

# FCC Radio Test Report

## FCC ID: RWO-HSD01

This report concerns: Original Grant

**Project No.** : 2202C081  
**Equipment** : WIRELESS DONGLE  
**Brand Name** : RAZER  
**Test Model** : HSD01  
**Series Model** : N/A  
**Applicant** : Razer Inc.  
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**Date of Receipt** : Mar. 14, 2022  
**Date of Test** : Mar. 15, 2022 ~ Mar. 19, 2022  
**Issued Date** : Apr. 01, 2022  
**Report Version** : R00  
**Test Sample** : Sample No.: DG2022031535 for conducted, DG2022031534 for radiated.  
**Standard(s)** : FCC CFR Title 47, Part 15, Subpart C  
FCC KDB 558074 D01 15.247 Meas Guidance v05r02  
ANSI C63.10-2013

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

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TESTING CERT #5123.02

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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**

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-1-2202C081	R00	Original Report.	Apr. 01, 2022	Valid

### 1. 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.

## 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 Rd. Shixia, Dalang Town Dongguan City, Guangdong 523792 People's Republic of China.

BTL's 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	U,(dB)
DG-CB01	CISPR	9kHz ~ 30MHz	2.36

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
DG-CB03 (3m)	CISPR	30MHz ~ 200MHz	V	4.36
		30MHz ~ 200MHz	H	3.32
		200MHz ~ 1,000MHz	V	4.08
		200MHz ~ 1,000MHz	H	3.96

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB03 (3m)	CISPR	1GHz ~ 6GHz	3.80
		6GHz ~ 18GHz	4.82

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB03 (1m)	CISPR	18 ~ 26.5 GHz	3.62
		26.5 ~ 40 GHz	4.00

### C. Other Measurement:

Test Item	Uncertainty
Bandwidth	±3.8 %
Maximum Output Power	±0.95 dB
Conducted Spurious Emission	±2.71 dB
Power Spectral Density	±0.86 dB
Temperature	±0.08 °C
Humidity	±1.5%

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	21°C	51%	AC 120V/60Hz	Ash Deng
Radiated Emissions-9 kHz to 30 MHz	25°C	58%	DC 5V	Farun Liang
Radiated Emissions-30 MHz to 1000 MHz	23°C	54%	DC 5V	Kwok Guo
Radiated Emissions-Above 1000 MHz	23°C	54%	DC 5V	Kwok Guo
Bandwidth	24°C	53%	DC 5V	Nicole Chen
Maximum Output Power	24°C	53%	DC 5V	Nicole Chen
Conducted Spurious Emission	24°C	53%	DC 5V	Nicole Chen
Power Spectral Density	24°C	53%	DC 5V	Nicole Chen



## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	WIRELESS DONGLE
Brand Name	RAZER
Test Model	HSD01
Series Model	N/A
Model Difference(s)	N/A
Power Source	Supplied from USB Port.
Power Rating	DC 5V
Operation Frequency	2402 MHz ~ 2480 MHz
Modulation Type	GFSK
Bit Rate of Transmitter	2Mbps
Max. Peak Output Power	2Mbps: 8.16 dBm (0.0065 W)
Max. Average Output Power	2Mbps: 8.04 dBm (0.0064 W)

**Note:**

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. The system's model name is RZ01-0439XXXX-XXXX (X: Can be 0-9, A-Z), and the system contains a Gaming Mouse. (Model name: RZ01-0439) and Wireless Dongle (Model name: HSD01).

## 2. Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402	28	2429	55	2456
02	2403	29	2430	56	2457
03	2404	30	2431	57	2458
04	2405	31	2432	58	2459
05	2406	32	2433	59	2460
06	2407	33	2434	60	2461
07	2408	34	2435	61	2462
08	2409	35	2436	62	2463
09	2410	36	2437	63	2464
10	2411	37	2438	64	2465
11	2412	38	2439	65	2466
12	2413	39	2440	66	2467
13	2414	40	2441	67	2468
14	2415	41	2442	68	2469
15	2416	42	2443	69	2470
16	2417	43	2444	70	2471
17	2418	44	2445	71	2472
18	2419	45	2446	72	2473
19	2420	46	2447	73	2474
20	2421	47	2448	74	2475
21	2422	48	2449	75	2476
22	2423	49	2450	76	2477
23	2424	50	2451	77	2478
24	2425	51	2452	78	2479
25	2426	52	2453	79	2480
26	2427	53	2454		
27	2428	54	2455		

## 3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	PCB	N/A	0.09

Note: The antenna gain is provided by the manufacturer.

## 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_2Mbps Channel 01/40/79
Mode 2	TX Mode_2Mbps Channel 79

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 79

Radiated emissions test - Below 1GHz	
Final Test Mode	Description
Mode 2	TX Mode_2Mbps Channel 79

Radiated emissions test - Above 1GHz	
Final Test Mode	Description
Mode 1	TX Mode_2Mbps Channel 01/40/79

Conducted test	
Final Test Mode	Description
Mode 1	TX Mode_2Mbps Channel 01/40/79

Note:

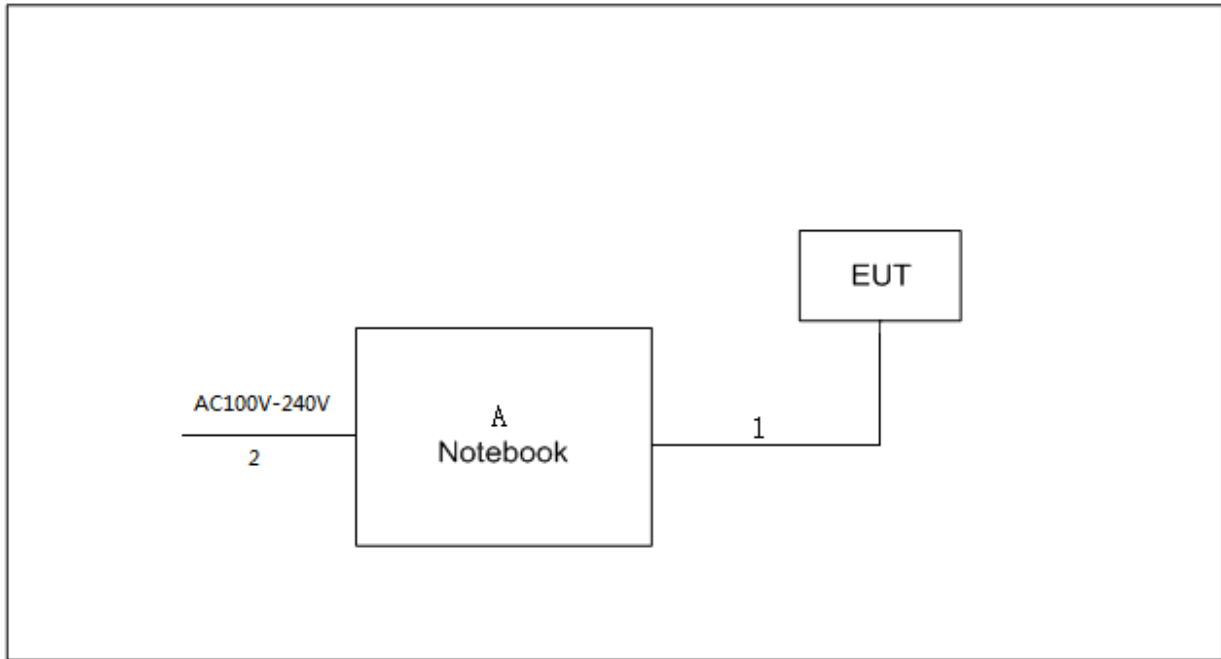
- (1) For radiated emission above 1 GHz test, the spurious points of 1GHz~26.5GHz have been pre-tested and in this report only recorded the worst case. The remaining spurious points are all below the limit value of 20dB.
- (2) For AC power line conducted emissions and radiated emissions below 1 GHz test, the 2Mbps Channel 79 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.

Test Software Version	FCCMTKTest_v0.00.02_20200109		
Frequency (MHz)	2402	2441	2480
2Mbps	8	8	8

## 2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



## 2.5 SUPPORT UNITS

### For Radiated Emissions - 30 MHz to 1000 MHz and Above 1000 MHz

Item	Equipment	Brand	Model No.	Series No.
A	Notebook	Lenovo	V310-14ISK	LR07GZNB

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	Type-C Cable	NO	NO	1.5m
2	AC Cable	NO	NO	1.5m

### For Radiated Emissions - 9 kHz to 30 MHz and AC Power Line Conducted Emissions

Item	Equipment	Brand	Model No.	Series No.
A	Notebook	Lenovo	Pro 13	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	Type-C Cable	NO	NO	1.5m
2	AC Cable	NO	NO	1.5m

### 3. AC POWER LINE CONDUCTED EMISSIONS

#### 3.1 LIMIT

Frequency of Emission (MHz)	Limit (dB $\mu$ V)	
	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.

#### 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.

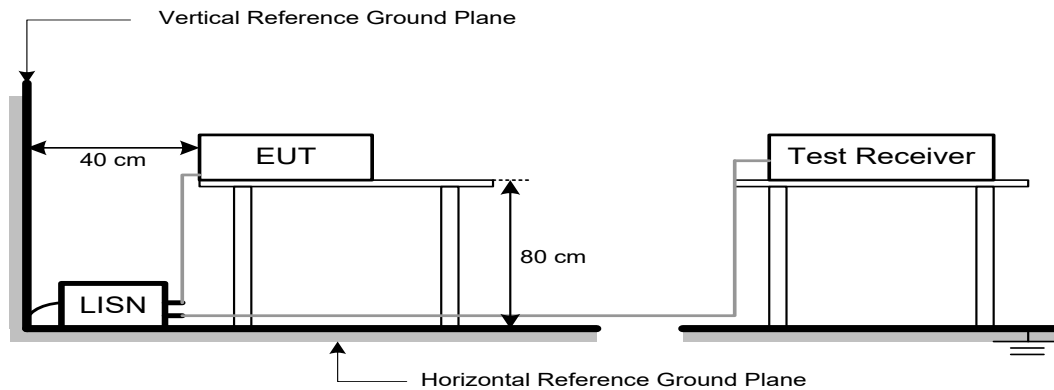
The following table is the setting of the receiver:

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

#### 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 『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.

## 4. RADIATED EMISSIONS

### 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 (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 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).

