Certificate #7130.01

FCC Radio Test Report

FCC ID: RWO-RZ020493

This report concerns: Original Grant

Project No.	:	2409C254
Equipment	:	GAMING MOUSE MAT
Brand Name	:	RAZER,
Test Model	:	RZ02-0493
Series Model	:	RZ02-0493XXXX-XXXX(X can be 0-9 or A-Z)
Applicant	:	Razer Inc.
Address	:	9 Pasteur, Suite 100, Irvine, CA92618, USA
Manufacturer	:	RAZER (ASIA-PACIFIC) PTE. LTD.
Address	:	Razer SEA HQ, 1 One-north Crescent, #02-01, Singapore 138538
Factory	:	RAZER TECHNOLOGY AND DEVELOPMENT (SHENZHEN)CO., LTD
Address	:	East Wing, 3rd Floor, Block 2, Phase 1 of Vision ShenzhenBusiness Park Keji South Road, Hi-Tech IndustrialPark, Shenzhen 518057, China
Date of Receipt	:	Oct. 11, 2024
Date of Test	:	Oct. 11, 2024 ~ Dec. 27, 2024
Issued Date	:	Jan. 06, 2025
Report Version	:	R00
Test Sample	:	Engineering Sample No.: DG2024101117 for conducted, DG2024101118 for radiated.
Standard(s)	:	FCC CFR Title 47, Part 15, Subpart C

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

Prepared by : Evan Yang

Evan Yang

Approved by : Chay Cai

Chay Cai

Room 108-116, 309-310, Building 2, No.1, Yile Road, Songshan Lake Zone, Dongguan City, Guangdong, People's Republic of China.

Tel: +86-769-8318-3000 Web: www.newbtl.com Service mail: btl_qa@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 assumes no responsibility for the data provided by the customer, any statements, inferences or generalizations drawn by the customer or others from the reports issued by BTL.

The report must not be used by the client to claim product certification, approval, or endorsement by 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: 2017 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 No.	Version	Description	Issued Date	Note
BTL-FCCP-1-2409C254	R00	Original Report.	Jan. 06, 2025	Valid

1. APPLICABLE STANDARDS

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:
ANSI C63.10-2013
The following reference test guidance is not within the scope of accreditation of A2LA:
KDB 558074 D01 15.247 Meas Guidance v05r02

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC CFR Title 47, Part 15, Subpart C				
Standard(s) Section	**Test Item**	**Test Result**	**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.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of 1-2/F, 4/F, Building A, 1-2/F, Building B, 3/F, Building C, No.3, Jinshagang 1st Road, Dalang Town, Dongguan City, Guangdong People's Republic of China.
BTL's Registration Number for FCC: 747969
BTL's Designation Number for FCC: CN1377

2.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95.45% 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	2.88

B. Radiated emissions Measurement:

Test Site	Method	Measurement Frequency Range	*U*,(dB)
DG-CB01	CISPR	9kHz ~ 30MHz	2.70

Test Site	Method	Measurement Frequency Range	Ant. H / V	*U*,(dB)
DG-CB01 (3m)	CISPR	30MHz ~ 200MHz	V	4.92
		30MHz ~ 200MHz	H	3.94
		200MHz ~ 1,000MHz	V	4.60
		200MHz ~ 1,000MHz	H	4.32

Test Site	Method	Measurement Frequency Range	*U*,(dB)
DG-CB01 (3m)	CISPR	1GHz ~ 6GHz	4.56
		6GHz ~ 18GHz	4.70

Test Site	Method	Measurement Frequency Range	*U*,(dB)
DG-CB01 (1m)	CISPR	18 ~ 26.5 GHz	3.36

C. Other Measurement:

Test Item	Uncertainty
Bandwidth	0.90 %
Maximum Output Power	1.3 dB
Conducted Spurious Emission	1.9 dB
Power Spectral Density	1.4 dB
Temperature	0.8 °C
Humidity	2.2 %

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

2.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By	Test Date
AC Power Line Conducted Emissions	25°C	48%	AC 120V/60Hz	Hayden Chen	Nov. 11, 2024
Radiated Emissions -9 kHz to 30 MHz	26°C	47%	DC 5V	Hayden Chen	Dec. 20, 2024
Radiated Emissions -30 MHz to 1000 MHz	22°C	52%	DC 5V	Calvin Wen	Oct. 20, 2024
Radiated Emissions -Above 1000 MHz	20°C	51%	DC 5V	Calvin Wen	Oct. 20, 2024
	20°C	49%	DC 5V	Calvin Wen	Oct. 21, 2024
	21°C	50%	DC 5V	Calvin Wen	Oct. 22, 2024
Bandwidth	23°C	56%	DC 5V	Parker Yang	Oct. 18, 2024
Maximum Output Power	23°C	56%	DC 5V	Parker Yang	Oct. 18, 2024
Conducted Spurious Emission	23°C	56%	DC 5V	Parker Yang	Oct. 18, 2024
Power Spectral Density	23°C	56%	DC 5V	Parker Yang	Oct. 18, 2024

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	GAMING MOUSE MAT
Brand Name	RAZER,
Test Model	RZ02-0493
Series Model	RZ02-0493XXXX-XXXX(X can be 0-9 or A-Z)
Model Difference(s)	Only differ in the model name.
Hardware Version	A1
Software Version	1.00.09
Power Source	Supplied from Type-C port.
Power Rating	5V ⎓ 1.5A
Operation Frequency	2402 MHz ~ 2480 MHz
Modulation Type	GFSK
Bit Rate of Transmitter	2Mbps
Max. Output Power	2Mbps: 4.21 dBm (0.0026 W)

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. The system model number is RZ02-0493XXXX-XXXX.This system consists of GAMING MOUSE MAT (Model:RZ02-0493).

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	Model Name	Antenna Type	Connector	Gain (dBi)
1	RAZER	RZ02-0493	PCB	N/A	4.48

3.2 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_2Mbps Channel 00/39/78
Mode 2	TX Mode_2Mbps Channel 00

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_2Mbps Channel 00

Radiated emissions test - Below 1GHz	
Final Test Mode	Description
Mode 2	TX Mode_2Mbps Channel 00

Radiated emissions test - Above 1GHz	
Final Test Mode	Description
Mode 1	TX Mode_2Mbps Channel 00/39/78

Conducted test	
Final Test Mode	Description
Mode 1	TX Mode_2Mbps Channel 00/39/78

Note:

(1) For radiated emission above 1 GHz test, the spurious points of 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) For AC power line conducted emissions and radiated emissions below 1 GHz test, the 2Mbps Channel 00 is found to be the worst case and recorded.

(3) For radiated emission Harmonic 18-26.5GHz test, only tested the worst case and recorded.

(4) For radiated emission above 1 GHz of Harmonic test: The polarization of Vertical and Horizontal are evaluated, the worst case is Vertical and recorded.

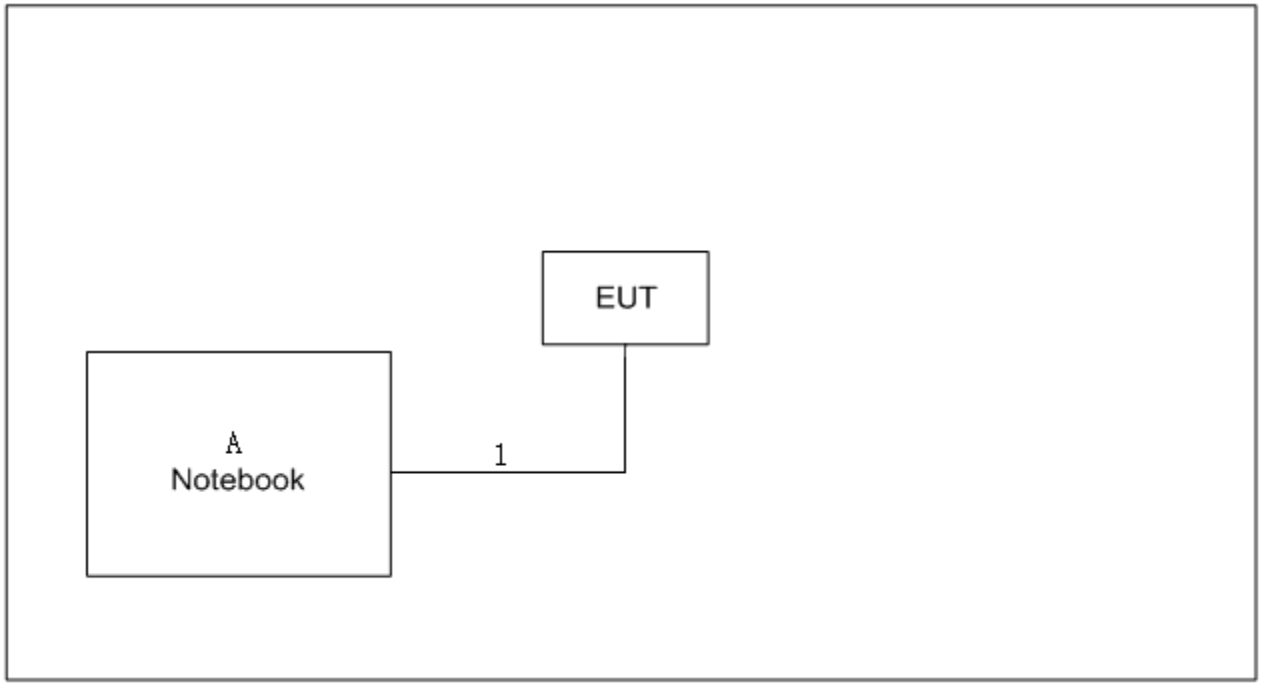
(5) For radiated emission above 1 GHz of Bandedge test: The polarization of Vertical and Horizontal are evaluated, the worst case is Horizontal and recorded.

3.3 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.

Test Software Version	FCCMTKTest_v1.05.02		
Frequency (MHz)	2402	2441	2480
2Mbps	4	4	4

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.5 SUPPORT UNITS

For AC power line conducted emissions test and Radiated Below 30MHz:

Item	Equipment	Brand	Model No.	Series No.
A	Notebook	HONOR	NBLK-WAX9X	N/A

For Radited Above 30MHz:

Item	Equipment	Brand	Model No.	Series No.
A	Notebook	HUAWEI	WFH9	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	USB Cable	NO	NO	1.5m

3.6 CUSTOMER INFORMATION DESCRIPTION

1) The antenna gain is provided by the manufacturer.
2) Except for AC power line conducted emissions and radiated emissions, the results of all test items include cable losses. Part of the cable losses (1dB) are provided by the manufacturer, while the other parts of the cable losses are provided by the testing laboratory.

4. AC POWER LINE CONDUCTED EMISSIONS

4.1 LIMIT

Frequency of Emission (MHz)	Limit (dBμV)	
	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.

4.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

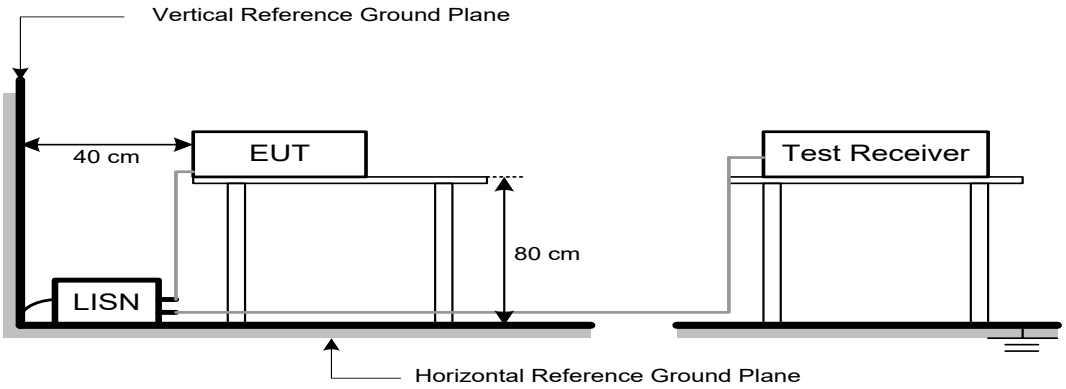
The following table is the setting of the receiver:

Receiver Parameters	Setting
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

4.3 DEVIATION FROM TEST STANDARD

No deviation.

