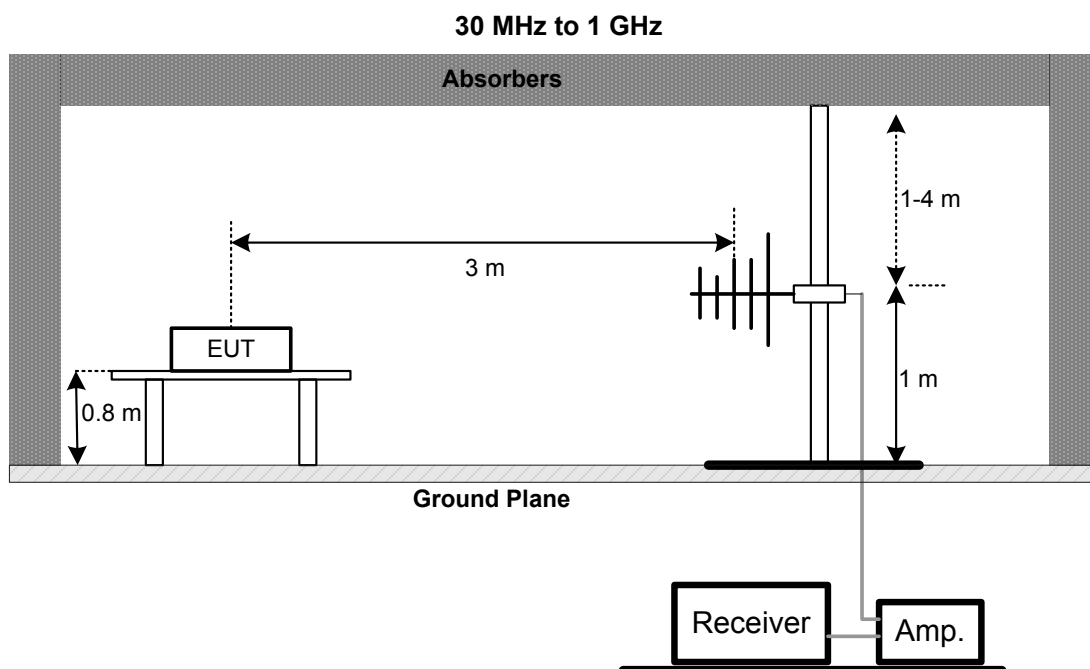
3.2 TEST PROCEDURE

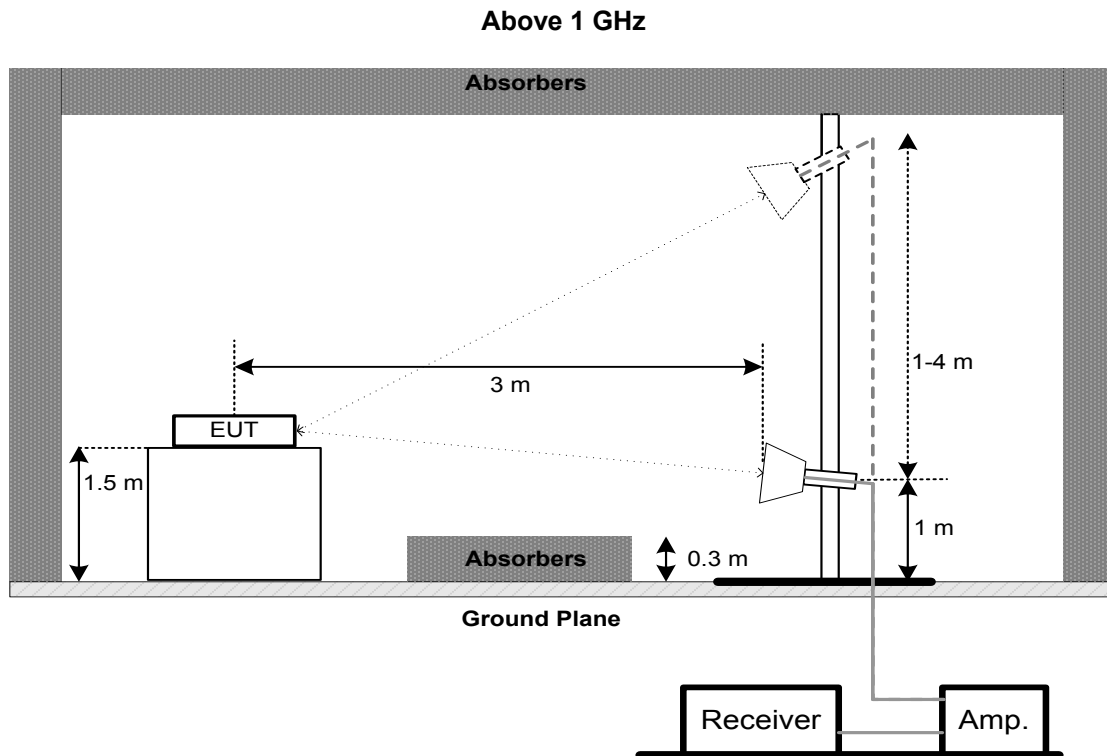
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- The measuring distance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