#### 4.2 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.

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

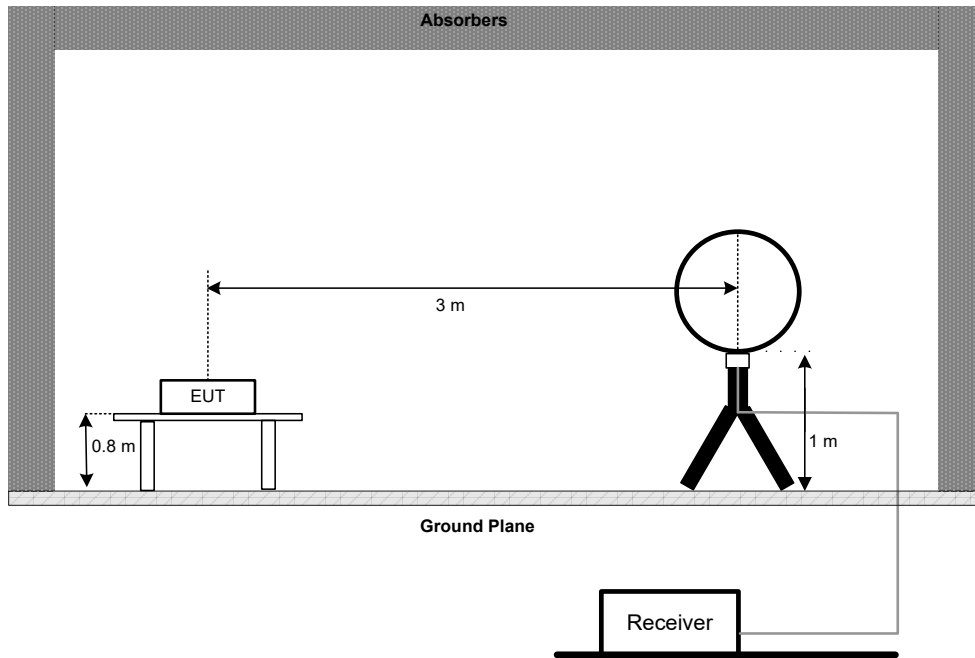


#### 4.3 DEVIATION FROM TEST STANDARD

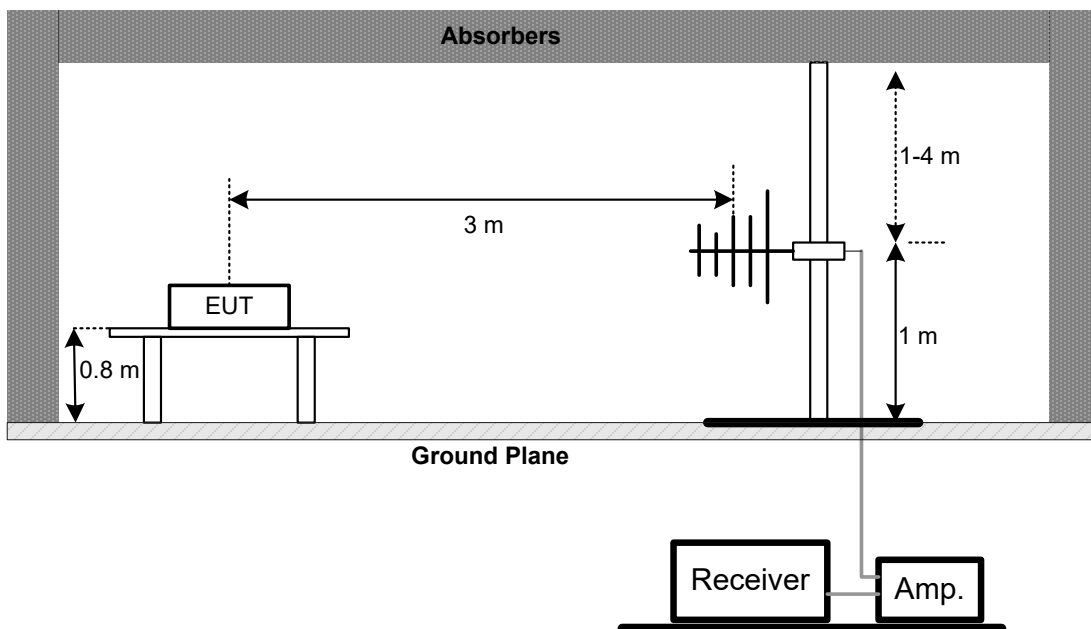
No deviation.

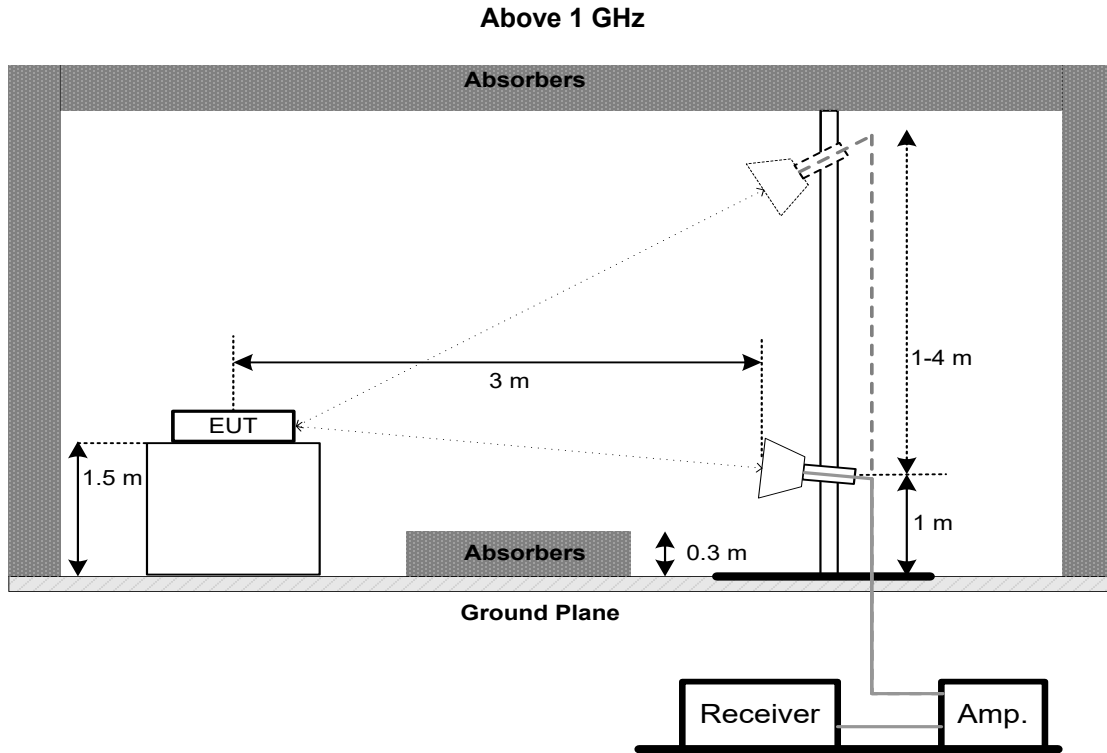
#### 4.4 TEST SETUP

##### 9 kHz to 30 MHz



##### 30 MHz to 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 =  $40 \log (\text{specific distance} / \text{test distance})$  (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

### 5.1 LIMIT

Section	Test Item	Limit
FCC 15.247(a)(2)	6 dB Bandwidth	$\geq 500$ kHz
	99% Emission Bandwidth	-

### 5.2 TEST PROCEDURE

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

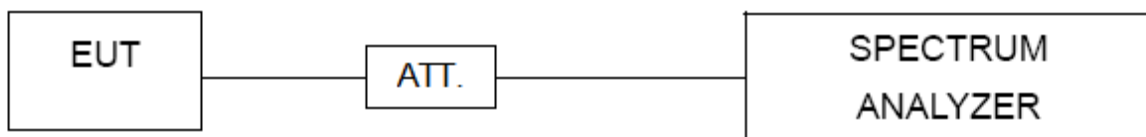
For 99% Emission Bandwidth:

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

### 5.3 DEVIATION FROM STANDARD

No deviation.

### 5.4 TEST SETUP



### 5.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

### 5.6 TEST RESULTS

Please refer to the APPENDIX E.

**6. MAXIMUM OUTPUT POWER**

**6.1 LIMIT**

Section	Test Item	Limit
FCC 15.247(b)(3)	Maximum Output Power	1.0000 watt or 30.00 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 following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Span Frequency	$\geq 3 \times \text{RBW}$
RBW	3 MHz
VBW	3 MHz
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 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. 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

**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 G.

**8. POWER SPECTRAL DENSITY**

**8.1 LIMIT**

Section	Test Item	Limit
FCC 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. The following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Span Frequency	2 MHz (1 Mbps) / 4 MHz (2 Mbps)
RBW	3 kHz
VBW	10 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 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	Jan. 22, 2023
2	LISN	EMCO	3816/2	52765	Jan. 22, 2023
3	TWO-LINE V-NETWORK	R&S	ENV216	101447	Jan. 22, 2023
4	50Ω Terminator	SHX	TF5-3	15041305	N/A
5	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
6	Cable	N/A	RG223	12m	Mar. 08, 2023
7	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	MXE EMI Receiver	Keysight	N9038A	MY56400091	Jan. 22, 2023
2*	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Aug. 23, 2024
3	Cable	N/A	RG 213/U(9kHz~1GHz)	N/A	May 27, 2022
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
5	966 Chamber Room	ETS	9*6*6	N/A	Jul. 17, 2022

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. 03, 2023
2	Amplifier	HP	8447D	2944A08742	Jan. 22, 2023
3	Cable	emci	LMR-400	N/A	Nov. 30, 2022
4	Controller	CT	SC100	N/A	N/A
5	Controller	MF	MF-7802	MF780208416	N/A
6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
7	Receiver	Agilent	N9038A	MY52130039	Jan. 22, 2023
8	966 Chamber Room	RM	9*6*6	N/A	Jul. 24, 2022

Radiated Emissions - Above 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Horn Antenna	ARA	DRG-118A	16554	Apr. 21, 2022
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 30, 2022
3	Amplifier	Agilent	8449B	3008A02584	Jul. 10, 2022
4	Controller	CT	SC100	N/A	N/A
5	Controller	MF	MF-7802	MF780208416	N/A
6	Receiver	Agilent	N9038A	MY52130039	Jan. 22, 2023
7	EXA Spectrum Analyzer	Keysight	N9010A	MY56480488	Jan. 22, 2023
8	Low Noise Amplifier	CONNPHY	CLN-18G40G-4330-K	619413	Jul. 16, 2022
9	Cable	N/A	A81-SMAMSMAM-12.5M	N/A	Oct. 15, 2022
10	Cable	Talent microwave	A40-2.92M2.92M-2.5M	N/A	Nov. 30, 2022
11	Filter	STI	STI15-9912	N/A	Jul. 10, 2022
12	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
13	966 Chamber Room	RM	9*6*6	N/A	Jul. 24, 2022

**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	FSP40	100185	Jul. 10, 2022
2	Attenuator	WOKEN	6SM3502	VAS1214NL	N/A
3	RF Cable	Tongkaichuan	N/A	N/A	N/A
4	DC Block	Mini	N/A	N/A	N/A

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

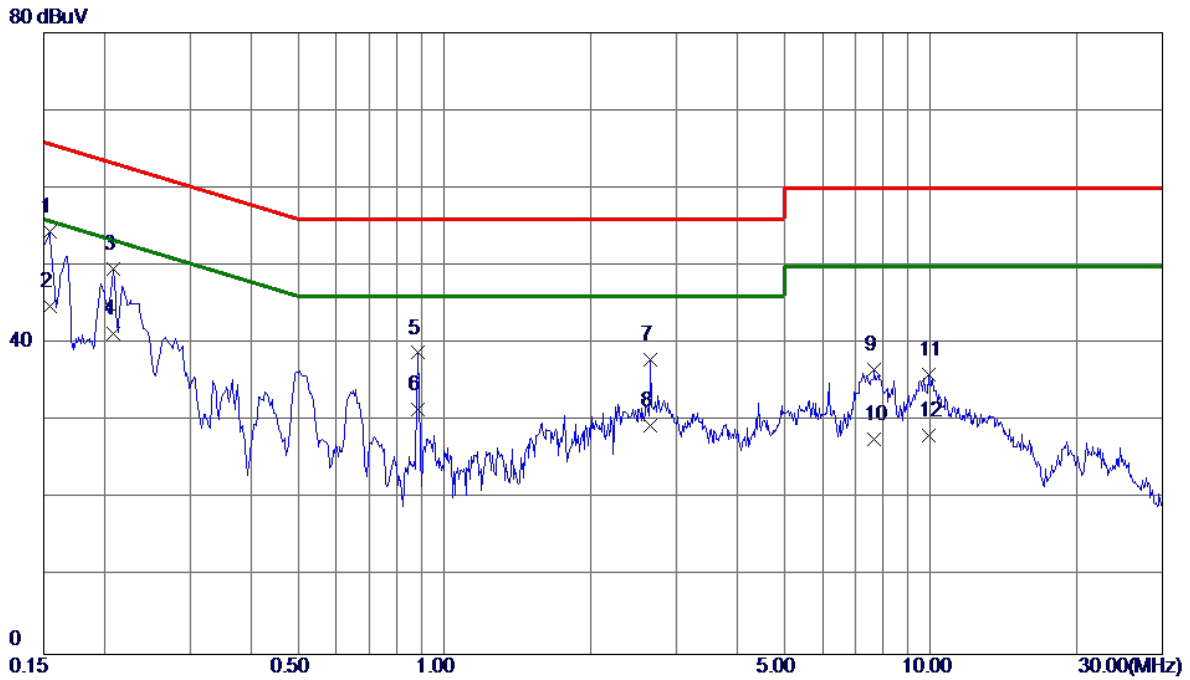
"\*" calibration period of equipment list is three year.