4.4 TEST SETUP



4.5 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.

4.6 TEST RESULTS

Please refer to the APPENDIX A.

Remark:

(1) All readings are QP Mode value unless otherwise stated AVG in column of『Note』. 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.

5. RADIATED EMISSIONS

5.1 LIMIT

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-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)	Band edge/ Harmonic at 3m (dBµV/m)		Harmonic at 1m (dBµV/m)	
	Peak	Average	Peak	Average
Above 1000	74	54	83.5 (Note 5)	63.5 (Note 5)

Note:

(1) The limit for radiated test was performed according to FCC CFR Title 47, Part 15, Subpart C.

(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

(5)

$$FS_{\text{limit}} = FS_{\max} - 20\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right)$$

$20\log (d_{limit}/d_{measure})=20\log (3/1)=9.5$ dB.
FS_{limit}: Harmonic at 3m Peak and Average limit.
FS_{max}: Harmonic at 1m Peak and Average Maximum value.
d_{limit}: Harmonic at 3m test distance.
$d_{measure}$: Harmonic Actual test distance.

5.2 TEST PROCEDURE

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

The following table is the setting of the receiver:

Spectrum Parameters	Setting
Start ~ Stop Frequency	9 kHz~150 kHz for RBW 200 Hz
Start ~ Stop Frequency	0.15 MHz~30 MHz for RBW 9 kHz
Start ~ Stop Frequency	30 MHz~1000 MHz for RBW 100 kHz

Spectrum Parameters	Setting
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1 MHz / 3 MHz for PK value 1 MHz / 1/T Hz for AVG value

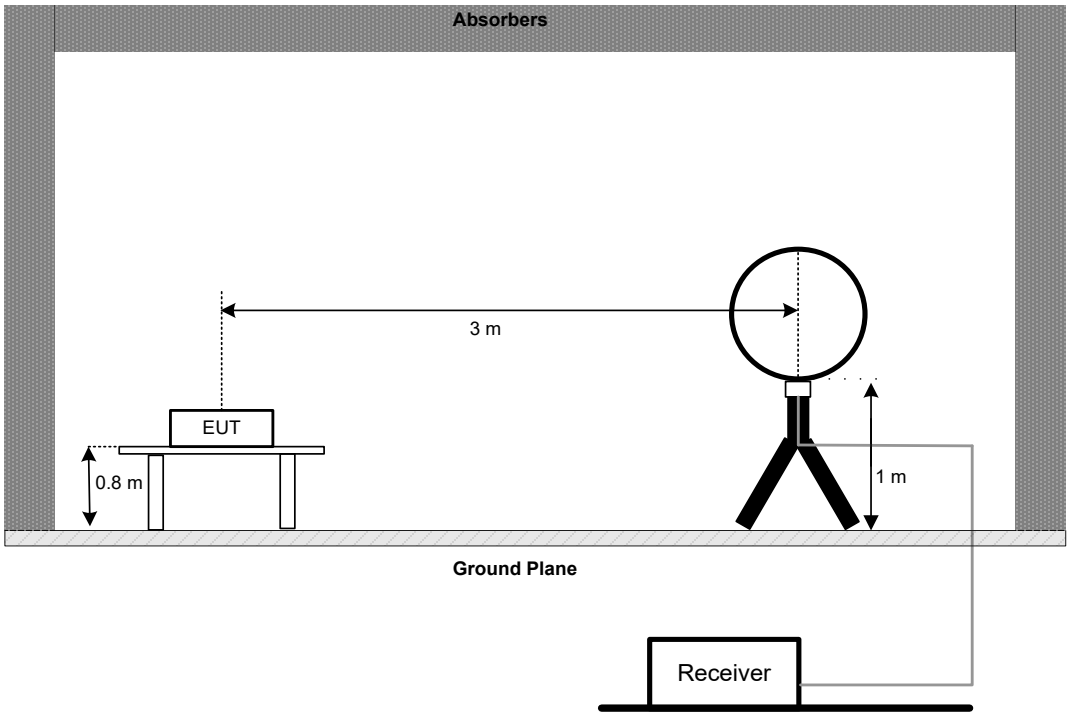
Spectrum Parameters	Setting
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000 MHz for QP detector
Start ~ Stop Frequency	1 GHz~26.5 GHz for PK/AVG detector

5.3 DEVIATION FROM TEST STANDARD

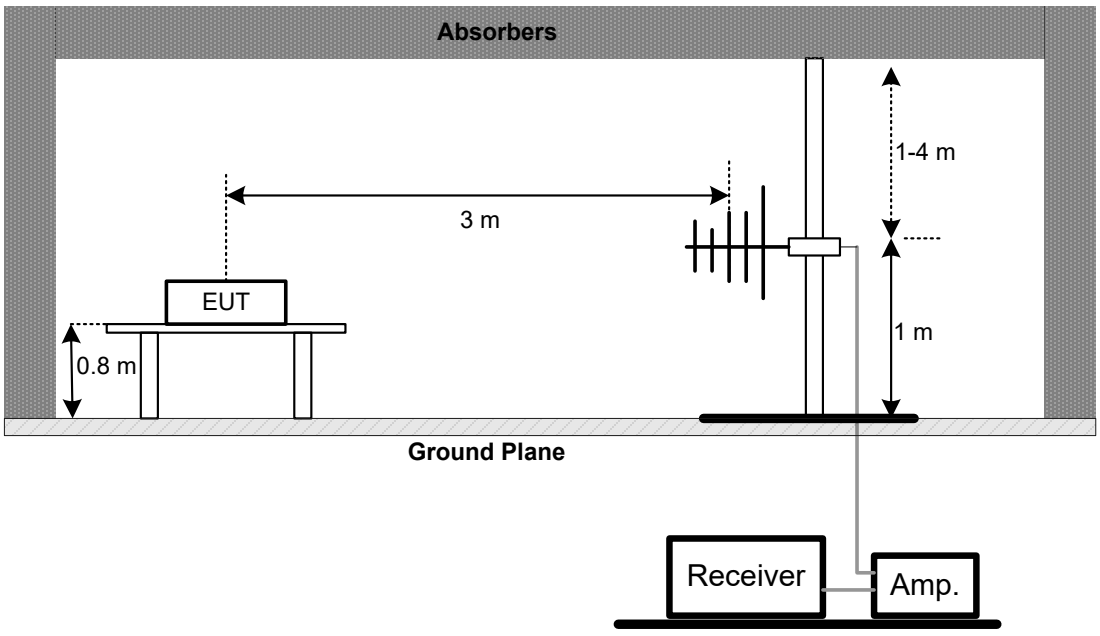
No deviation.