3.6 TEST RESULTS - 30 MHz TO 1000 MHz

Please refer to the APPENDIX A.

3.7 TEST RESULTS - ABOVE 1000 MHz

Please refer to the APPENDIX B.

Remark:

- (1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

4. MEASUREMENT INSTRUMENTS LIST

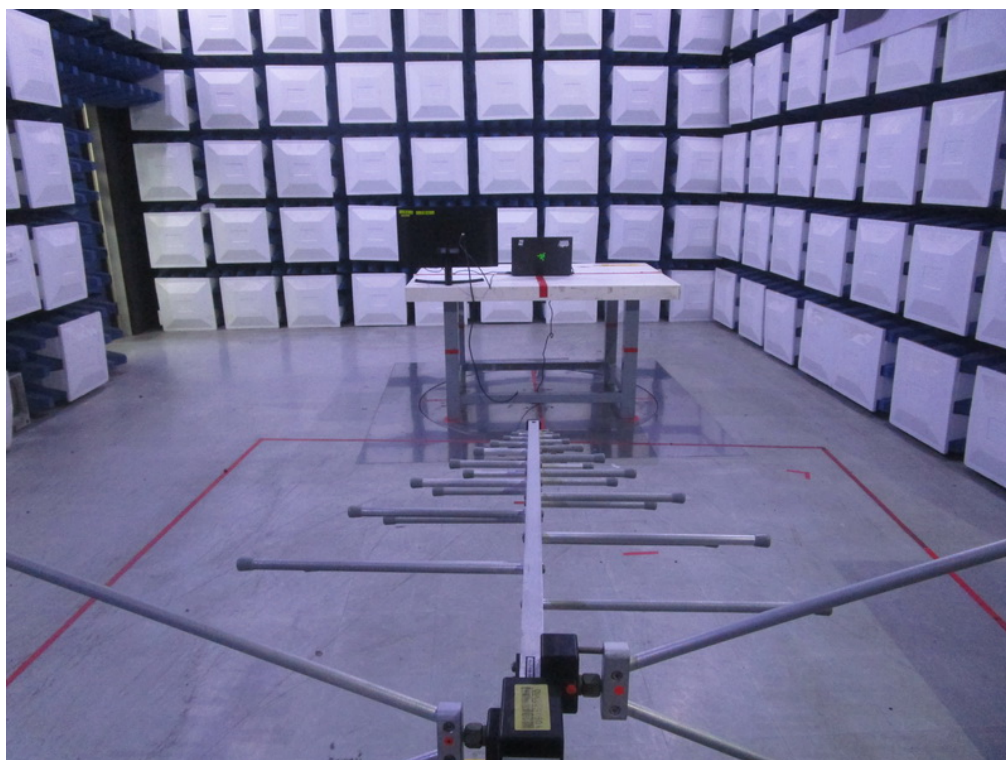
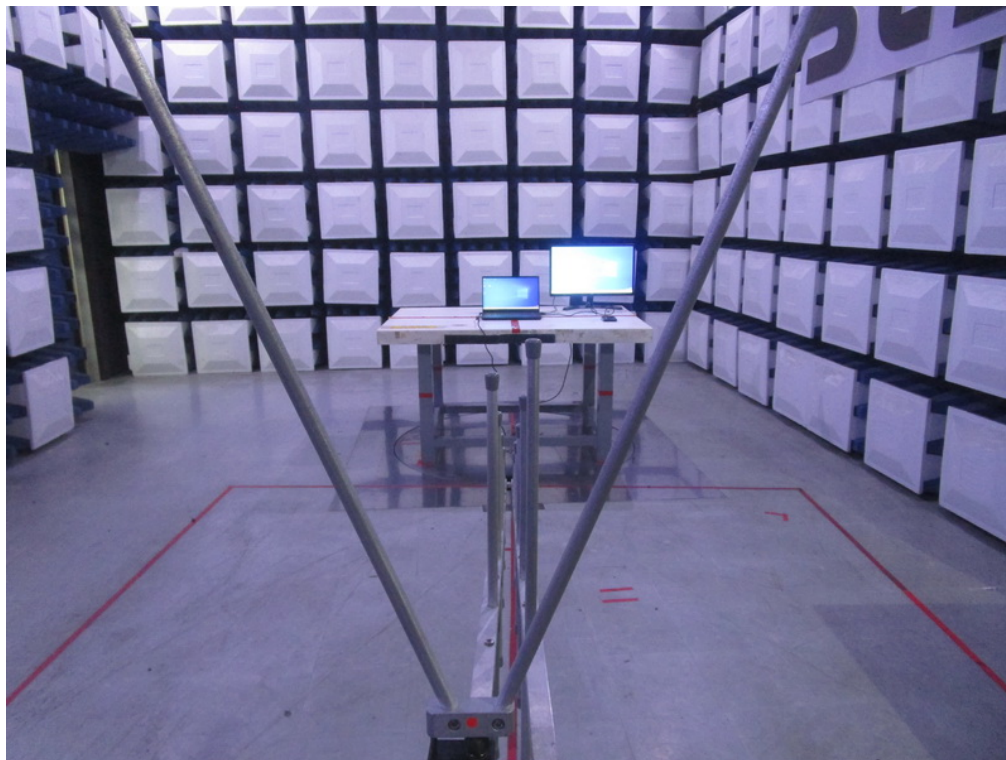
Radiated Emissions - 30 MHz to 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 09, 2021
2*	Amplifier	HP	8447D	2944A08742	Mar. 01, 2021
3	Receiver	Agilent	N9038A	MY52130039	Aug. 03, 2020
4	Cable	emci	LMR-400(30MHz-1 GHz)(8m+5m)	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