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



## **APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS**

Test Mode	TX Mode_2Mbps Channel 79	Phase	Line
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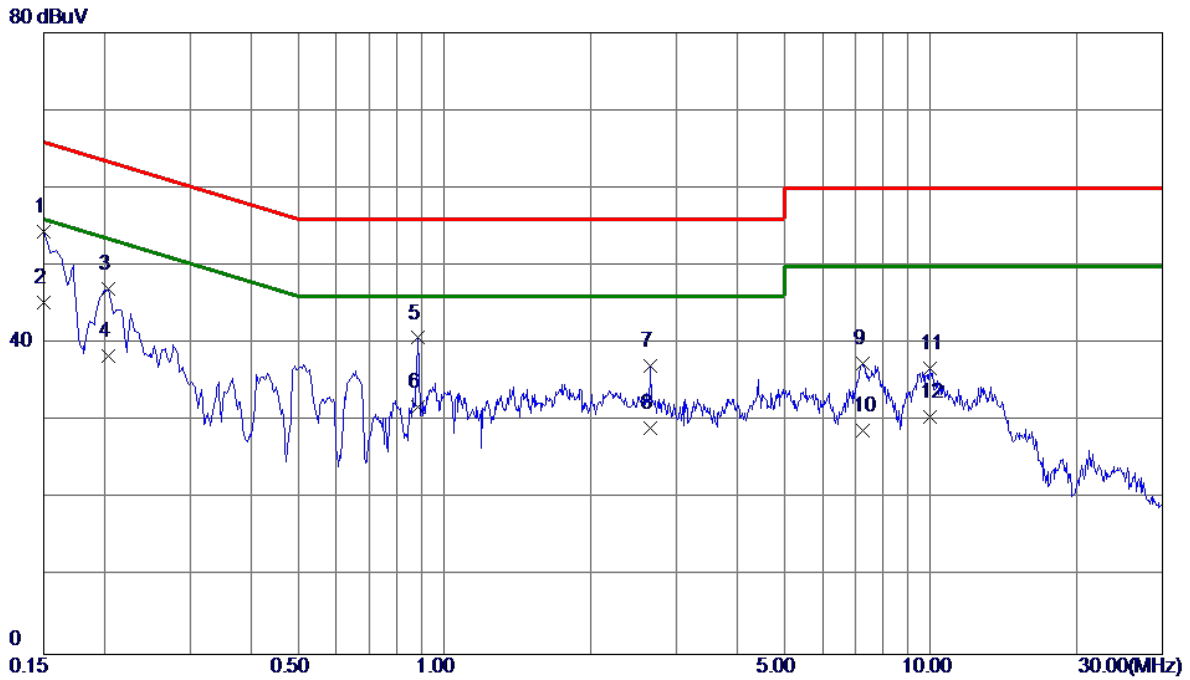


No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.1545	43.85	10.53	54.38	65.75	-11.37	QP	
2 *	0.1545	34.31	10.53	44.84	55.75	-10.91	AVG	
3	0.2085	39.07	10.52	49.59	63.26	-13.67	QP	
4	0.2085	30.80	10.52	41.32	53.26	-11.94	AVG	
5	0.8835	28.04	10.76	38.80	56.00	-17.20	QP	
6	0.8835	20.70	10.76	31.46	46.00	-14.54	AVG	
7	2.6520	27.03	10.92	37.95	56.00	-18.05	QP	
8	2.6520	18.50	10.92	29.42	46.00	-16.58	AVG	
9	7.6470	25.52	11.14	36.66	60.00	-23.34	QP	
10	7.6470	16.60	11.14	27.74	50.00	-22.26	AVG	
11	9.8969	24.83	11.22	36.05	60.00	-23.95	QP	
12	9.8969	16.90	11.22	28.12	50.00	-21.88	AVG	

**REMARKS:**

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

Test Mode	TX Mode_2Mbps Channel 79	Phase	Neutral
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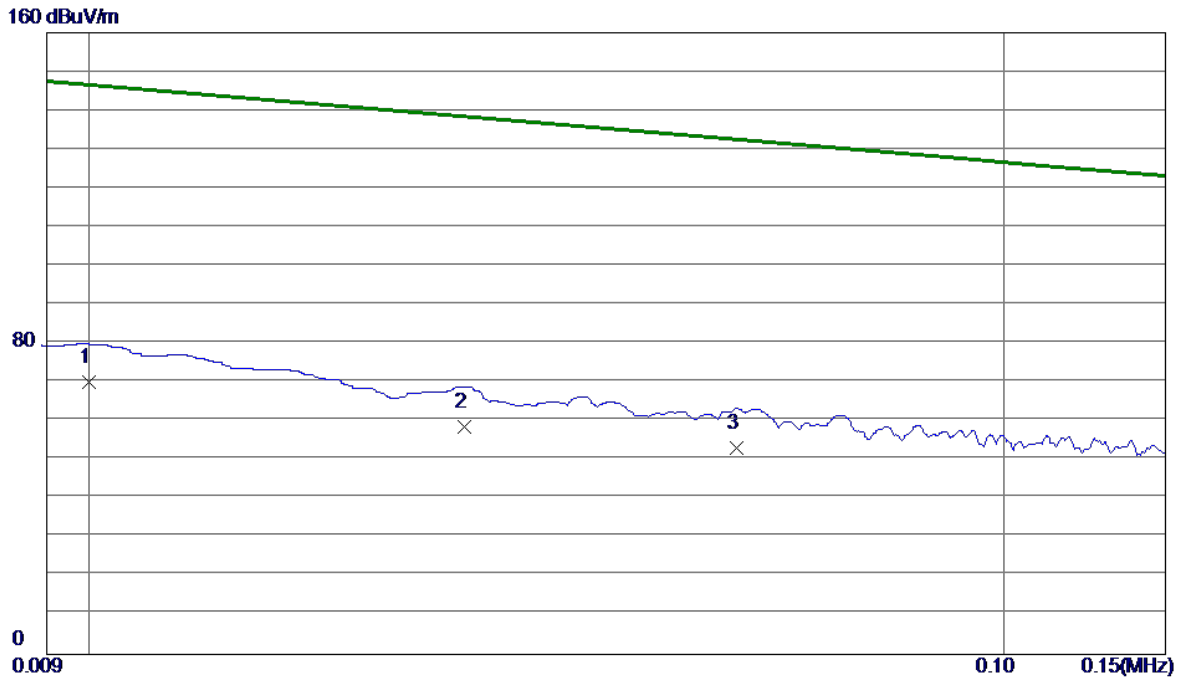
No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.1500	44.62	9.85	54.47	66.00	-11.53	QP	
2 *	0.1500	35.41	9.85	45.26	56.00	-10.74	AVG	
3	0.2040	37.13	9.86	46.99	63.45	-16.46	QP	
4	0.2040	28.60	9.86	38.46	53.45	-14.99	AVG	
5	0.8835	30.54	10.18	40.72	56.00	-15.28	QP	
6	0.8835	21.71	10.18	31.89	46.00	-14.11	AVG	
7	2.6520	26.43	10.62	37.05	56.00	-18.95	QP	
8	2.6520	18.50	10.62	29.12	46.00	-16.88	AVG	
9	7.2510	25.98	11.43	37.41	60.00	-22.59	QP	
10	7.2510	17.31	11.43	28.74	50.00	-21.26	AVG	
11	9.9825	25.11	11.69	36.80	60.00	-23.20	QP	
12	9.9825	18.90	11.69	30.59	50.00	-19.41	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 79	Polarization	Ant 0°
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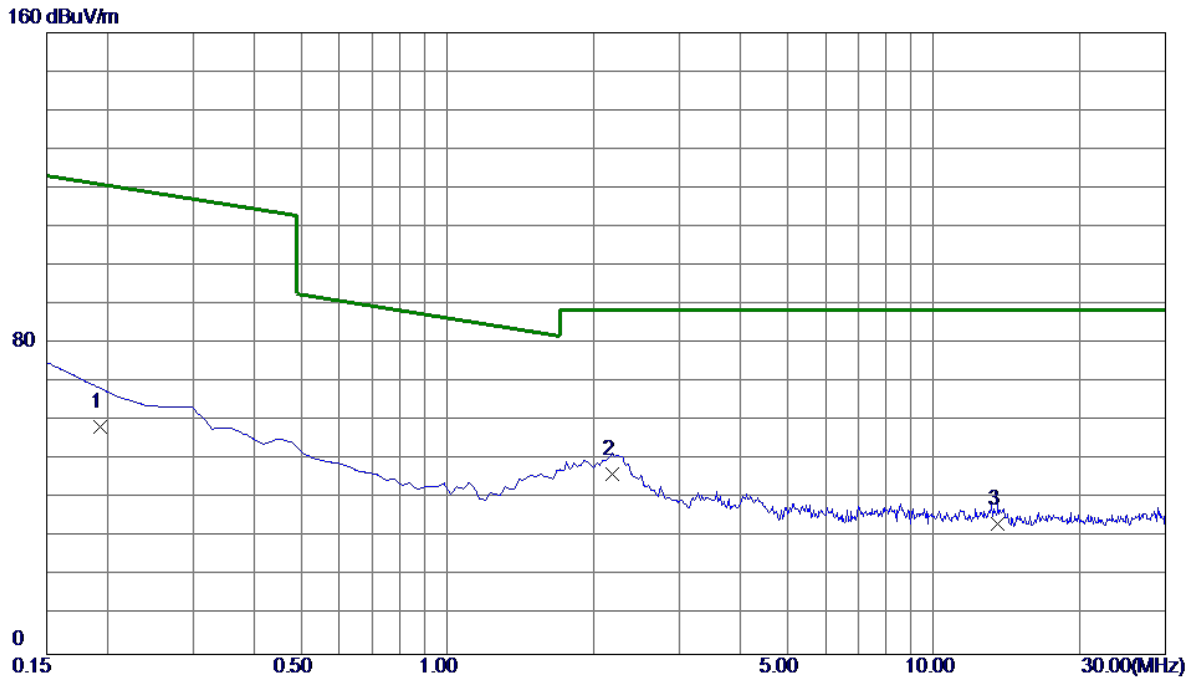


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	0.0100	52.68	17.41	70.09	146.59	-76.50	AVG	
2	0.0257	44.28	14.16	58.44	138.43	-79.99	AVG	
3	0.0510	39.67	13.60	53.27	132.50	-79.23	AVG	

**REMARKS:**

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

Test Mode	TX Mode_2Mbps Channel 79	Polarization	Ant 0°
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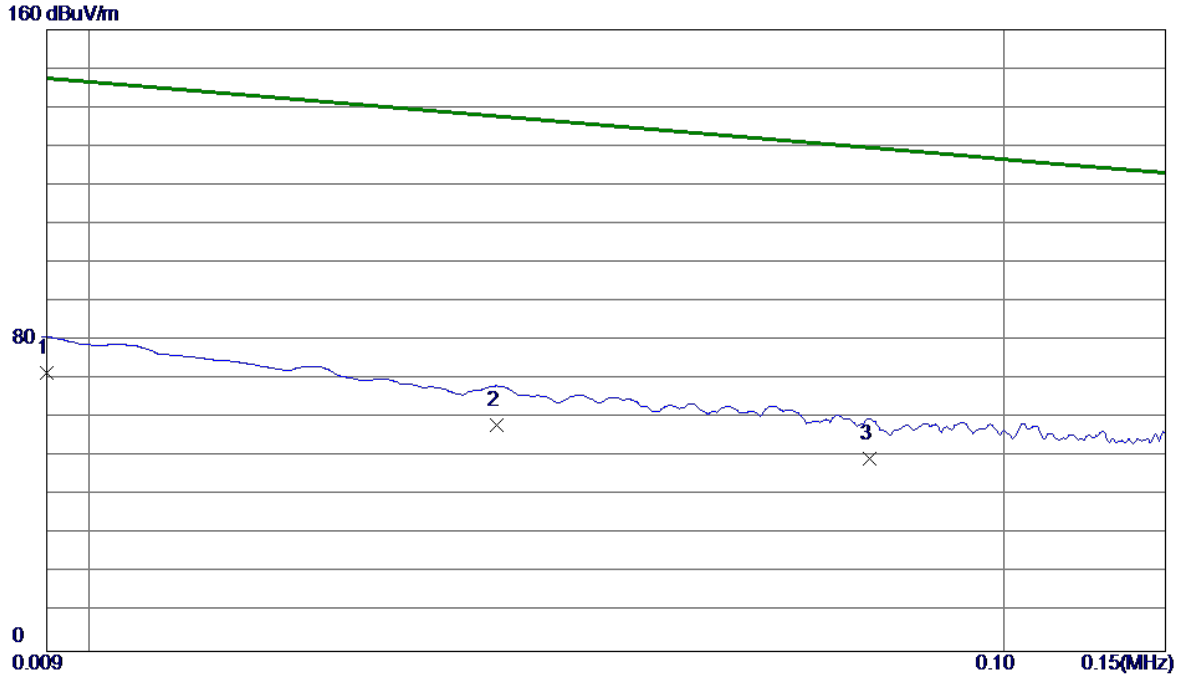