5.4 TEST SETUP

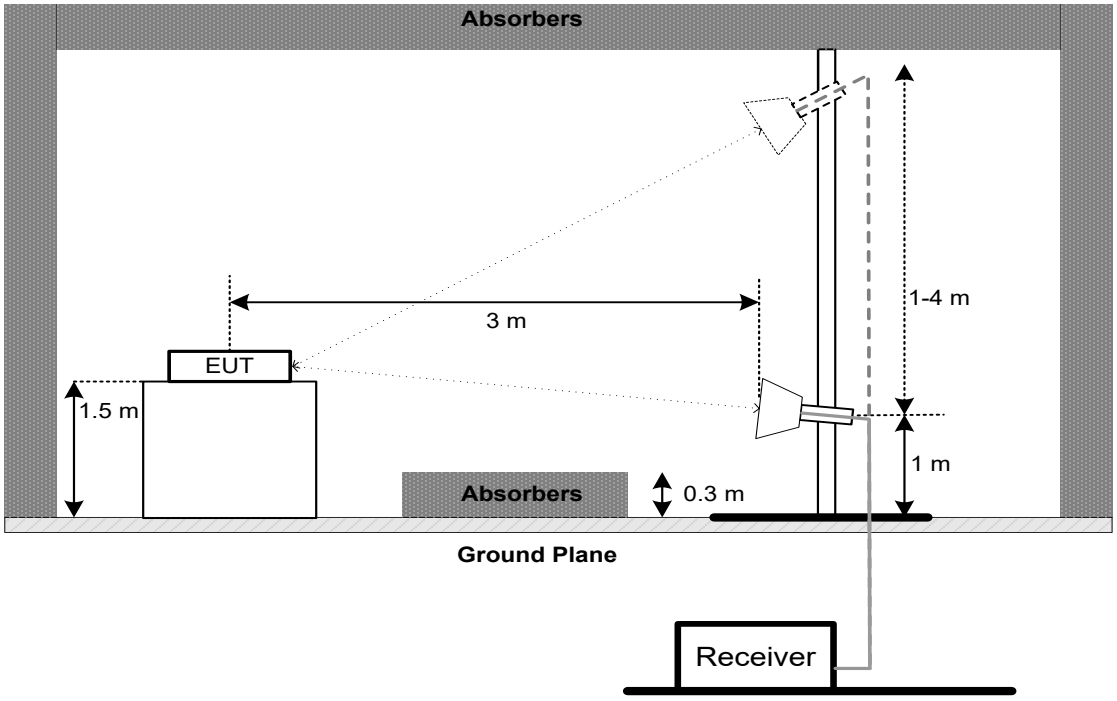
9 kHz to 30 MHz



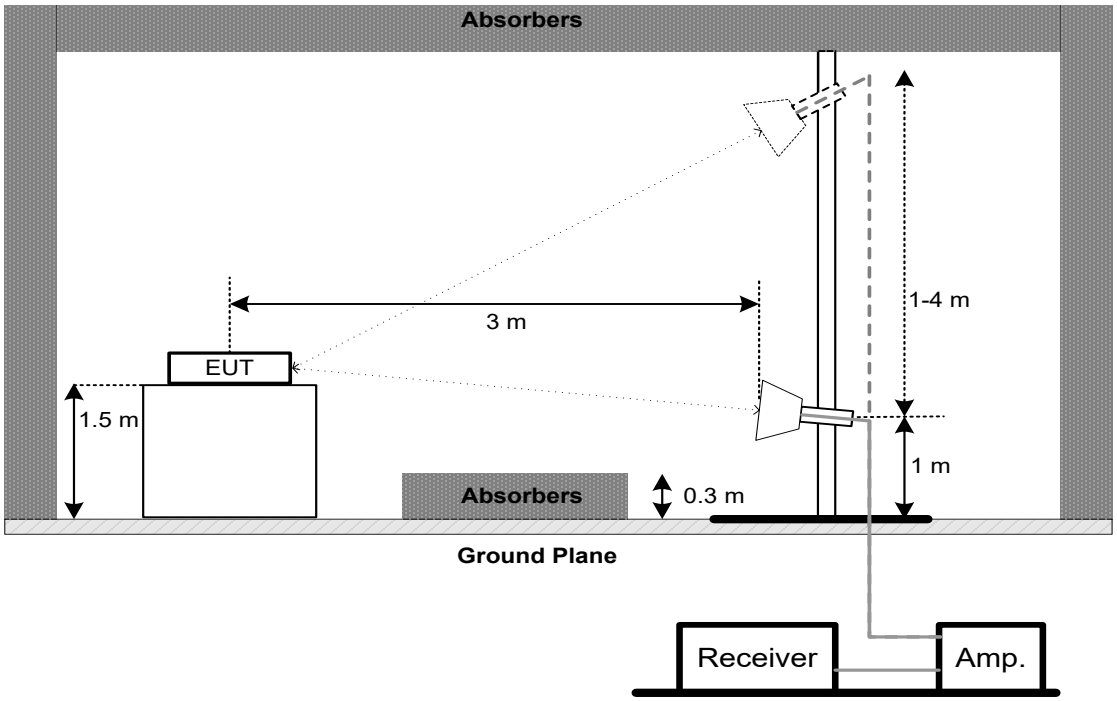
30 MHz to 1 GHz



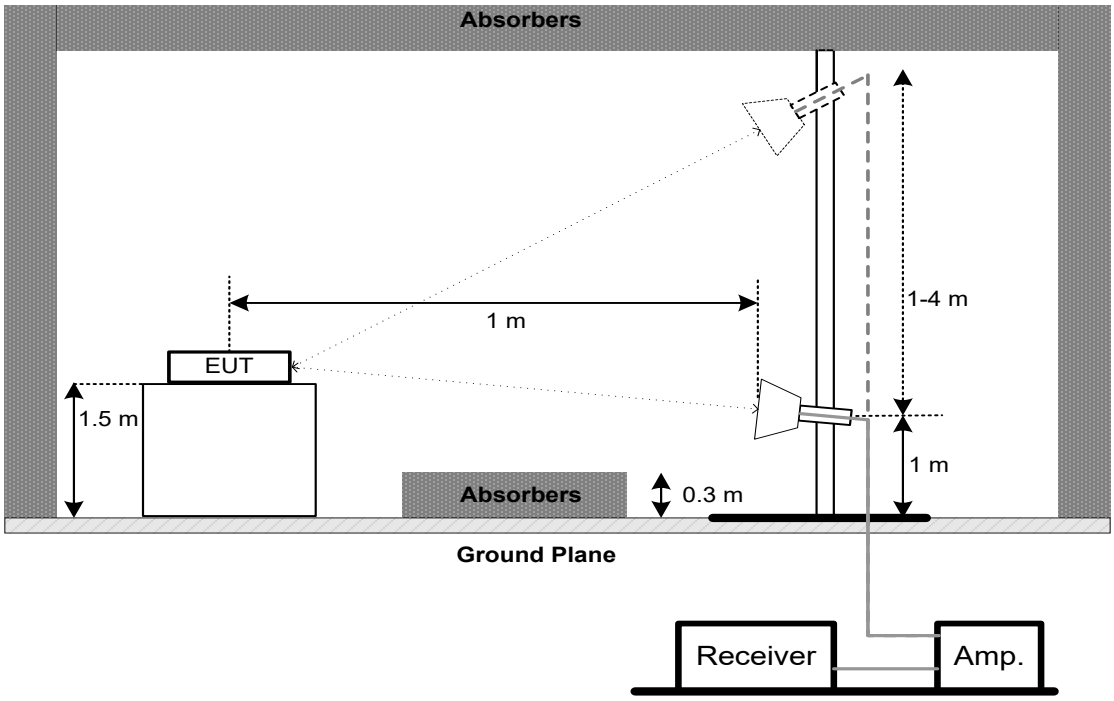
Above 1 GHz
Band edge



Harmonic(1 GHz to 18 GHz)



Harmonic(18 GHz to 26.5 GHz)



5.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

5.6 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.

5.7 TEST RESULT - 30 MHz TO 1000 MHz

Please refer to the APPENDIX C.

5.8 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.

6. BANDWIDTH

6.1 LIMIT

Section	Test Item	Limit
FCC 15.247(a)(2)	6 dB Bandwidth	>= 500 kHz
	99% Emission Bandwidth	-

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 following table is the setting of the spectrum analyzer:

For 6 dB Bandwidth:

Spectrum Parameters	Setting
Span Frequency	> Measurement Bandwidth
RBW	100 kHz
VBW	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

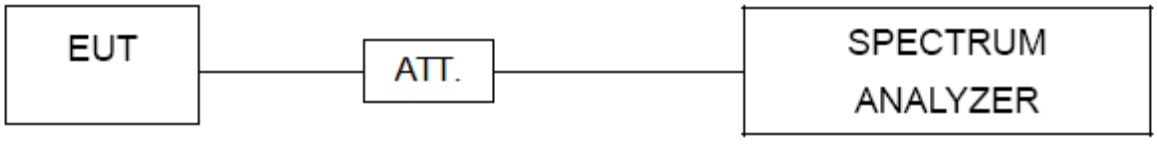
For 99% Emission Bandwidth:

Spectrum Parameters	Setting
Span Frequency	Between 1.5 times and 5.0 times the OBW
RBW	30 kHz
VBW	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

6.6 TEST RESULTS

Please refer to the APPENDIX E.

7. MAXIMUM OUTPUT POWER

7.1 LIMIT

Section	Test Item	Limit
FCC 15.247(b)(3)	Maximum Output Power	1.0000 watt or 30.00 dBm

7.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.

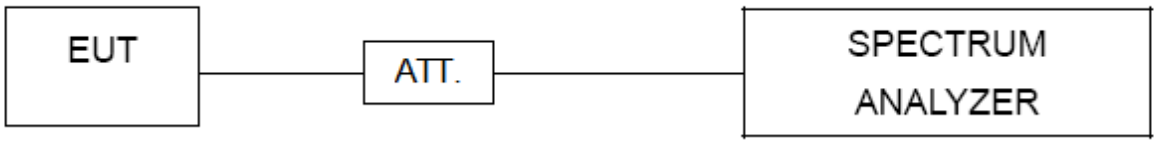
b. The following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Span Frequency	≥ 3×RBW
RBW	3 MHz
VBW	3 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

7.6 TEST RESULTS

Please refer to the APPENDIX F.

8. CONDUCTED SPURIOUS EMISSION

8.1 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.

8.2 TEST PROCEDURE

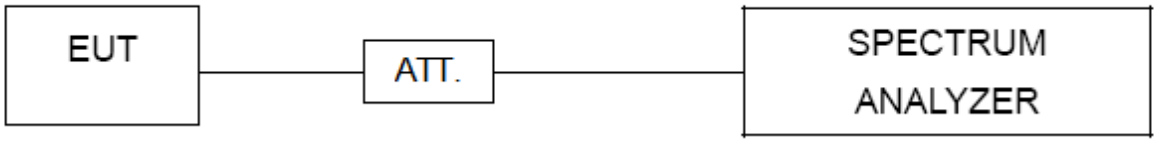
a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. The following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Start Frequency	30 MHz
Stop Frequency	26.5 GHz
RBW	100 kHz
VBW	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

8.6 TEST RESULTS

Please refer to the APPENDIX G.

9. POWER SPECTRAL DENSITY

9.1 LIMIT

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

9.2 TEST PROCEDURE

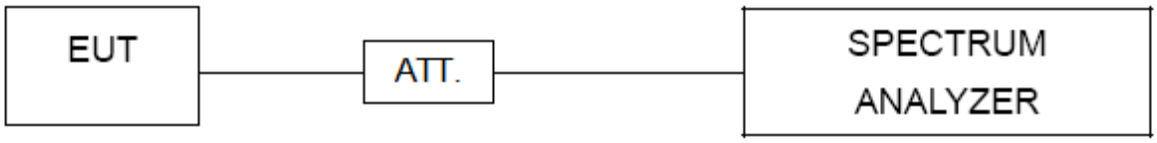
a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. The following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Span Frequency	4 MHz (2 Mbps)
RBW	3 kHz
VBW	10 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

9.3 DEVIATION FROM STANDARD

No deviation.

9.4 TEST SETUP



9.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

9.6 TEST RESULTS

Please refer to the APPENDIX H.

10. 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	Dec. 22, 2024
2	TWO-LINE V-NETWORK	R&S	ENV216	101447	Dec. 22, 2024
3	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
4	Cable	N/A	SFT205-NMNM-9M -001	9M	Nov. 27, 2024
5	643 Shield Room	ETS	6*4*3	N/A	N/A

Radiated Emissions - 9 kHz to 30 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Active Loop Antenna	Schwarzbeck	FMZB 1513-60B	1513-60 B-034	Mar. 30, 2025
2	MXE EMI Receiver	Keysight	N9038A	MY56400091	Dec. 22, 2024
3	Cable	N/A	RW2350-3.8A-NMB M-1.5M	N/A	Jun. 10, 2024
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
5	WPT coil	N/A	100KHz-300KHz	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	1462	Dec. 13, 2024
2	Attenuator	EMC INSTRUMENT	EMCI-N-6-06	AT-06009	Dec. 13, 2024
3	Preamplifier	EMC INSTRUMENT	EMC001330	980998	Nov. 17, 2024
4	Cable	RegalWay	LMR400-NMNM-12 .5m	N/A	Jun. 06, 2025
5	Cable	RegalWay	LMR400-NMNM-3 m	N/A	Jun. 06, 2025
6	Cable	RegalWay	LMR400-NMNM-0. 5m	N/A	Jun. 06, 2025
7	Receiver	Agilent	N9038A	MY52130039	Dec. 22, 2024
8	Positioning Controller	MF	MF-7802	N/A	N/A

Radiated Emissions - Above 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Receiver	Agilent	N9038A	MY52130039	Dec. 22, 2024
2	Preamplifier	EMC INSTRUMENT	EMC118A45SE	980888	Nov. 17, 2024
3	Double Ridged Guide Antenna	ETS	3115	75789	Jun. 15, 2025
4	Cable	RegalWay	RWLP50-4.0A-SMS M-12.5M	N/A	Jul. 03, 2025
5	Cable	RegalWay	RWLP50-4.0A-NM RASM-2.5M	N/A	Jul. 03, 2025
6	Cable	RegalWay	RWLP50-4.0A-NM RASMRA-0.8M	N/A	Jul. 03, 2025
7	966 Chamber room	CM	9*6*6	N/A	May 19, 2025
8	Attenuator	Talent Microwave	TA10A2-S-18	N/A	N/A
9	Filter	STI	STI15-9912	N/A	May 31, 2025
10	Positioning Controller	MF	MF-7802	N/A	N/A
11	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