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.

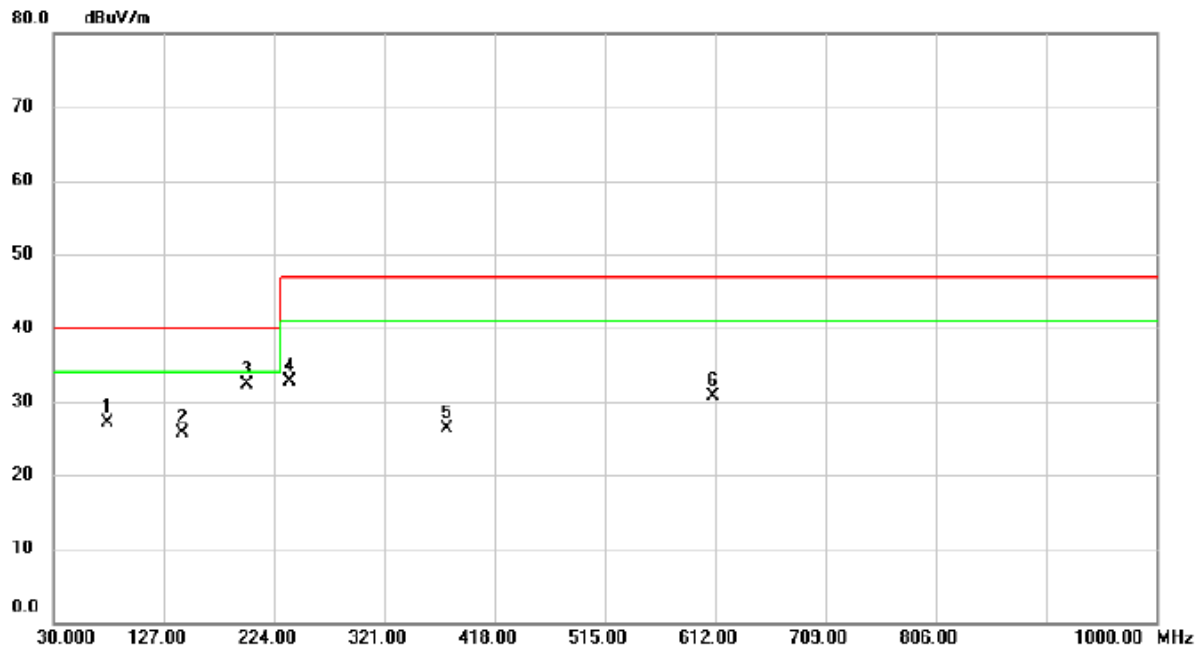
5. EUT TEST PHOTO**Radiated Emissions Test Photos****30 MHz to 1000 MHz**