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	0.1934	44.85	13.66	58.51	120.96	-62.45	AVG	
2 *	2.1798	34.26	12.02	46.28	88.63	-42.35	QP	
3	13.5825	21.67	11.80	33.47	88.63	-55.16	QP	

**REMARKS:**

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

Test Mode	TX Mode_2Mbps Channel 79	Polarization	Ant 90°
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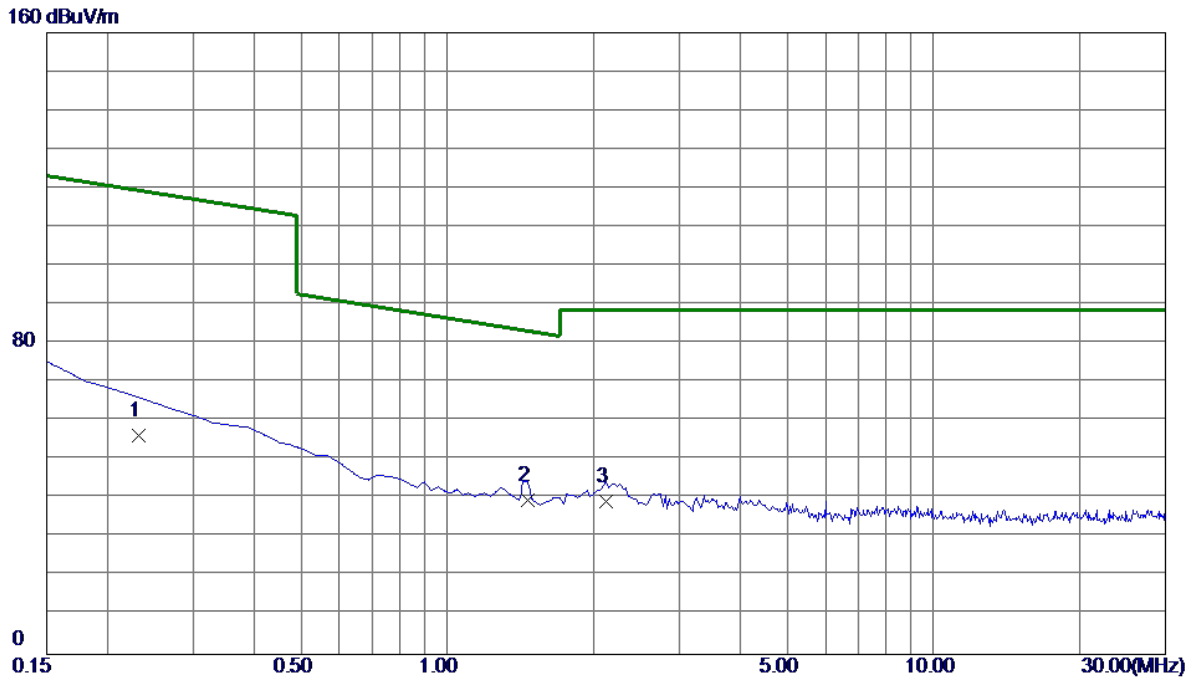


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	0.0090	53.84	17.72	71.56	147.50	-75.94	AVG	
2	0.0279	44.04	14.11	58.15	137.72	-79.57	AVG	
3	0.0713	36.07	13.61	49.68	129.60	-79.92	AVG	

**REMARKS:**

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

Test Mode	TX Mode_2Mbps Channel 79	Polarization	Ant 90°
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No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	0.2316	42.66	13.62	56.28	119.40	-63.12	AVG	
2 *	1.4633	27.20	12.48	39.68	83.38	-43.70	QP	
3	2.1201	27.41	12.04	39.45	88.63	-49.18	QP	

**REMARKS:**

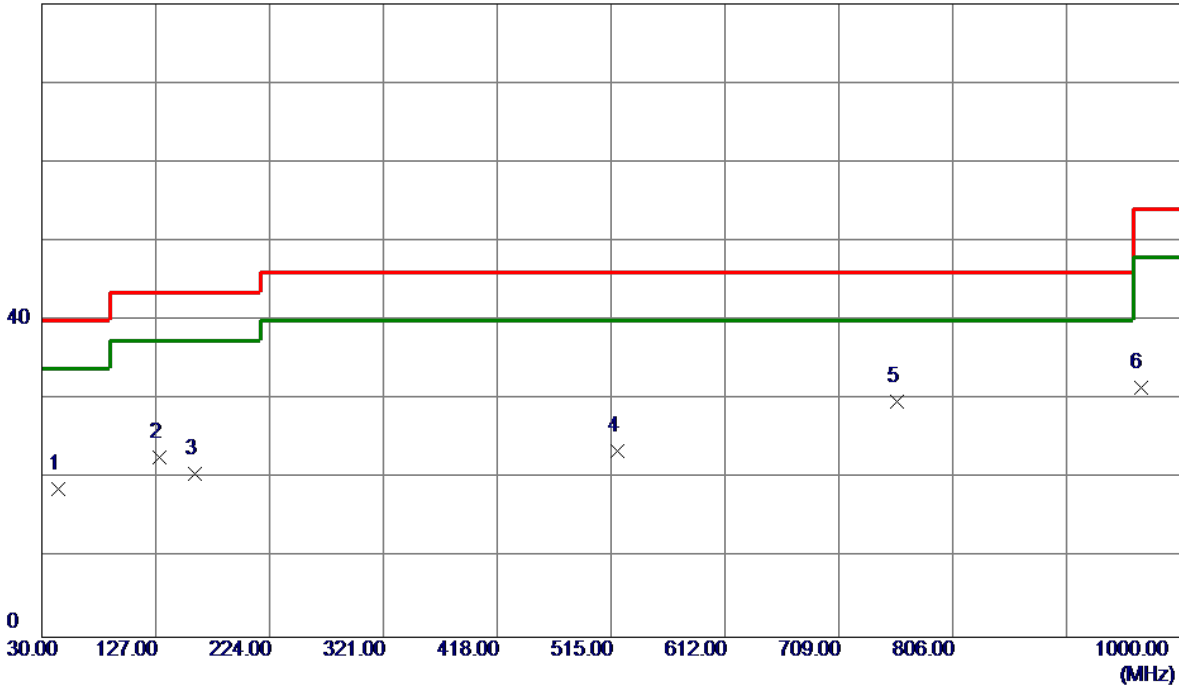
- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.



**APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ**

Test Mode	TX Mode_2Mbps Channel 79	Polarization	Vertical
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80 dBuV/m



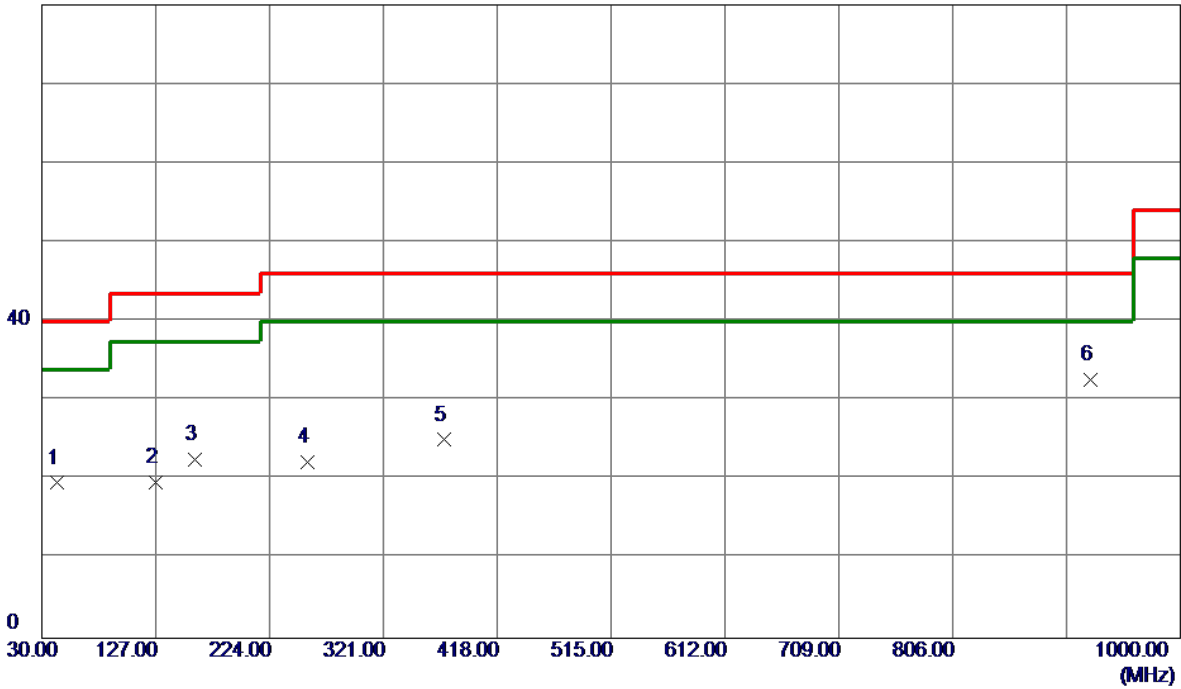
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	44.0650	31.77	-13.11	18.66	40.00	-21.34	Peak	
2	129.9100	37.16	-14.50	22.66	43.50	-20.84	Peak	
3	159.9800	33.34	-12.70	20.64	43.50	-22.86	Peak	
4	520.3350	30.31	-6.74	23.57	46.00	-22.43	Peak	
5 *	758.9550	31.74	-2.04	29.70	46.00	-16.30	Peak	
6	966.0500	30.29	1.26	31.55	54.00	-22.45	Peak	

**REMARKS:**

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

Test Mode	TX Mode_2Mbps Channel 79	Polarization	Horizontal
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80 dBuV/m