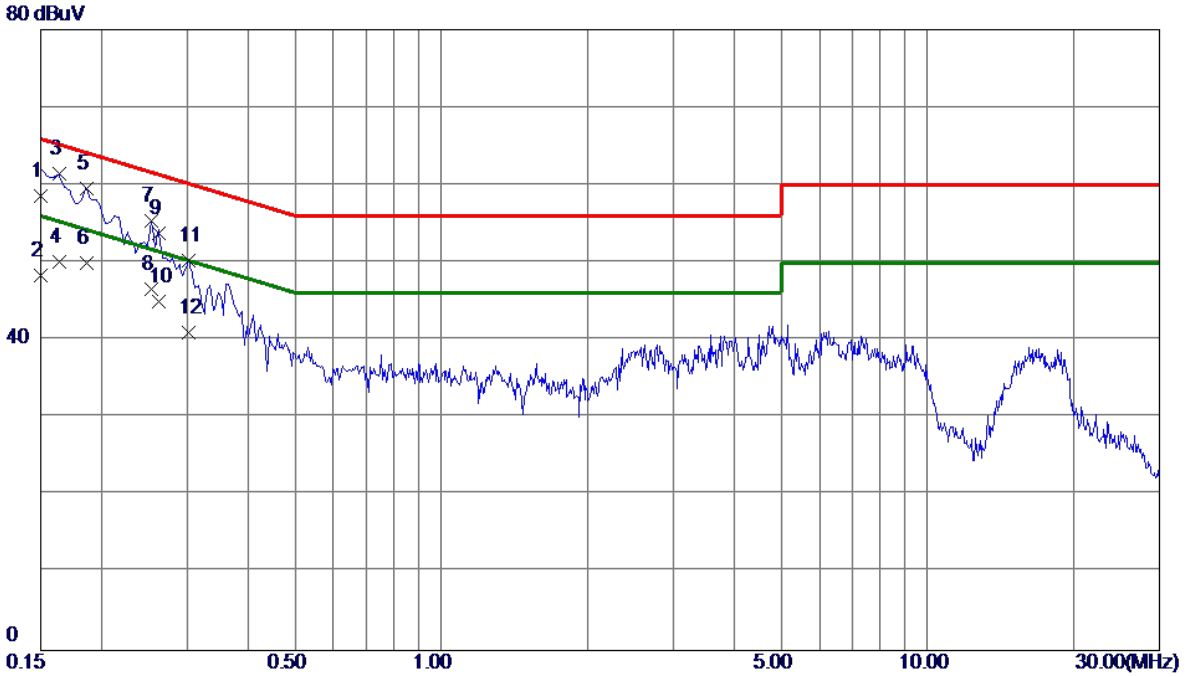
Radiated Emissions - Above 18 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Signal Analyzer	Keysight	N9010A	MY56480488	Dec. 22, 2024
2	Low Noise Amplifier	CONNPHY	CLN-18G40G-4330 -K	619413	Jul. 17, 2025
3	Cable	RegalWay	RWLP50-2.6A-2.92 M2.92M-1.1M	N/A	Jul. 25, 2025
4	Cable	Tonscend	HF160-KMKM-3M	N/A	Jul. 25, 2025
5	966 Chamber room	CM	9*6*6	N/A	May 19, 2025
6	Positioning Controller	MF	MF-7802	N/A	N/A
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Bandwidth & Maximum Output Power & Power Spectral Density & Conducted Spurious Emission					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP38	100852	May 31, 2025
2	Measurement Software	BTL	BTL Conducted Test	N/A	N/A
3	Isolation attenuator	Z-Link	ASMA-16-18-2W	N/A	N/A

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

APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS

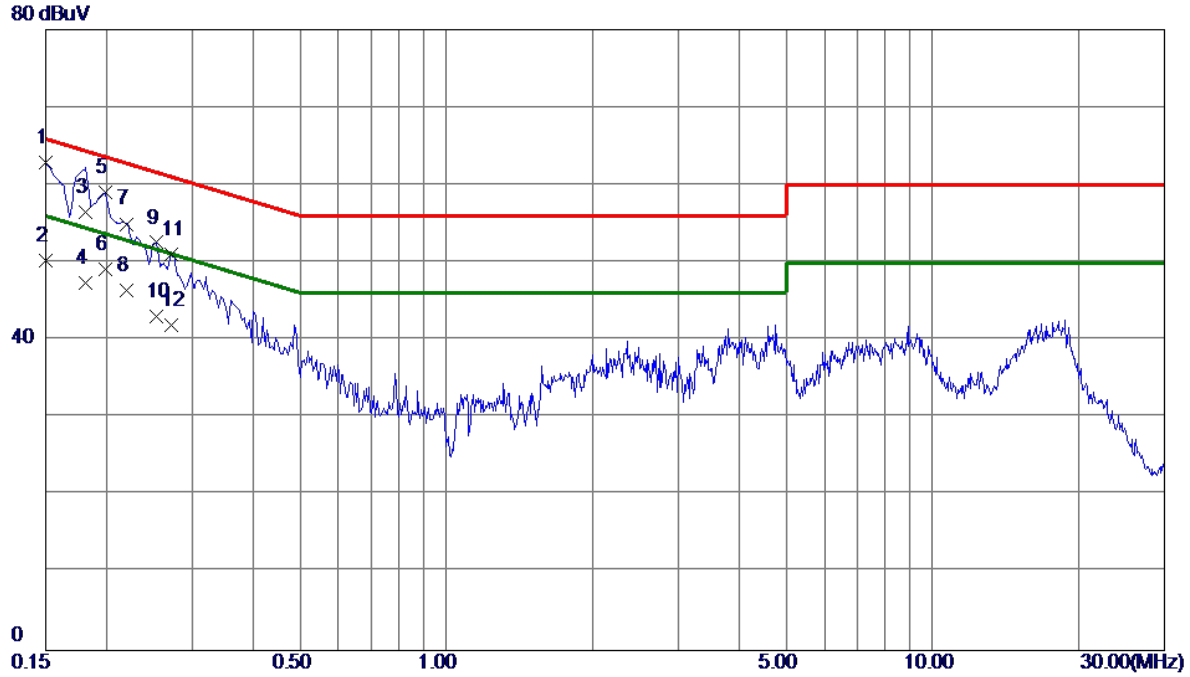
Test Mode	TX Mode_2Mbps Channel 00	Phase	Line



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1500	48.90	9.70	58.60	66.00	-7.40	QP	
2	0.1500	38.60	9.70	48.30	56.00	-7.70	AVG	
3 *	0.1635	51.67	9.70	61.37	65.28	-3.91	QP	
4	0.1635	40.40	9.70	50.10	55.28	-5.18	AVG	
5	0.1860	49.87	9.70	59.57	64.21	-4.64	QP	
6	0.1860	40.20	9.70	49.90	54.21	-4.31	AVG	
7	0.2535	45.62	9.71	55.33	61.64	-6.31	QP	
8	0.2535	36.90	9.71	46.61	51.64	-5.03	AVG	
9	0.2630	44.07	9.71	53.78	61.34	-7.56	QP	
10	0.2630	35.30	9.71	45.01	51.34	-6.33	AVG	
11	0.3030	40.47	9.72	50.19	60.16	-9.97	QP	
12	0.3030	31.20	9.72	40.92	50.16	-9.24	AVG	

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

Test Mode	TX Mode_2Mbps Channel 00	Phase	Neutral

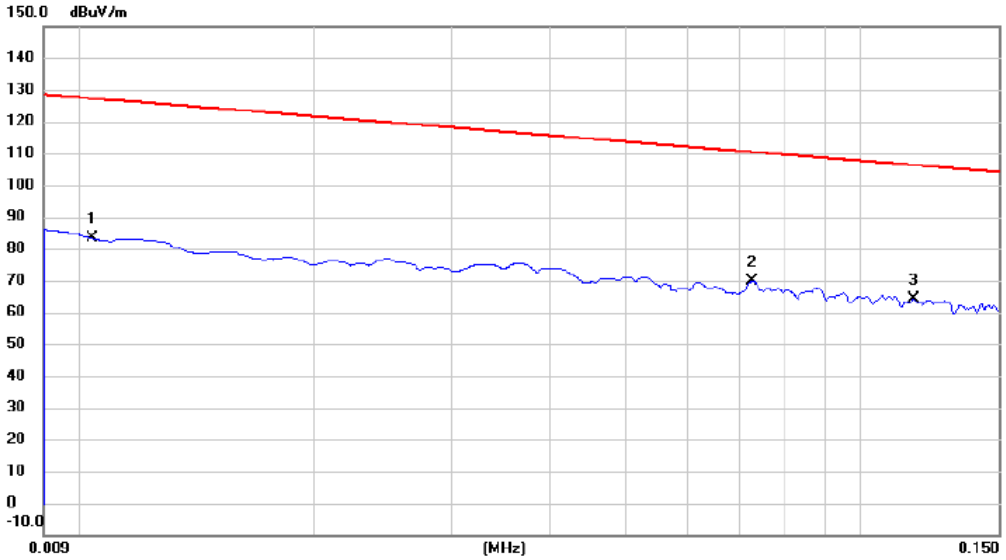


No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1 *	0.1500	53.27	9.55	62.82	66.00	-3.18	QP	
2	0.1500	40.70	9.55	50.25	56.00	-5.75	AVG	
3	0.1815	46.90	9.55	56.45	64.42	-7.97	QP	
4	0.1815	37.80	9.55	47.35	54.42	-7.07	AVG	
5	0.1995	49.48	9.56	59.04	63.63	-4.59	QP	
6	0.1995	39.60	9.56	49.16	53.63	-4.47	AVG	
7	0.2197	45.40	9.56	54.96	62.83	-7.87	QP	
8	0.2197	36.90	9.56	46.46	52.83	-6.37	AVG	
9	0.2535	42.99	9.57	52.56	61.64	-9.08	QP	
10	0.2535	33.50	9.57	43.07	51.64	-8.57	AVG	
11	0.2714	41.46	9.57	51.03	61.07	-10.04	QP	
12	0.2714	32.40	9.57	41.97	51.07	-9.10	AVG	

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

APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ

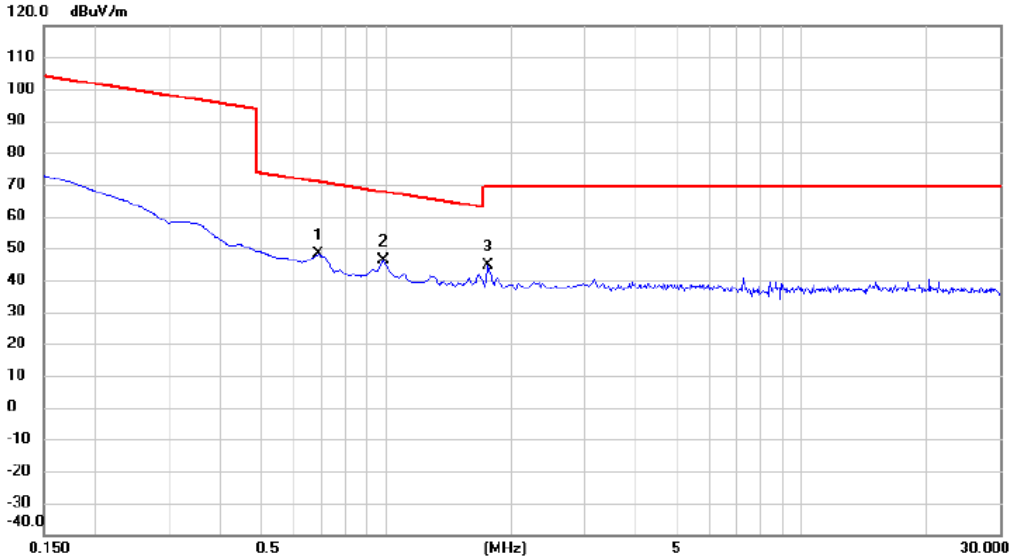
Test Mode	TX Mode_2Mbps Channel 00	Polarization	Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.0104	62.99	20.55	83.54	127.26	-43.72	AVG	
2	*	0.0727	48.37	21.32	69.69	110.37	-40.68	AVG	
3		0.1170	42.76	21.31	64.07	106.24	-42.17	QP	