Radiated Emissions Test Photos**Above 1 GHz**

APPENDIX A - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

Test Mode: TX Mode Channel 78_1Mbps

Vertical



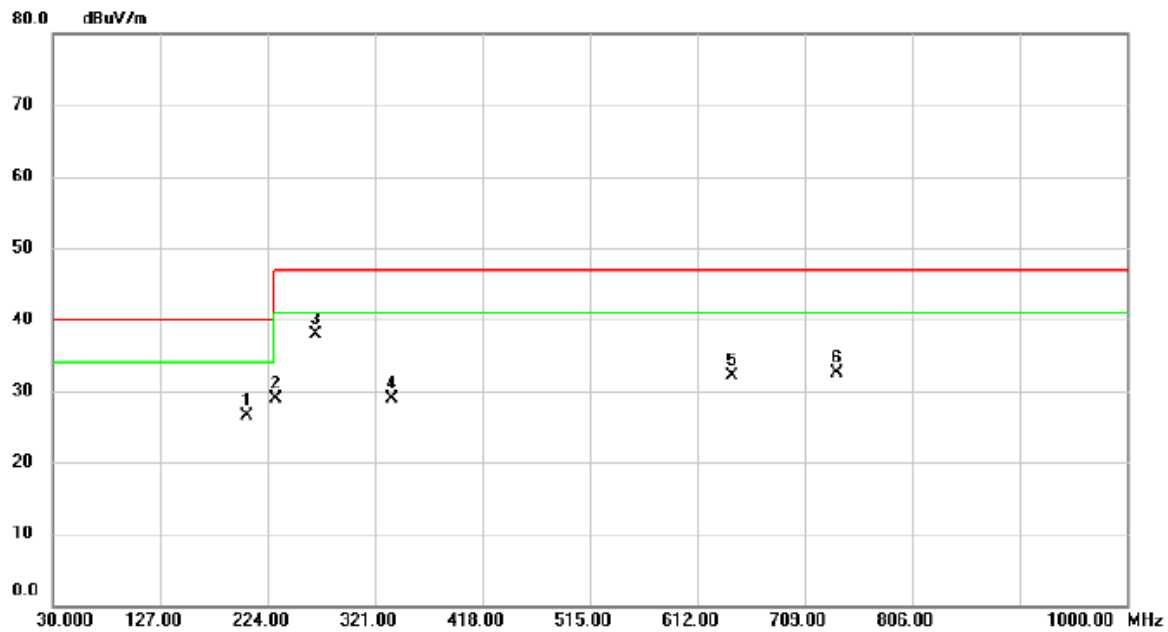
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		77.530	37.92	-10.72	27.20	40.00	-12.80	peak	
2		142.520	32.63	-6.98	25.65	40.00	-14.35	peak	
3	*	199.750	41.13	-8.84	32.29	40.00	-7.71	peak	
4		237.580	40.67	-7.98	32.69	47.00	-14.31	peak	
5		375.320	30.18	-3.86	26.32	47.00	-20.68	peak	
6		610.060	30.34	0.38	30.72	47.00	-16.28	peak	

REMARKS:

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

Test Mode: TX Mode Channel 78_1Mbps

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		204.600	35.22	-8.81	26.41	40.00	-13.59	peak	
2		230.790	37.32	-8.42	28.90	47.00	-18.10	peak	
3	*	267.650	44.49	-6.60	37.89	47.00	-9.11	peak	
4		335.550	33.65	-4.83	28.82	47.00	-18.18	peak	
5		643.040	31.14	0.93	32.07	47.00	-14.93	peak	
6		738.100	30.50	2.08	32.58	47.00	-14.42	peak	

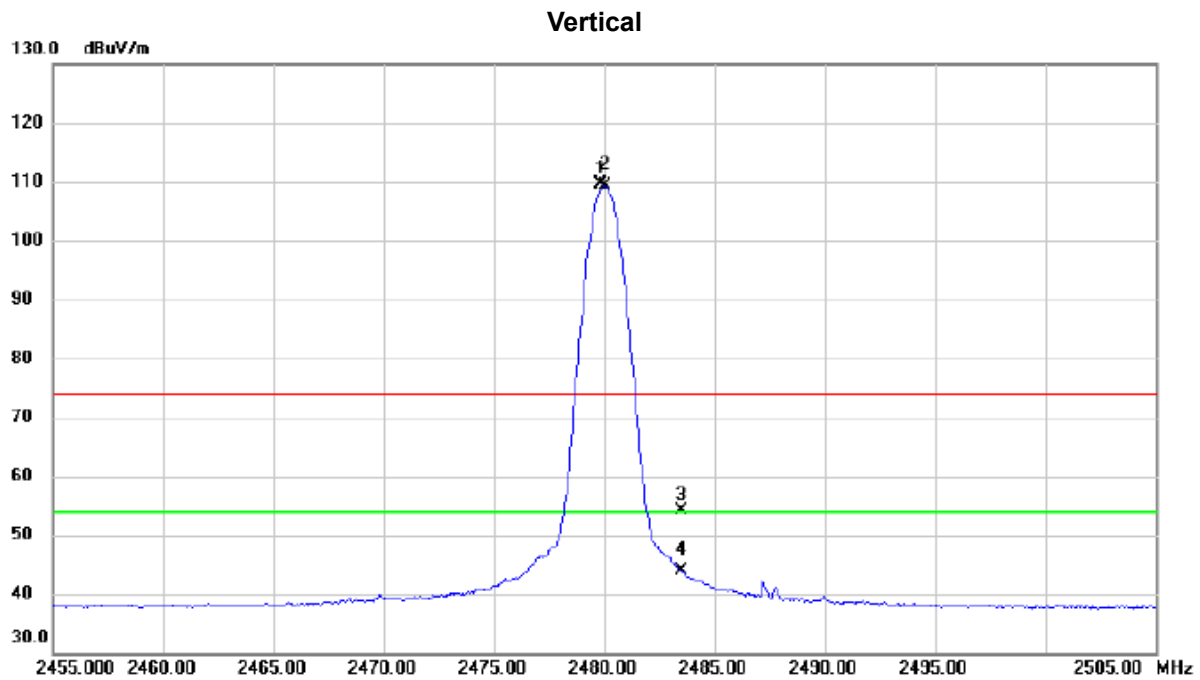
REMARKS:

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

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

APPENDIX B - RADIATED EMISSION - ABOVE 1000 MHZ

Test Mode: TX Mode Channel 78_1Mbps



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	X	2479.850	100.55	9.02	109.57	74.00	35.57	peak	No Limit
2	*	2480.050	100.30	9.02	109.32	54.00	55.32	AVG	No Limit
3		2483.500	45.11	9.02	54.13	74.00	-19.87	peak	
4		2483.500	34.93	9.02	43.95	54.00	-10.05	AVG	