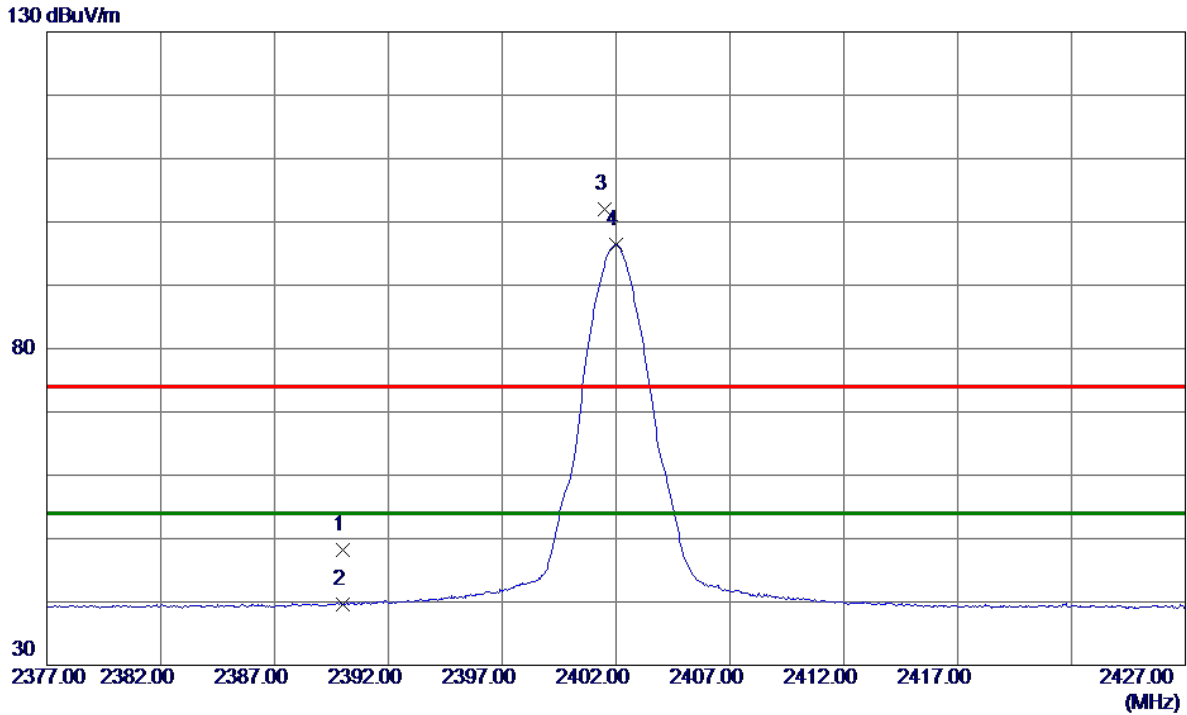
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	42.6100	32.85	-13.25	19.60	40.00	-20.40	Peak	
2	126.5150	34.38	-14.63	19.75	43.50	-23.75	Peak	
3	159.9800	35.19	-12.70	22.49	43.50	-21.01	Peak	
4	256.0100	35.37	-13.06	22.31	46.00	-23.69	Peak	
5	372.8950	34.84	-9.80	25.04	46.00	-20.96	Peak	
6 *	923.8550	32.15	0.53	32.68	46.00	-13.32	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 _CH01_2Mbps	Polarization	Vertical
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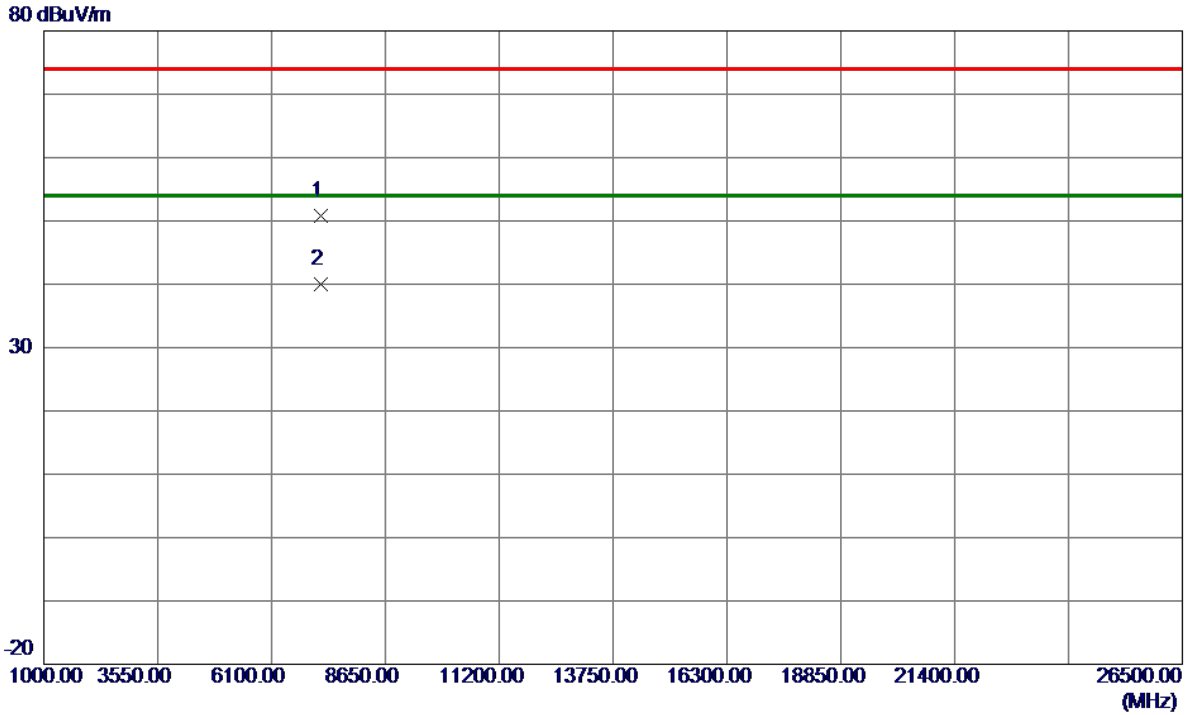


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	39.84	8.31	48.15	74.00	-25.85	Peak	
2	2390.0000	31.25	8.31	39.56	54.00	-14.44	AVG	
3	2401.5250	93.70	8.32	102.02	74.00	28.02	Peak	No Limit
4 *	2401.9750	88.08	8.32	96.40	54.00	42.40	AVG	No Limit

**REMARKS:**

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

Test Mode	TX 2402 MHz _CH01_2Mbps	Polarization	Vertical
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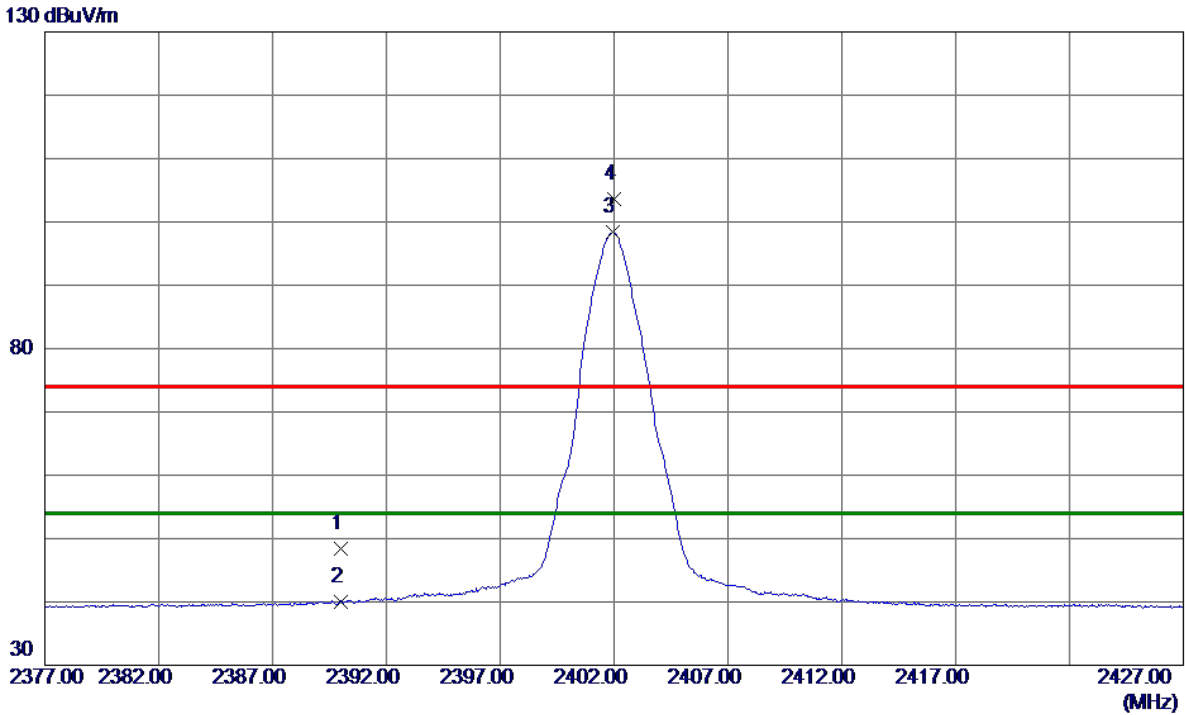


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7206.0230	40.23	10.56	50.79	74.00	-23.21	Peak	
2 *	7206.0470	29.37	10.56	39.93	54.00	-14.07	AVG	

**REMARKS:**

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

Test Mode	TX 2402 MHz_CH01_2Mbps	Polarization	Horizontal
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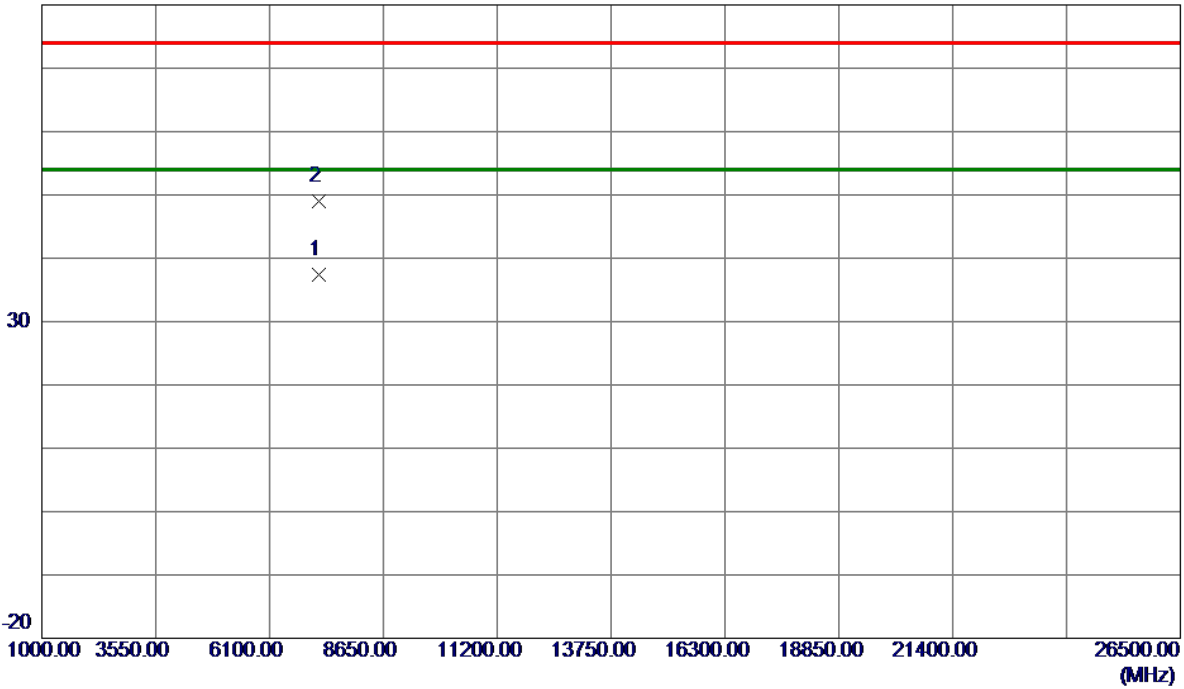
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	40.08	8.31	48.39	74.00	-25.61	Peak	
2	2390.0000	31.71	8.31	40.02	54.00	-13.98	AVG	
3 *	2401.9500	90.00	8.32	98.32	54.00	44.32	AVG	No Limit
4	2402.0250	95.28	8.32	103.60	74.00	29.60	Peak	No Limit

**REMARKS:**

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

Test Mode	TX 2402 MHz _CH01_2Mbps	Polarization	Horizontal
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80 dBuV/m



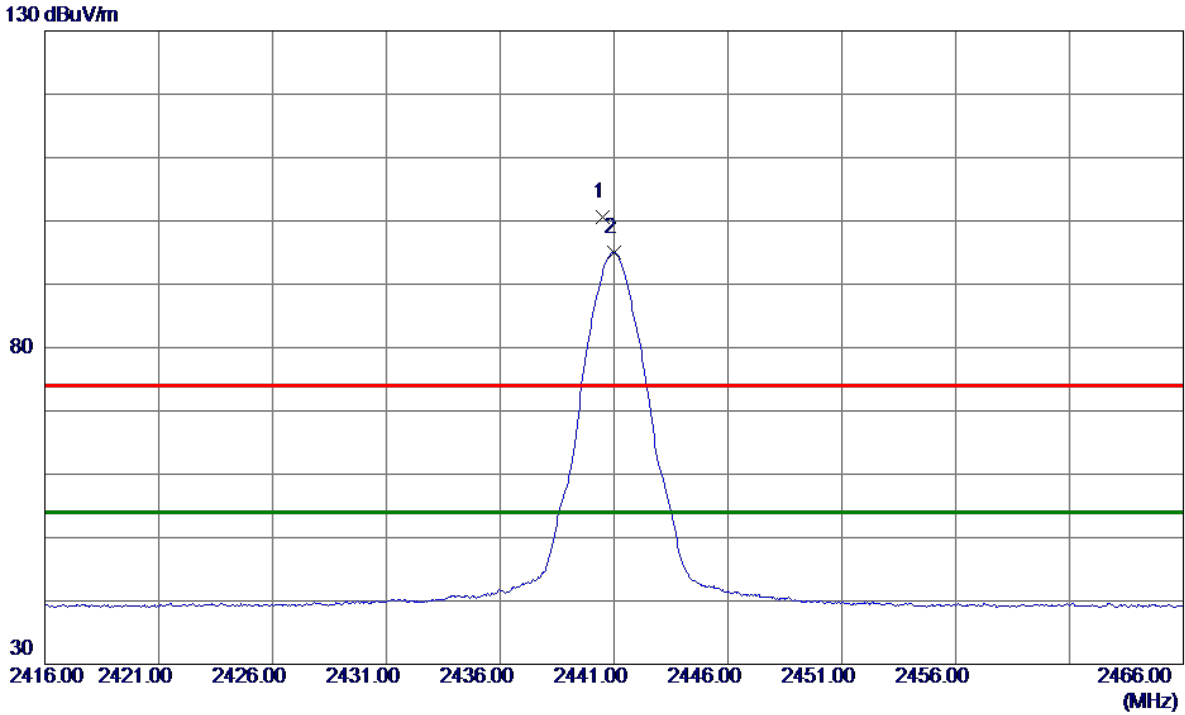
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7205.9450	26.86	10.56	37.42	54.00	-16.58	AVG	
2	7205.9950	38.35	10.56	48.91	74.00	-25.09	Peak	