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

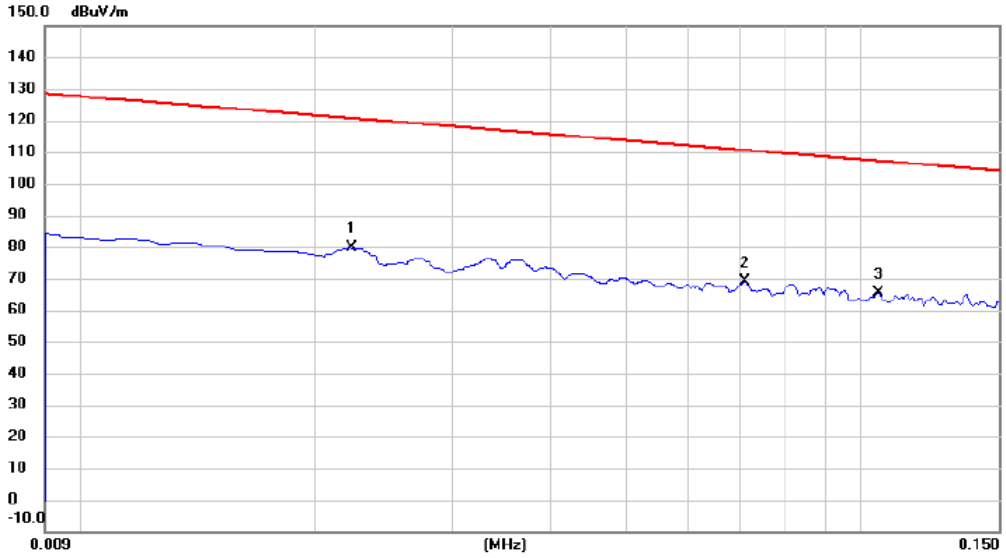
Test Mode	TX Mode_2Mbps Channel 00	Polarization	Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.6873	27.10	21.12	48.22	70.86	-22.64	QP	
2	*	0.9858	24.87	21.20	46.07	67.73	-21.66	QP	
3		1.7620	23.32	21.13	44.45	69.54	-25.09	QP	

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

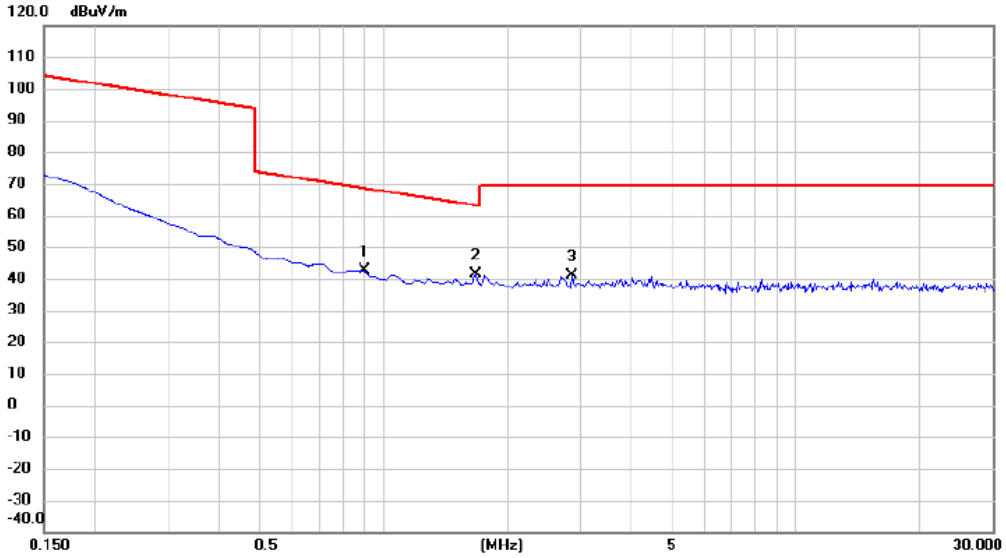
Test Mode	TX Mode_2Mbps Channel 00	Polarization	Ant 90°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0223	58.70	20.91	79.61	120.64	-41.03	AVG	
2		0.0710	47.67	21.31	68.98	110.58	-41.60	AVG	
3		0.1052	44.03	21.33	65.36	107.17	-41.81	QP	

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

Test Mode	TX Mode_2Mbps Channel 00	Polarization	Ant 90°

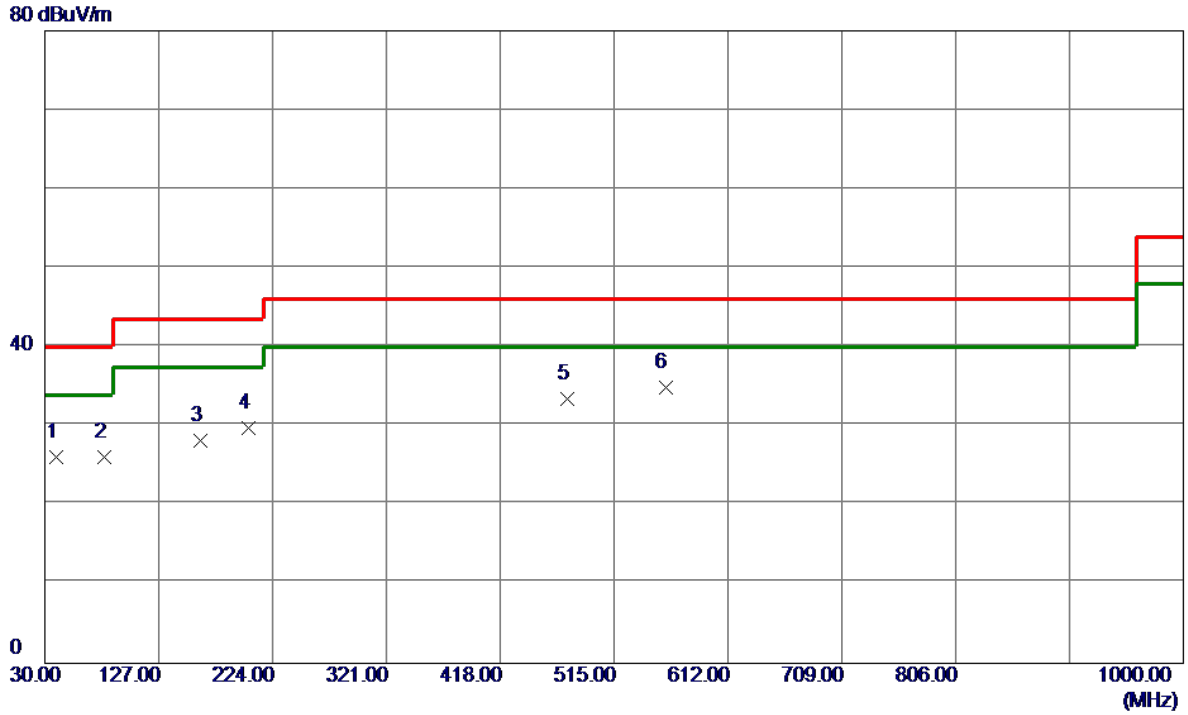


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.8962	21.33	21.18	42.51	68.56	-26.05	QP	
2	*	1.6724	20.46	21.14	41.60	63.14	-21.54	QP	
3		2.8664	19.75	21.12	40.87	69.54	-28.67	QP	

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

APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

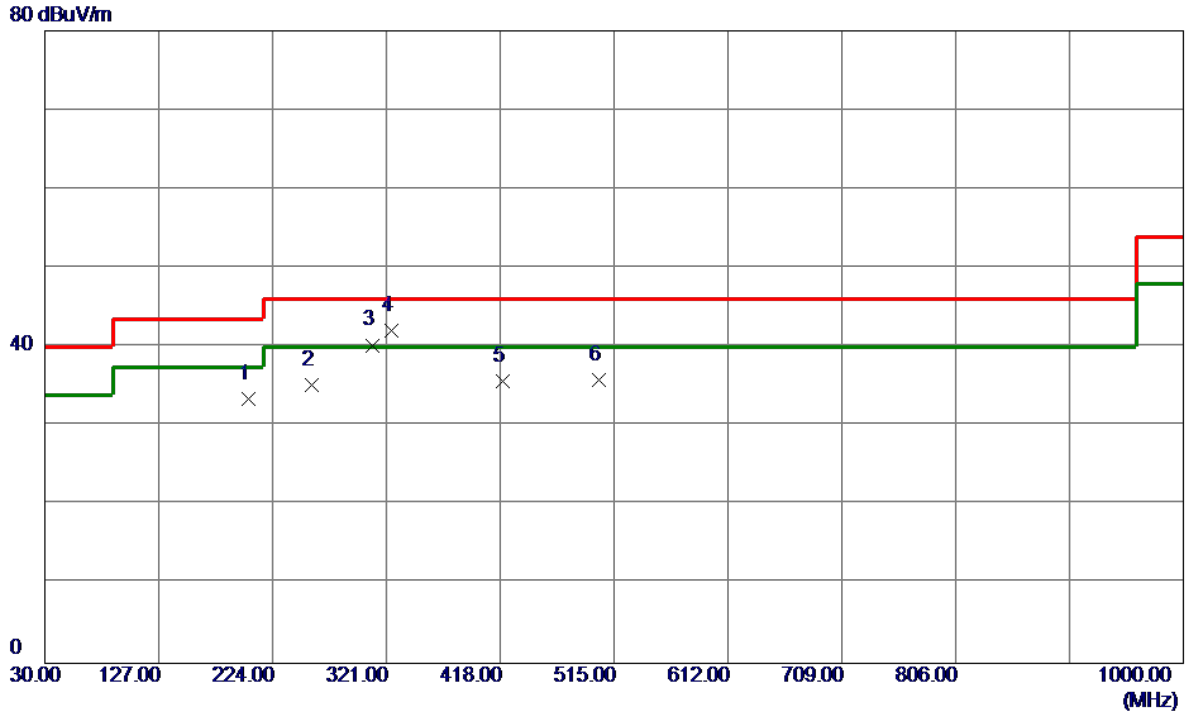
Test Mode	TX Mode_2Mbps Channel 00	Polarization	Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	39.2150	37.99	-11.84	26.15	40.00	-13.85	Peak	
2	80.9250	41.68	-15.65	26.03	40.00	-13.97	Peak	
3	162.8900	39.06	-10.96	28.10	43.52	-15.42	Peak	
4	203.6300	44.14	-14.43	29.71	43.52	-13.81	Peak	
5	474.7450	39.87	-6.40	33.47	46.02	-12.55	Peak	
6 *	558.6500	39.56	-4.75	34.81	46.02	-11.21	Peak	