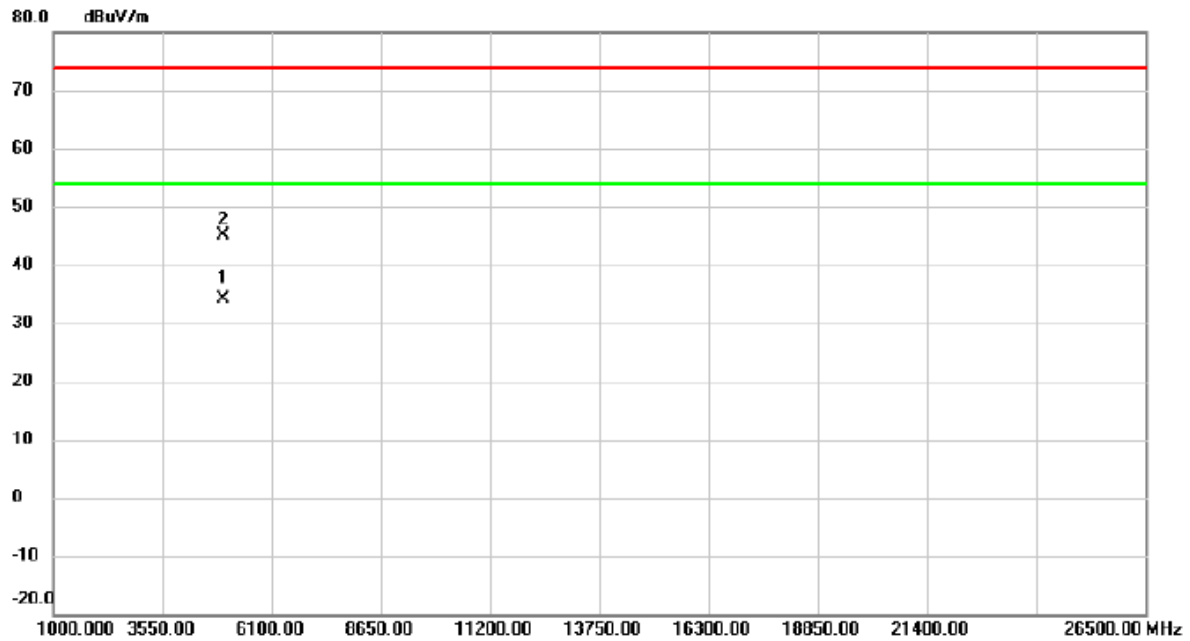
REMARKS:

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

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

Test Mode:	TX Mode Channel 78_1Mbps
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Vertical



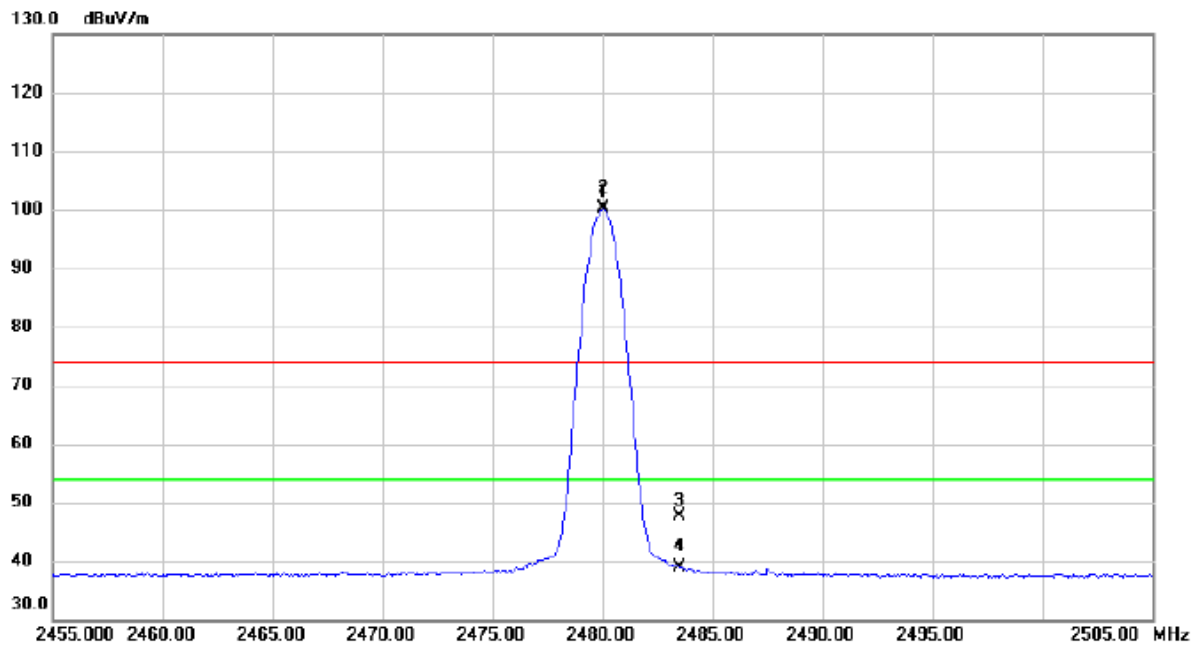
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4957.915	25.64	8.49	34.13	54.00	-19.87	AVG	
2		4958.285	36.58	8.49	45.07	74.00	-28.93	peak	