**REMARKS:**

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



Test Mode	TX 2441 MHz _CH40_2Mbps	Polarization	Vertical
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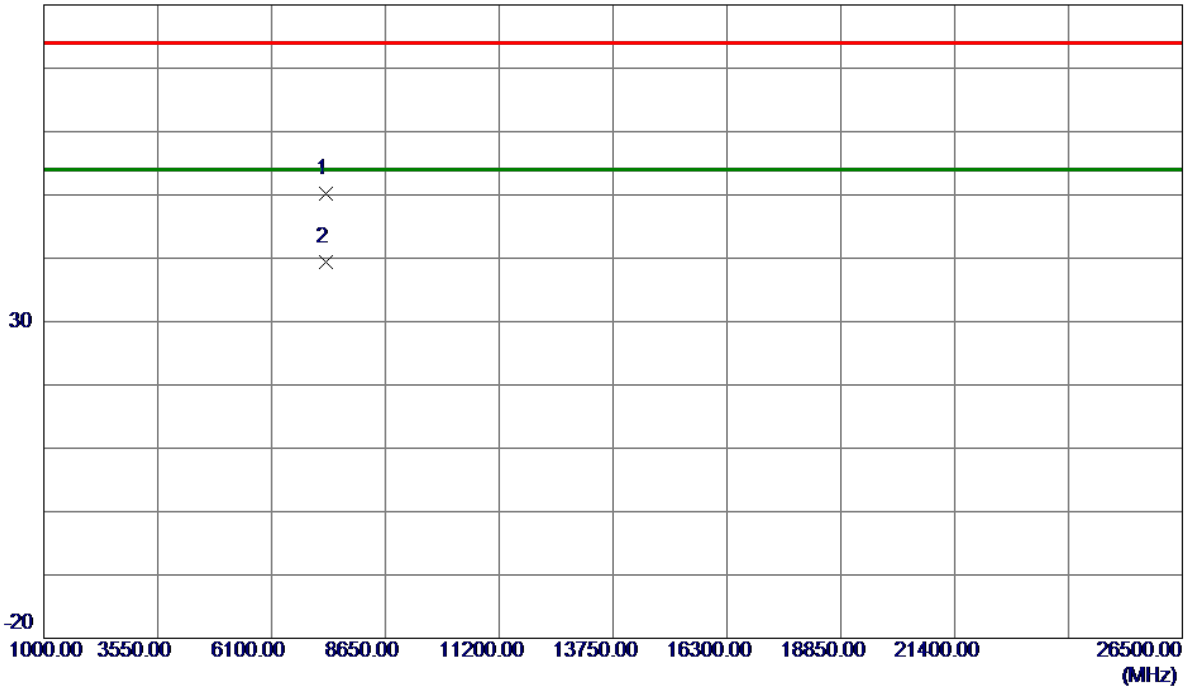
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2440.5250	92.18	8.37	100.55	74.00	26.55	Peak	No Limit
2 *	2440.9750	86.72	8.37	95.09	54.00	41.09	AVG	No Limit

**REMARKS:**

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

Test Mode	TX 2441 MHz _CH40_2Mbps	Polarization	Vertical
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80 dBuV/m

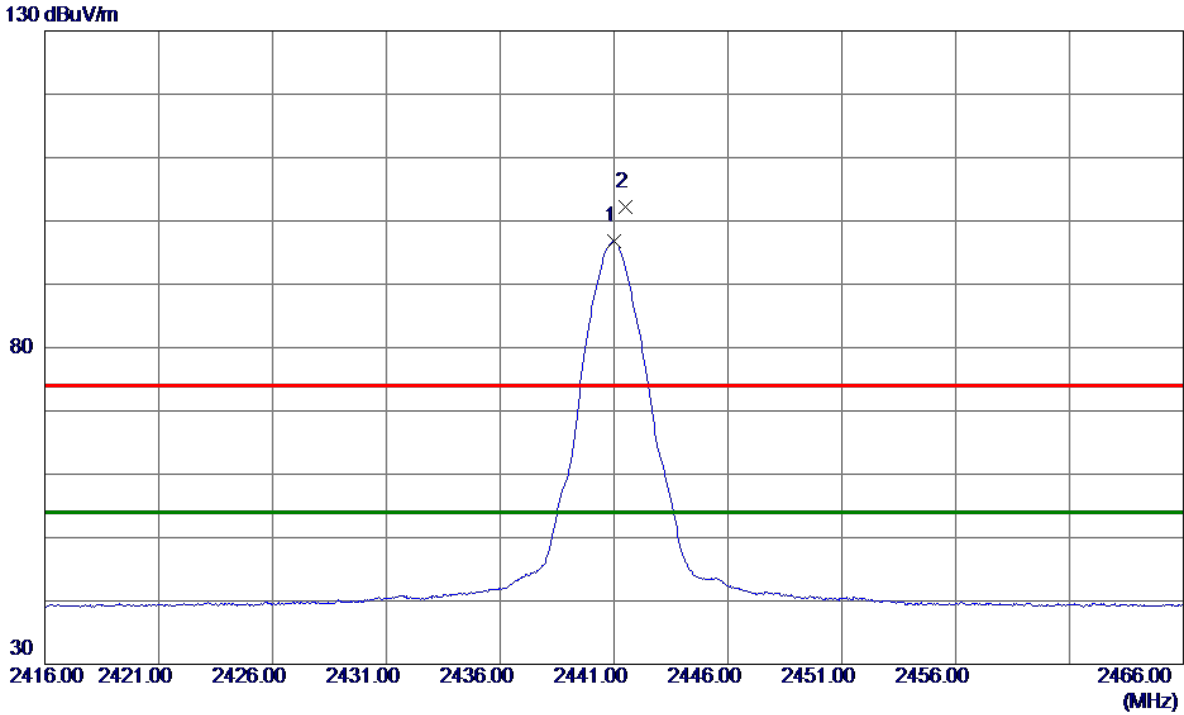


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7322.9200	39.54	10.71	50.25	74.00	-23.75	Peak	
2 *	7322.9500	28.65	10.71	39.36	54.00	-14.64	AVG	

REMARKS:

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

Test Mode	TX 2441 MHz _CH40_2Mbps	Polarization	Horizontal
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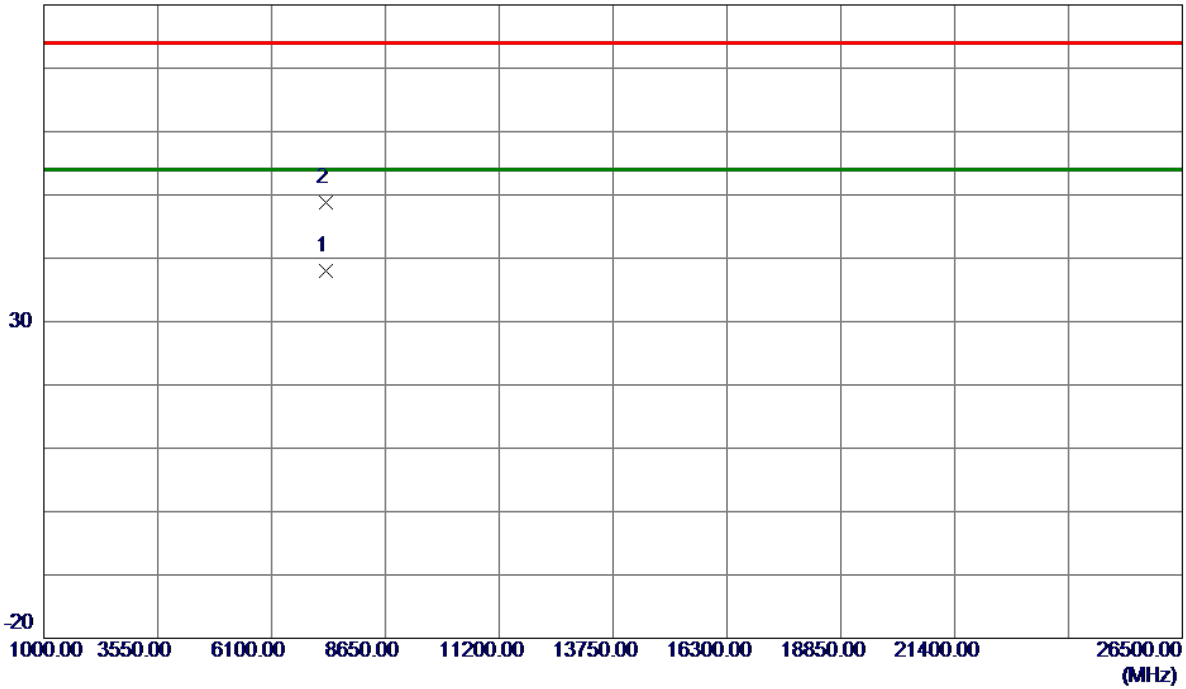
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2440.9750	88.38	8.37	96.75	54.00	42.75	AVG	No Limit
2	2441.5000	93.83	8.37	102.20	74.00	28.20	Peak	No Limit

**REMARKS:**

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

Test Mode	TX 2441 MHz _CH40_2Mbps	Polarization	Horizontal
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80 dBuV/m

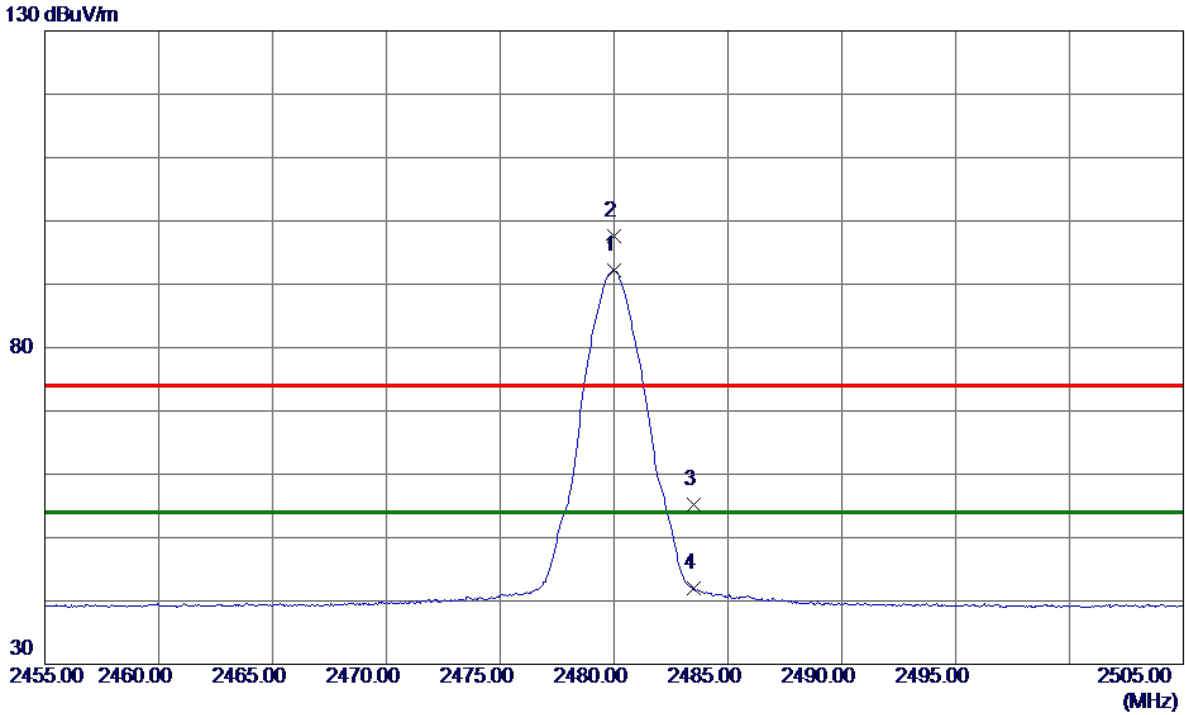


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7321.7430	27.32	10.71	38.03	54.00	-15.97	AVG	
2	7324.4850	38.13	10.71	48.84	74.00	-25.16	Peak	