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

Test Mode	TX Mode_2Mbps Channel 00	Polarization	Horizontal

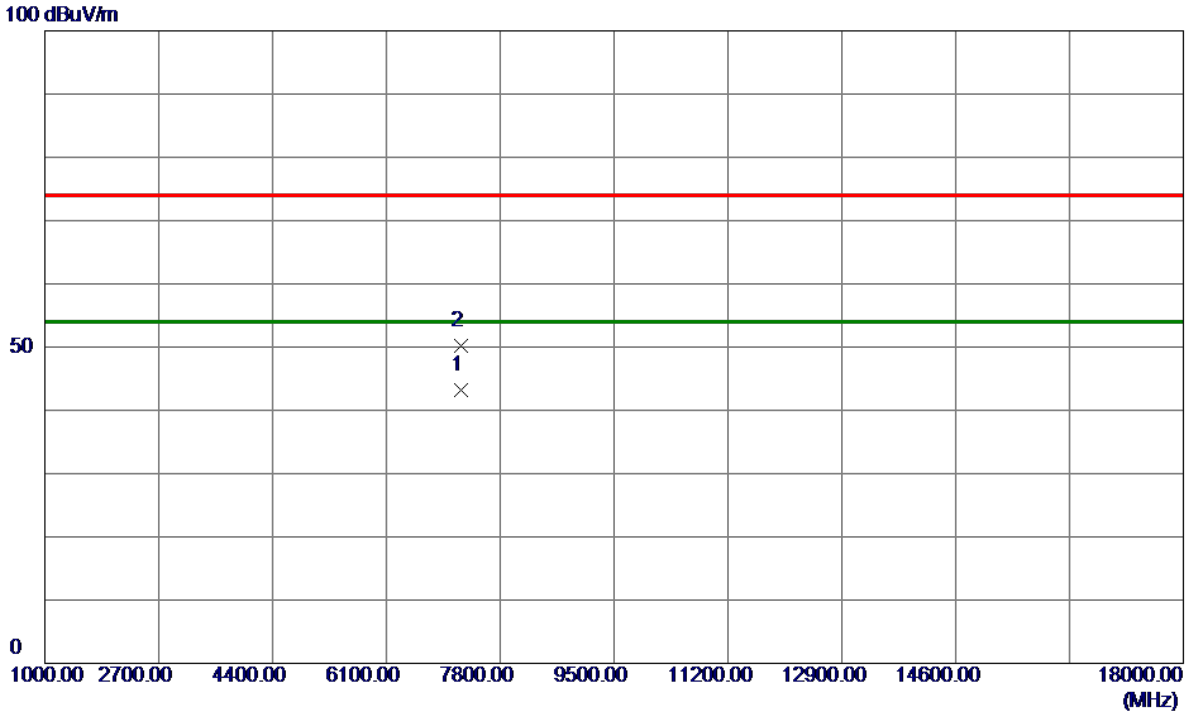


No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	203.6300	47.89	-14.43	33.46	43.52	-10.06	Peak	
2	257.4650	47.36	-12.14	35.22	46.02	-10.80	Peak	
3	309.3599	50.59	-10.35	40.24	46.02	-5.78	Peak	
4 *	324.8800	51.88	-9.83	42.05	46.02	-3.97	Peak	
5	420.4250	43.27	-7.52	35.75	46.02	-10.27	Peak	
6	501.9050	41.85	-5.98	35.87	46.02	-10.15	Peak	

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

APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ

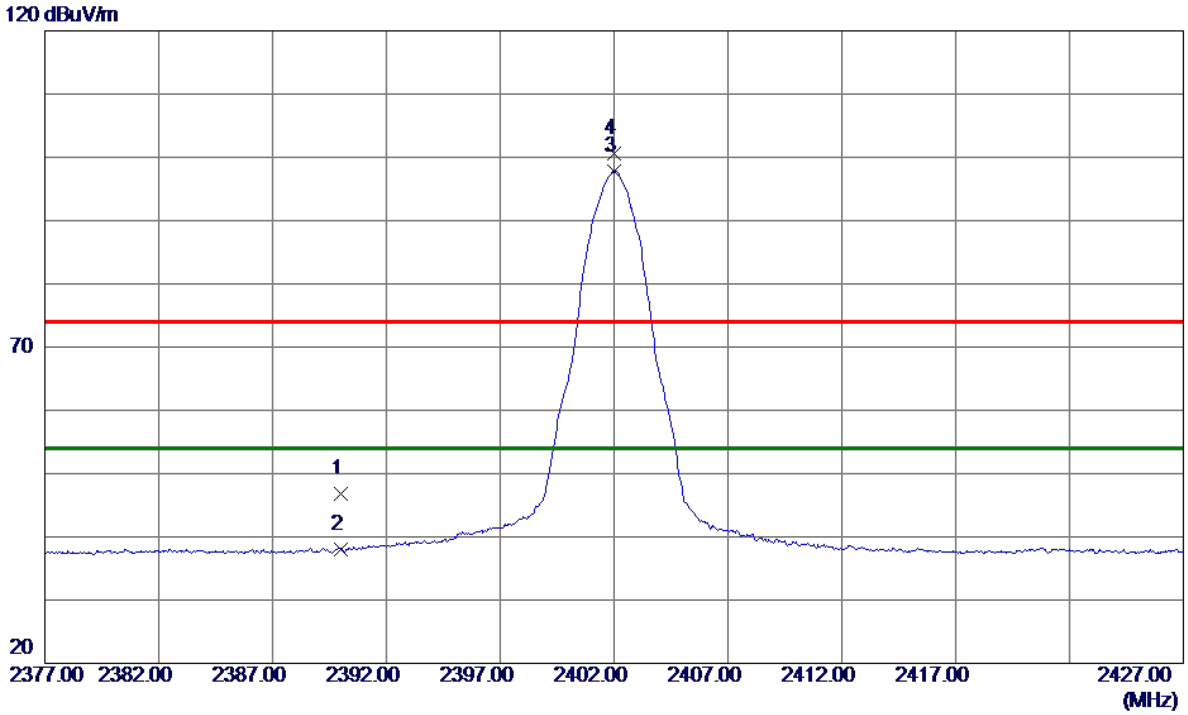
Test Mode	TX 2402 MHz _CH00_2Mbps	Polarization	Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	7207.2200	34.92	8.30	43.22	54.00	-10.78	AVG	
2	7207.5800	41.92	8.30	50.22	74.00	-23.78	Peak	

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

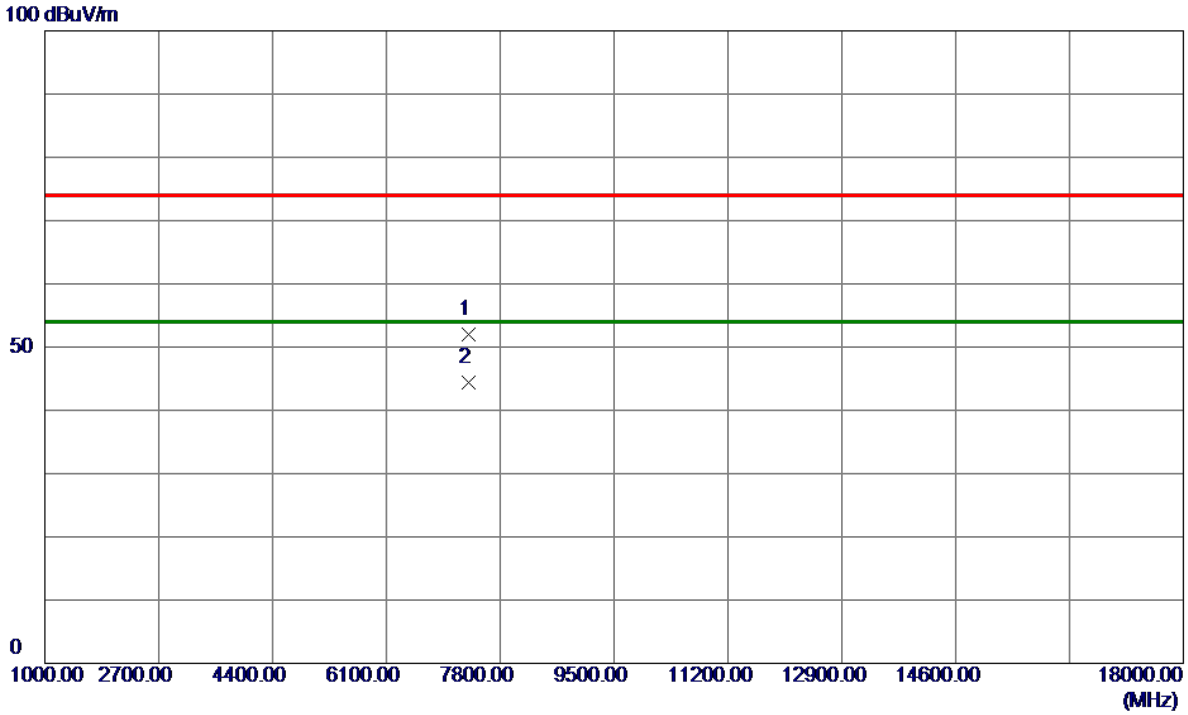
Test Mode	TX 2402 MHz _CH00_2Mbps	Polarization	Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2390.0000	39.03	7.70	46.73	74.00	-27.27	Peak	
2	2390.0000	30.37	7.70	38.07	54.00	-15.93	AVG	
3 *	2401.9750	90.13	7.71	97.84	54.00	43.84	AVG	No Limit
4	2402.0250	92.81	7.71	100.52	74.00	26.52	Peak	No Limit

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

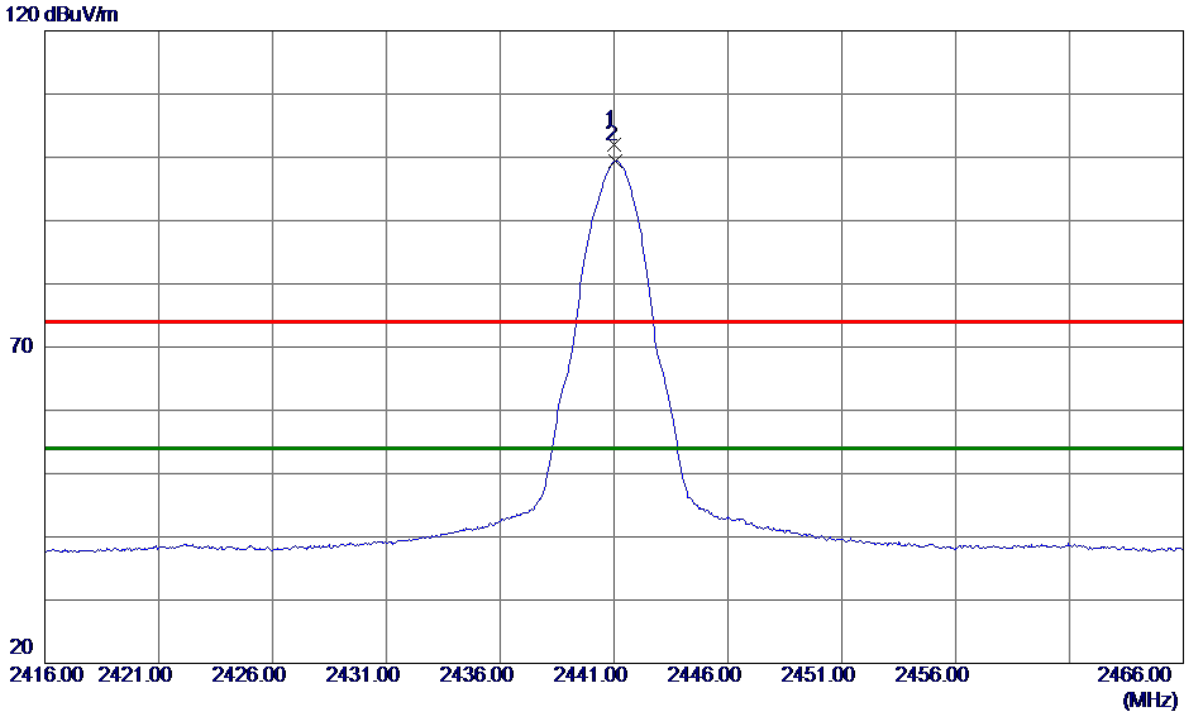
Test Mode	TX 2441 MHz _CH39_2Mbps	Polarization	Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	7321.6000	43.68	8.31	51.99	74.00	-22.01	Peak	
2 *	7321.7800	36.18	8.31	44.49	54.00	-9.51	AVG	