REMARKS:

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

Test Mode: TX Mode Channel 78_1Mbps

Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	X	2480.000	91.26	9.02	100.28	74.00	26.28	peak	No Limit
2	*	2480.000	91.00	9.02	100.02	54.00	46.02	AVG	No Limit
3		2483.500	38.66	9.02	47.68	74.00	-26.32	peak	
4		2483.500	29.94	9.02	38.96	54.00	-15.04	AVG	

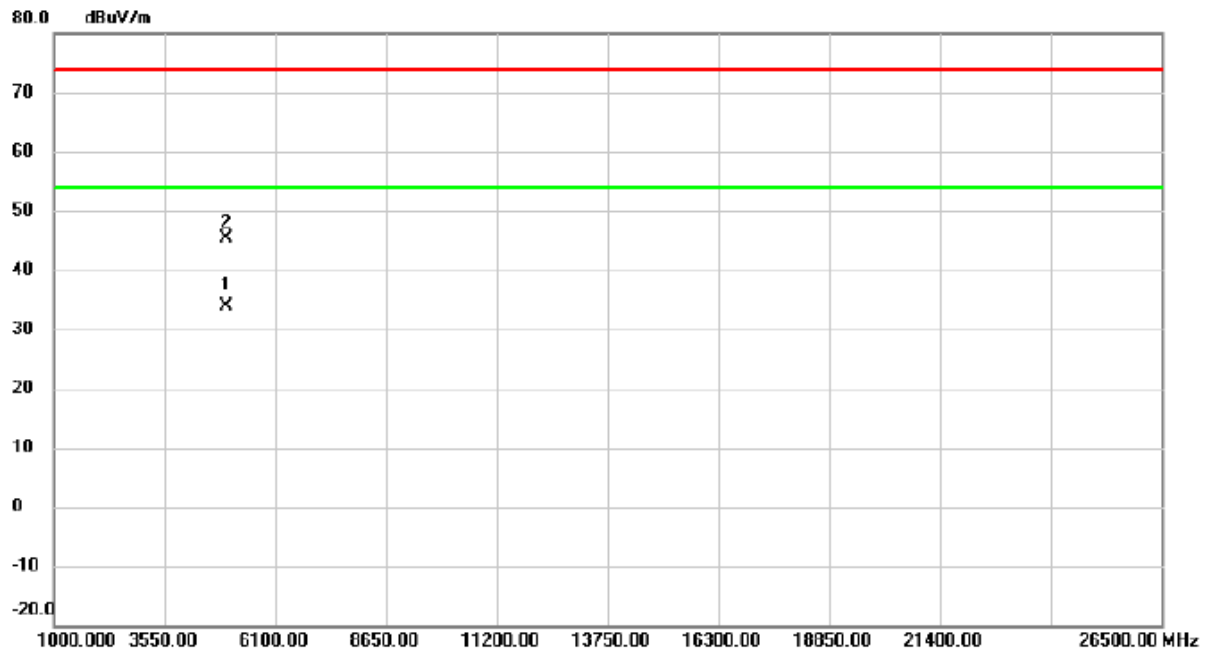
REMARKS:

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

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

Test Mode: TX Mode Channel 78_1Mbps

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4957.610	25.47	8.49	33.96	54.00	-20.04	AVG	
2		4961.035	36.88	8.50	45.38	74.00	-28.62	peak	

REMARKS:

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

End of Test Report