REMARKS:

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

Test Mode	TX 2480 MHz _CH79_2Mbps	Polarization	Vertical
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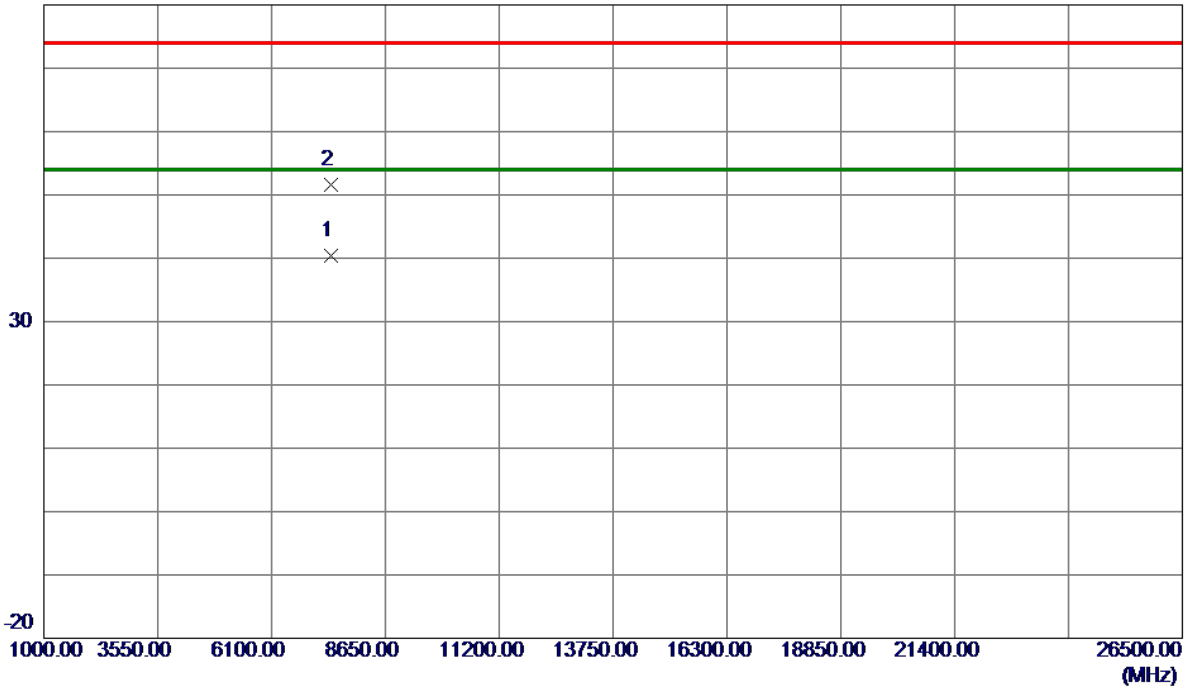
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2479.9750	83.75	8.42	92.17	54.00	38.17	AVG	No Limit
2	2480.0250	89.21	8.42	97.63	74.00	23.63	Peak	No Limit
3	2483.5000	46.78	8.42	55.20	74.00	-18.80	Peak	
4	2483.5000	33.59	8.42	42.01	54.00	-11.99	AVG	

**REMARKS:**

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

Test Mode	TX 2480 MHz _CH79_2Mbps	Polarization	Vertical
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80 dBuV/m

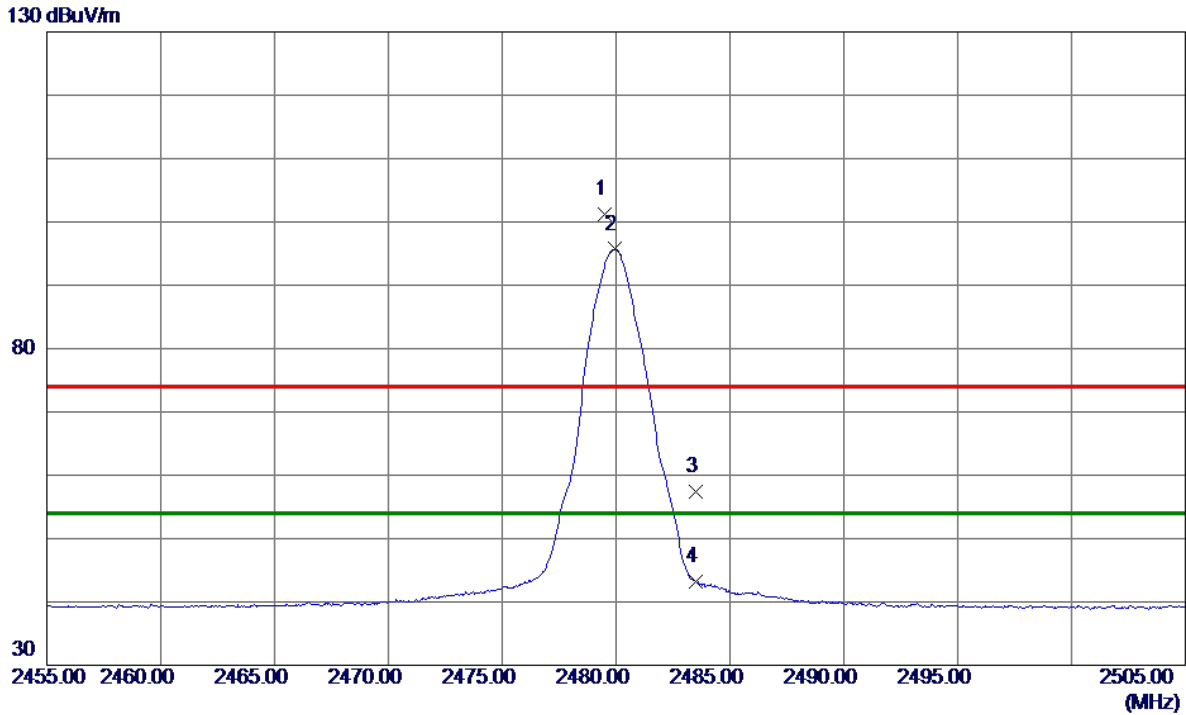


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7440.0500	29.55	10.86	40.41	54.00	-13.59	AVG	
2	7440.1750	40.68	10.86	51.54	74.00	-22.46	Peak	

REMARKS:

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

Test Mode	TX 2480 MHz _CH79_2Mbps	Polarization	Horizontal
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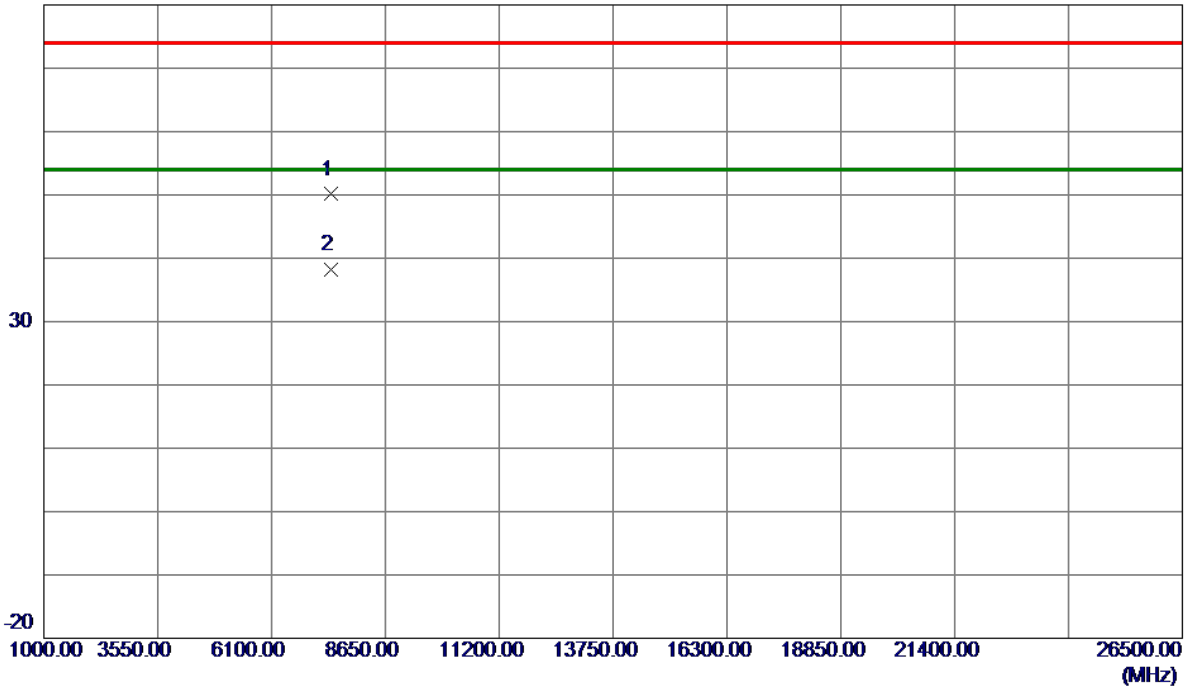
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2479.5250	92.74	8.42	101.16	74.00	27.16	Peak	No Limit
2 *	2479.9250	87.28	8.42	95.70	54.00	41.70	AVG	No Limit
3	2483.5000	49.03	8.42	57.45	74.00	-16.55	Peak	
4	2483.5000	34.75	8.42	43.17	54.00	-10.83	AVG	

**REMARKS:**

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

Test Mode	TX 2480 MHz _CH79_2Mbps	Polarization	Horizontal
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80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7438.1770	39.24	10.86	50.10	74.00	-23.90	Peak	
2 *	7441.9750	27.27	10.86	38.13	54.00	-15.87	AVG	

**REMARKS:**

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

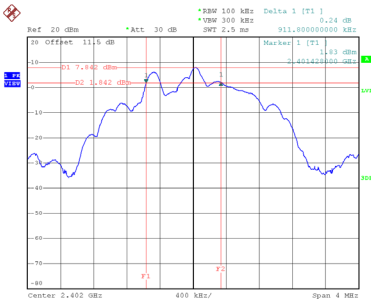


**APPENDIX E - BANDWIDTH**

Test Mode	TX Mode_2Mbps
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Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	6 dB Bandwidth Min. Limit (MHz)	Test Result
01	2402	0.912	1.992	0.5	Pass
40	2441	0.720	2.000	0.5	Pass
79	2480	0.928	2.024	0.5	Pass