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

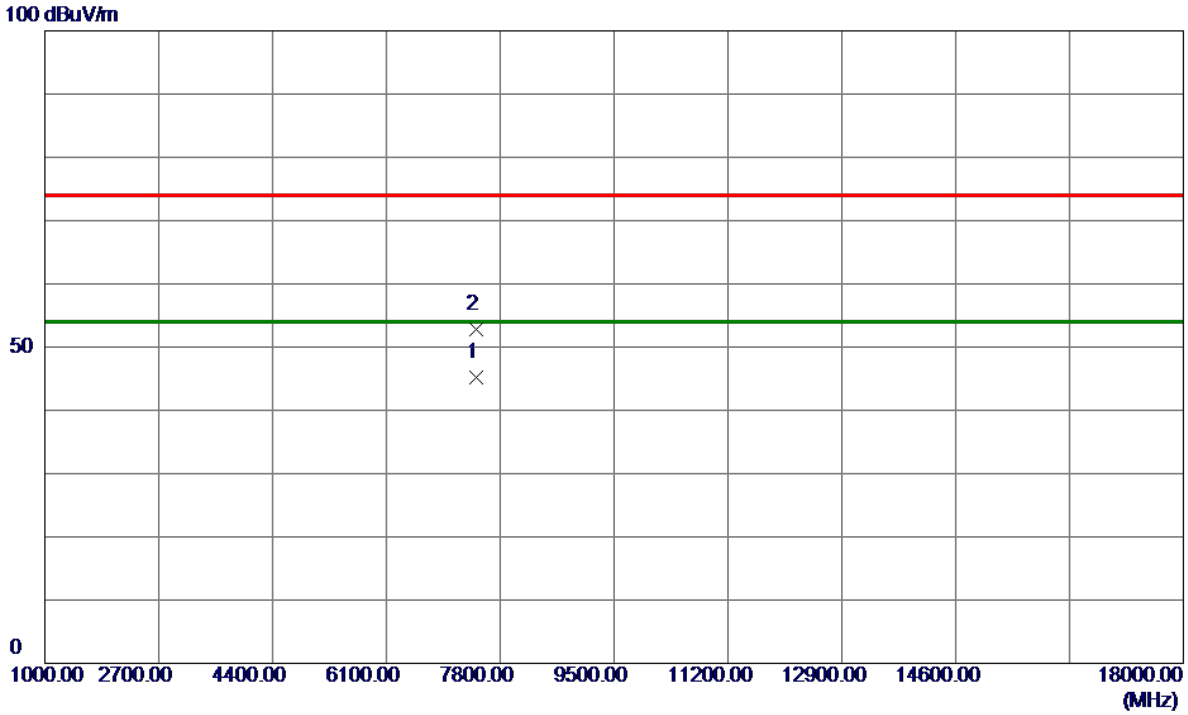
Test Mode	TX 2441 MHz _CH39_2Mbps	Polarization	Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2441.0250	94.18	7.76	101.94	74.00	27.94	Peak	No Limit
2 *	2441.0750	91.74	7.76	99.50	54.00	45.50	AVG	No Limit

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

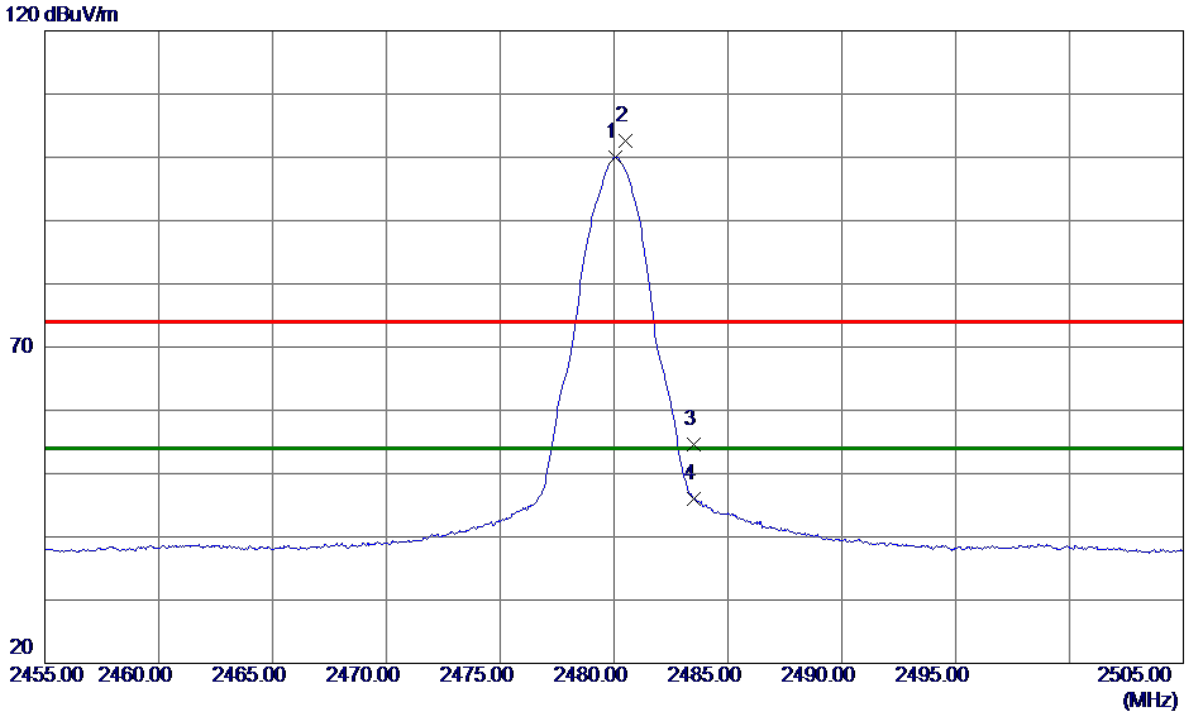
Test Mode	TX 2480 MHz _CH78_2Mbps	Polarization	Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	7440.3200	36.79	8.32	45.11	54.00	-8.89	AVG	
2	7440.4500	44.43	8.32	52.75	74.00	-21.25	Peak	

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

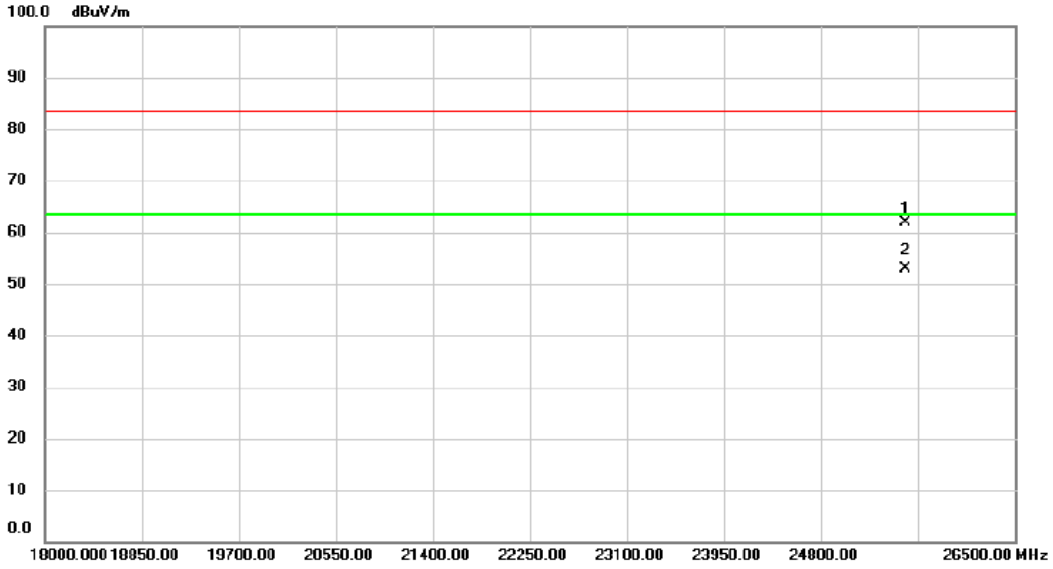
Test Mode	TX 2480 MHz _CH78_2Mbps	Polarization	Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	2480.0500	92.23	7.81	100.04	54.00	46.04	AVG	No Limit
2	2480.5250	94.82	7.81	102.63	74.00	28.63	Peak	No Limit
3	2483.5000	46.72	7.81	54.53	74.00	-19.47	Peak	
4	2483.5000	38.25	7.81	46.06	54.00	-7.94	AVG	

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

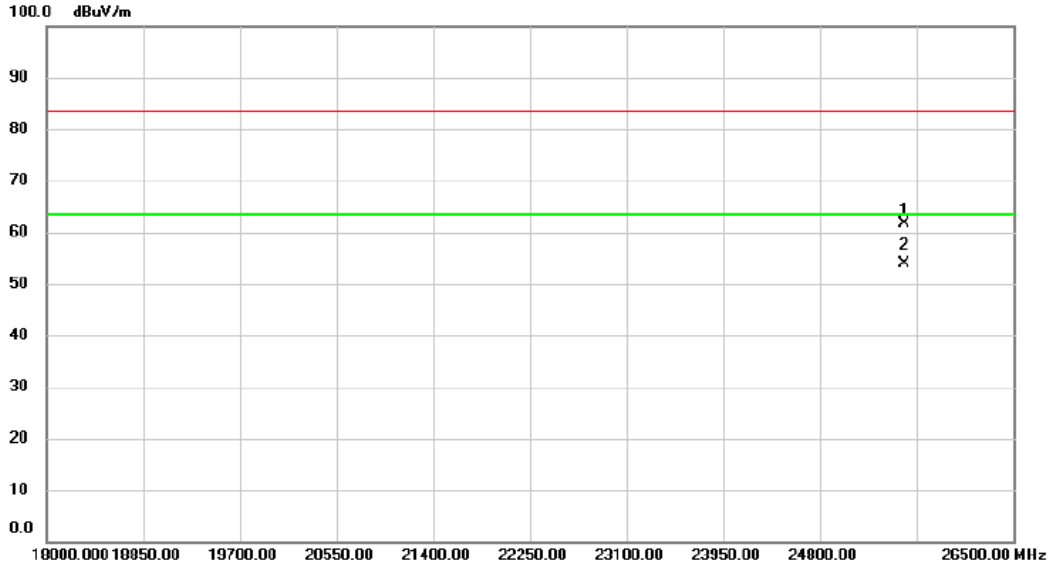
Test Mode	TX Mode_2Mbps Channel 00	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		25543.750	49.64	12.30	61.94	83.50	-21.56	peak	
2	*	25543.750	40.56	12.30	52.86	63.50	-10.64	AVG	

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

Test Mode	TX Mode_2Mbps Channel 00	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		25539.500	49.45	12.30	61.75	83.50	-21.75	peak	
2	*	25539.500	41.63	12.30	53.93	63.50	-9.57	AVG	

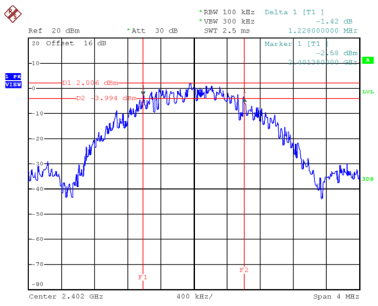
REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX E - BANDWIDTH

Test Mode	TX Mode _2Mbps

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	6 dB Bandwidth Min. Limit (MHz)	Test Result
00	2402	1.228	2.088	0.5	Pass
39	2441	1.272	2.048	0.5	Pass
78	2480	1.218	1.984	0.5	Pass

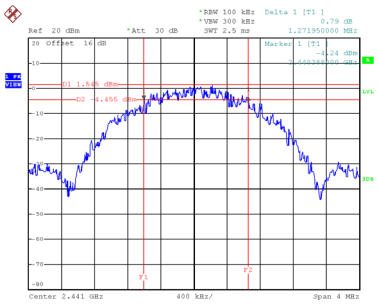
CH00



Date: 18.OCT.2024 09:22:47

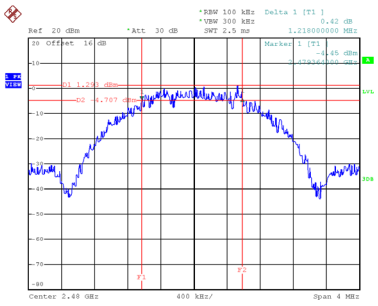
CH39

6 dB Bandwidth



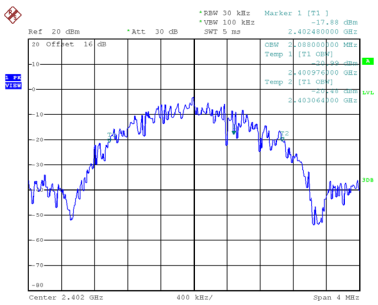
Date: 18.OCT.2024 09:29:43

CH79

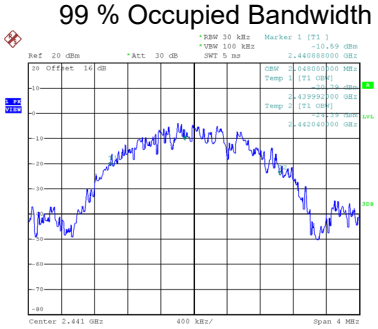


Date: 18.OCT.2024 09:35:32

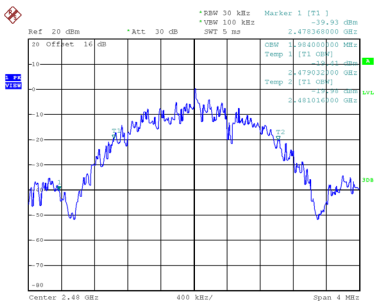
99 % Occupied Bandwidth



Date: 18.OCT.2024 09:22:06



Date: 18.OCT.2024 09:29:49



Date: 18.OCT.2024 09:35:37

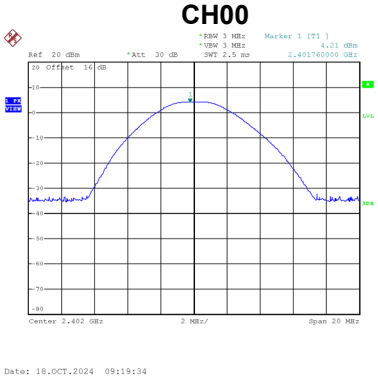
APPENDIX F - MAXIMUM OUTPUT POWER

Test Mode	TX Mode _2Mbps

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	4.21	0.0026	30.00	1.0000	Pass
2441	3.89	0.0024	30.00	1.0000	Pass
2480	3.64	0.0023	30.00	1.0000	Pass

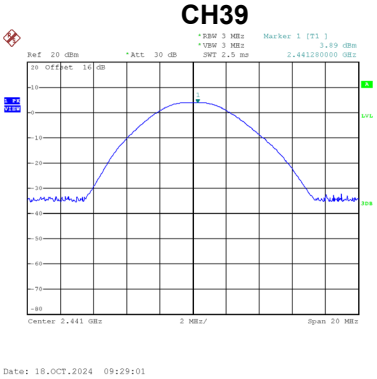
Note: Output power = Measure result + Cable loss

CH00



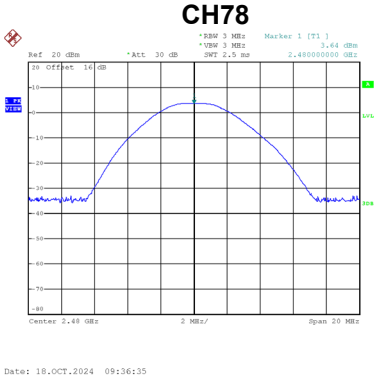
Date: 18.OCT.2024 09:19:34

CH39



Date: 18.OCT.2024 09:29:01

CH78

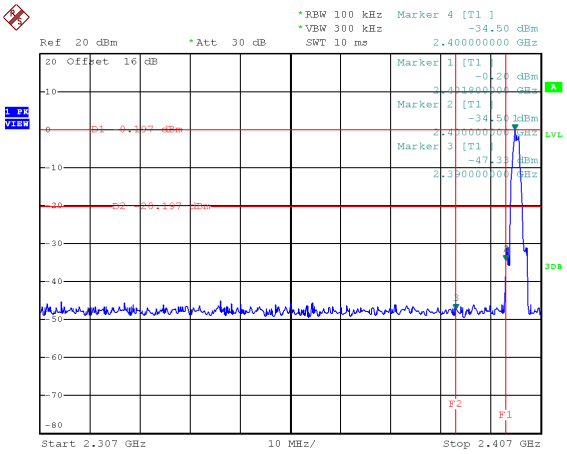


Date: 18.OCT.2024 09:36:35

APPENDIX G - CONDUCTED SPURIOUS EMISSION

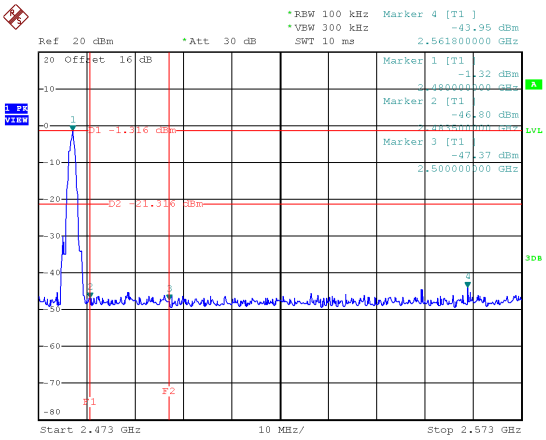
Test Mode	TX Mode _2Mbps

Bandedge CH00 (Lower)



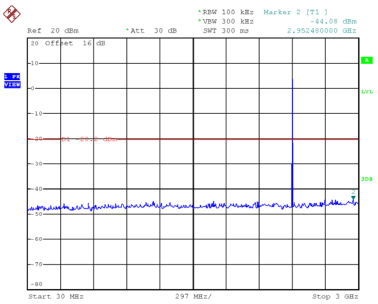
Date: 18.OCT.2024 09:22:54

Bandedge CH78 (Upper)

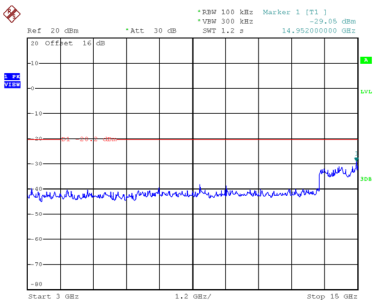


Date: 18.OCT.2024 09:36:01

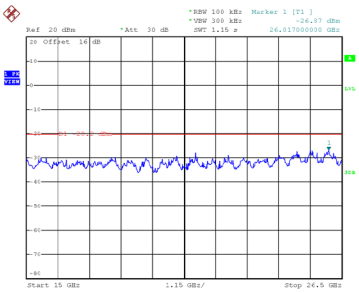
CH00 – 10th Harmonic of the fundamental frequency



Date: 18.OCT.2024 09:23:10

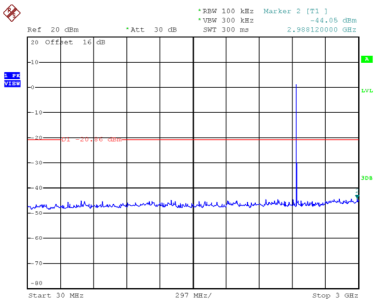


Date: 18.OCT.2024 09:23:17

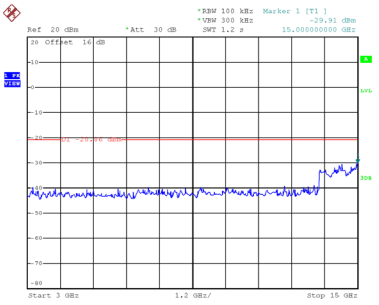


Date: 18.OCT.2024 09:23:24

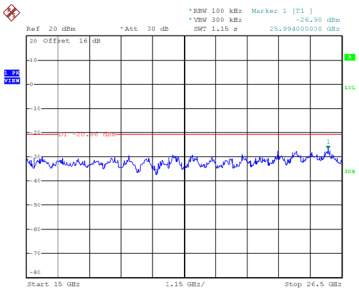
CH39 – 10th Harmonic of the fundamental frequency



Date: 18.OCT.2024 09:32:11

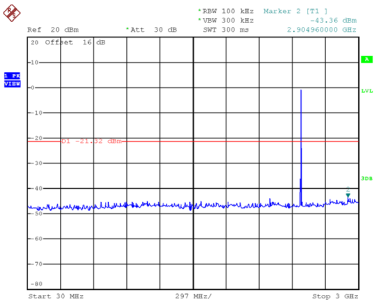


Date: 18.OCT.2024 09:32:18

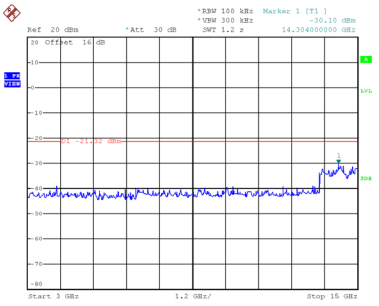


Date: 18.OCT.2024 09:32:25

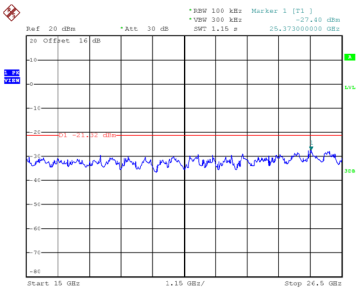
CH78 – 10th Harmonic of the fundamental frequency



Date: 18.OCT.2024 09:36:16



Date: 18.OCT.2024 09:36:23



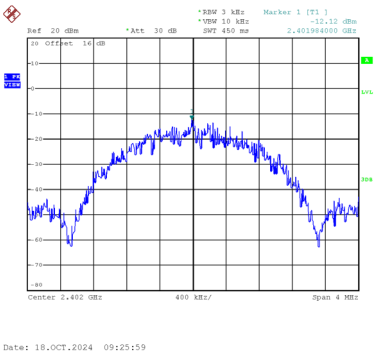
Date: 18.OCT.2024 09:36:30

APPENDIX H - POWER SPECTRAL DENSITY

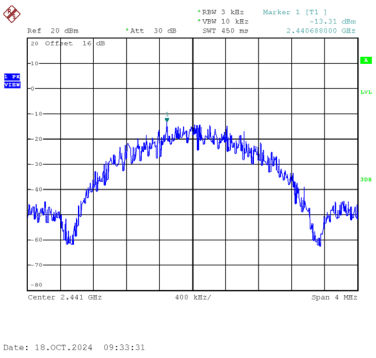
Test Mode	TX Mode _2Mbps

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Max. Limit (dBm/3 kHz)	Test Result
00	2402	-12.12	8.00	Pass
39	2441	-13.31	8.00	Pass
78	2480	-13.44	8.00	Pass

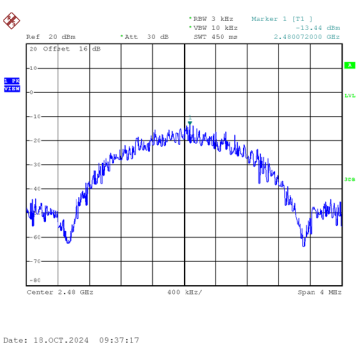
CH00



CH39



CH78



End of Test Report