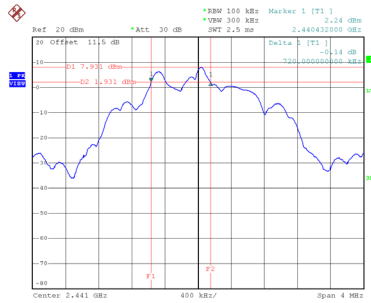
**CH01**



Date: 16.MAR.2022 09:40:42

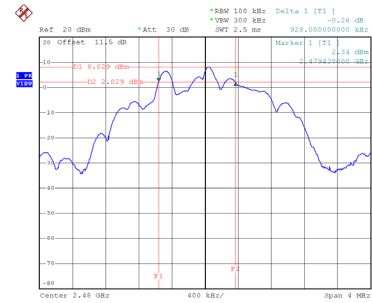
**CH40**

**6 dB Bandwidth**



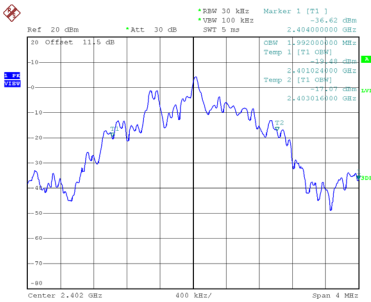
Date: 16.MAR.2022 09:45:00

**CH79**

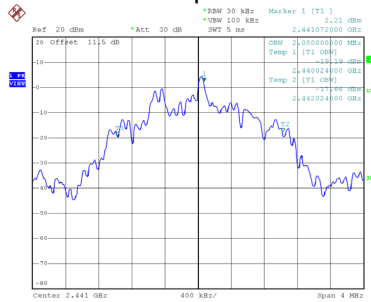


Date: 16.MAR.2022 09:49:20

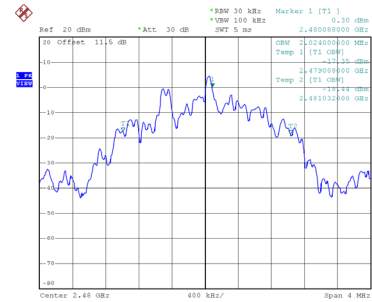
**99 % Occupied Bandwidth**



Date: 16.MAR.2022 09:39:45



Date: 16.MAR.2022 09:46:22



Date: 16.MAR.2022 09:49:27

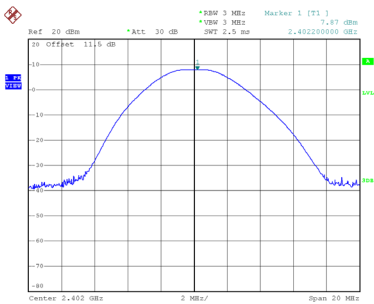
**APPENDIX F - MAXIMUM OUTPUT POWER**

Test Mode	TX Mode_2Mbps
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Frequency (MHz)	Peak Output Power (dBm)	Peak Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	7.87	0.0061	30.00	1.0000	Pass
2441	8.01	0.0063	30.00	1.0000	Pass
2480	8.16	0.0065	30.00	1.0000	Pass

Frequency (MHz)	Average Output Power (dBm)	Average Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	7.79	0.0060	30.00	1.0000	Pass
2441	7.90	0.0062	30.00	1.0000	Pass
2480	8.04	0.0064	30.00	1.0000	Pass

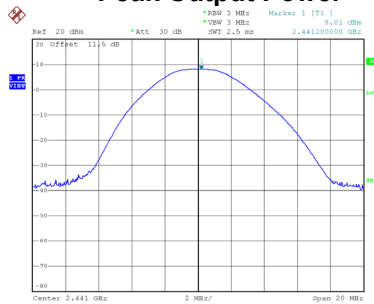
**CH01**



Date: 16.MAR.2022 09:36:16

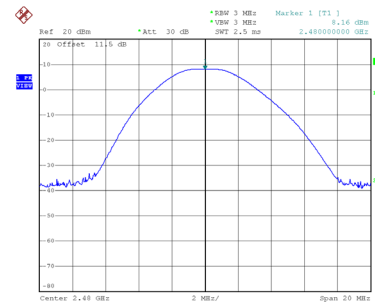
**CH40**

**Peak Output Power**



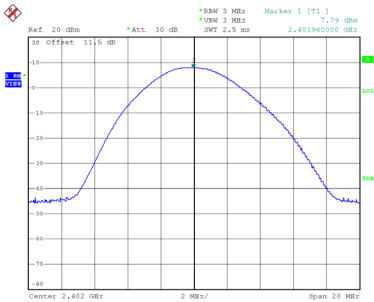
Date: 16.MAR.2022 09:36:59

**CH79**

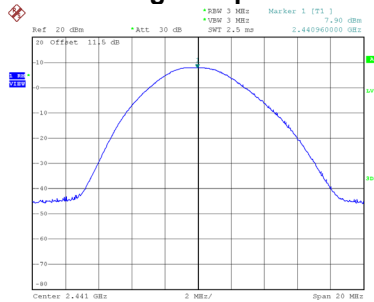


Date: 16.MAR.2022 09:37:17

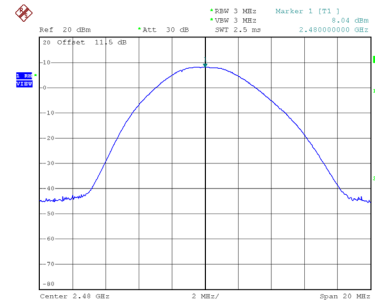
**Average Output Power**



Date: 16.MAR.2022 09:38:20



Date: 16.MAR.2022 09:38:39

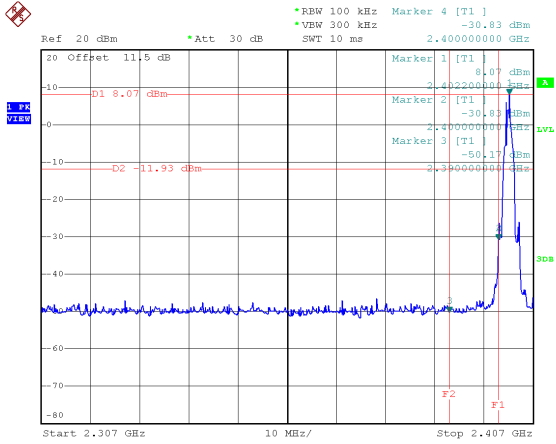


Date: 16.MAR.2022 09:38:56

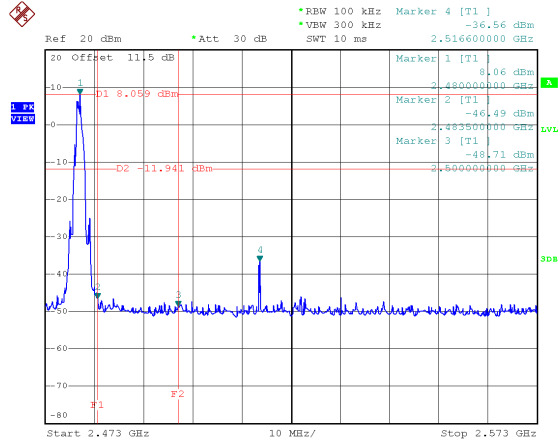
## **APPENDIX G - CONDUCTED SPURIOUS EMISSION**

Test Mode TX Mode\_2Mbps

### Bandedge CH01 (Lower)



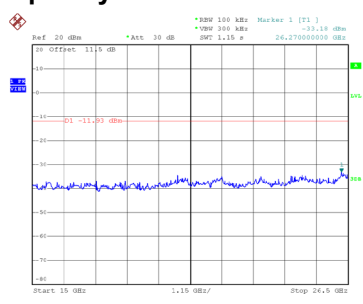
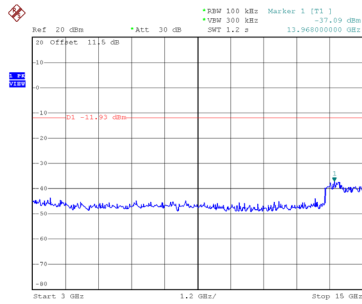
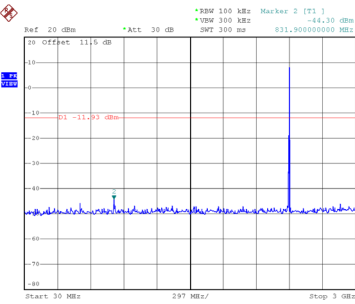
### Bandedge CH79 (Upper)



Date: 16.MAR.2022 09:41:07

Date: 16.MAR.2022 09:49:35

### CH01 – 10th Harmonic of the fundamental frequency

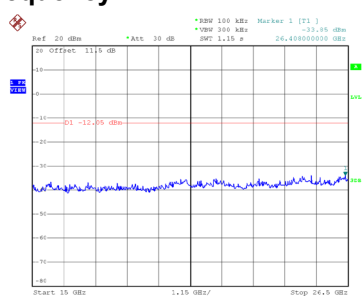
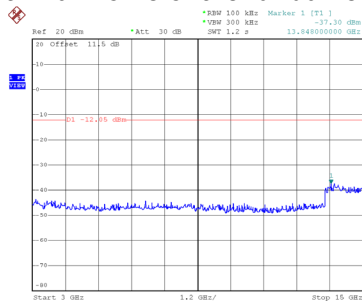
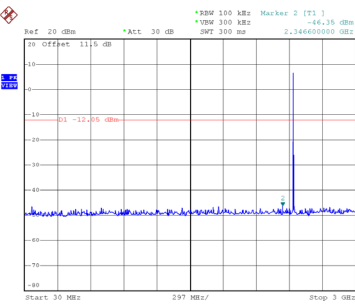


Date: 16.MAR.2022 09:41:21

Date: 16.MAR.2022 09:41:29

Date: 16.MAR.2022 09:41:37

### CH40 – 10th Harmonic of the fundamental frequency

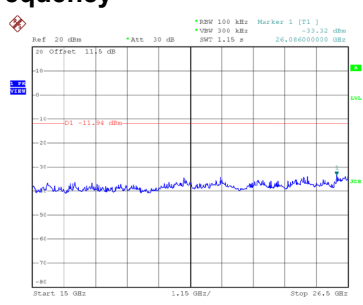
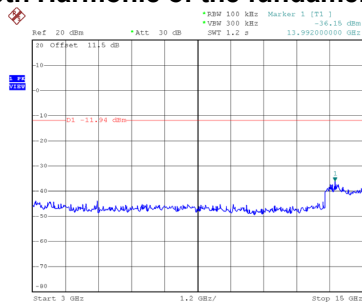
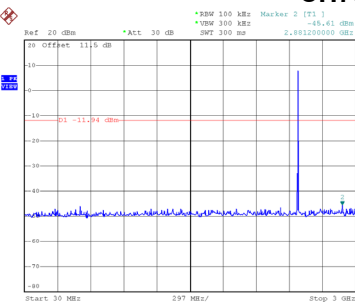


Date: 16.MAR.2022 09:47:57

Date: 16.MAR.2022 09:47:10

Date: 16.MAR.2022 09:47:10

### CH79 – 10th Harmonic of the fundamental frequency



Date: 16.MAR.2022 09:49:49

Date: 16.MAR.2022 09:49:57

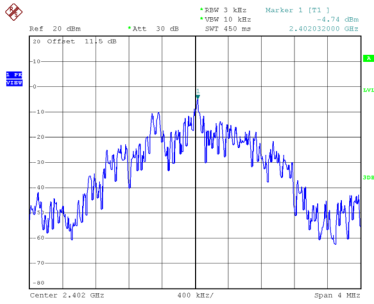
Date: 16.MAR.2022 09:50:06

## APPENDIX H - POWER SPECTRAL DENSITY

Test Mode	TX Mode_2Mbps
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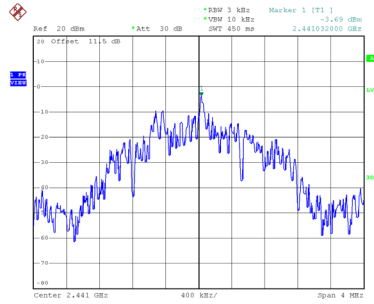
Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Max. Limit (dBm/3 kHz)	Test Result
01	2402	-4.74	8.00	Pass
40	2441	-3.69	8.00	Pass
79	2480	-4.11	8.00	Pass

**CH01**



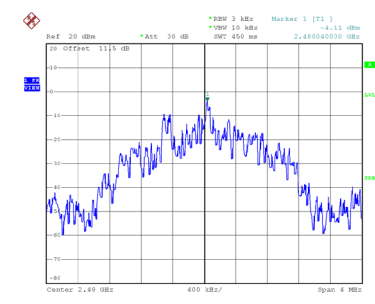
Date: 16.MAR.2022 09:41:44

**CH40**



Date: 16.MAR.2022 09:48:10

**CH79**



Date: 16.MAR.2022 09:50:12

**End of Test Report**