

FCC Radio Test Report

FCC ID: 2AXJ4C420

This report concerns: Original Grant

Project No. : 2204C109A
Equipment : Smart Wire-Free Security Camera
Brand Name : tp-link, tapo
Test Model : Tapo C420
Series Model : N/A
Applicant : TP-Link Corporation Limited
Address : Room 901, 9/F. , New East Ocean Centre, 9 Science Museum Road,
Tsim Sha Tsui, Kowloon, Hong Kong
Manufacturer : TP-Link Corporation Limited
Address : Room 901, 9/F. , New East Ocean Centre, 9 Science Museum Road,
Tsim Sha Tsui, Kowloon, Hong Kong
Date of Receipt : Jun. 06, 2022
Date of Test : Jun. 08, 2022 ~ Jul. 13, 2022
Issued Date : Sep. 30, 2022
Report Version : R02
Test Sample : Engineering Sample No.: DG2022053168 for conducted,
DG2022053169 for radiated emissions above 1GHz, DG2022053171
for others.
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.

Chella Zheng

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TESTING CERT #5123.02

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Declaration

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

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

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

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

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

Limitation

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

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

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REPORT ISSUED HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCCP-2-2204C109A	R00	Original Report.	Sep. 09, 2022	Invalid
BTL-FCCP-2-2204C109A	R01	Changed the product name.	Sep. 13, 2022	Invalid
BTL-FCCP-2-2204C109A	R02	Updated the writing of antenna type.	Sep. 30, 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 test:

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

B. Radiated emissions test:

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	25°C	56%	AC 120V/60Hz	Jeter Wang
Radiated Emissions-9kHz to 30 MHz	24°C	58%	AC 120V/60Hz	Rod Tang
Radiated Emissions-30MHz to 1000MHz	26°C	52%	AC 120V/60Hz	Meers Zhang
Radiated Emissions-Above 1000MHz	26°C	52%	AC 120V/60Hz	Meers Zhang
Bandwidth	24°C	57%	AC 120V/60Hz	Nicole Chen
Maximum Output Power	24°C	57%	AC 120V/60Hz	Nicole Chen
Conducted Spurious Emission	24°C	57%	AC 120V/60Hz	Nicole Chen
Power Spectral Density	24°C	57%	AC 120V/60Hz	Nicole Chen

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Smart Wire-Free Security Camera
Brand Name	tp-link, tapo
Test Model	Tapo C420
Series Model	N/A
Model Difference(s)	N/A
Power Source	1# DC voltage supplied from AC adapter. Model: A8-501000 2# Supplied from battery. Model: Tapo A100
Power Rating	1# Input: 100-240V~ 50/60Hz 0.2A Max. Output: 5V  1A 2# DC 3.7V, 5200mAh
Operation Frequency Band	902 MHz ~ 928 MHz
Modulation Type	GFSK
Bit Rate of Transmitter	50 kbps
Max. Output Power	16.48 dBm (0.0445 W)

Note:

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

2. Channel List:

Channel	Frequency (MHz)
00	920.9
01	921.7
02	922.3

3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	tp-link	Tapo C420(US)1.0	Monopole	N/A	-5.04

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_Channel 00
Mode 2	TX Mode_Channel 00/01/02

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 1	TX Mode_Channel 00

Radiated emissions test - Below 1GHz	
Final Test Mode	Description
Mode 1	TX Mode_Channel 00

Radiated emissions test - Above 1GHz	
Final Test Mode	Description
Mode 2	TX Mode_Channel 00/01/02

Conducted test	
Final Test Mode	Description
Mode 2	TX Mode_Channel 00/01/02

Note:

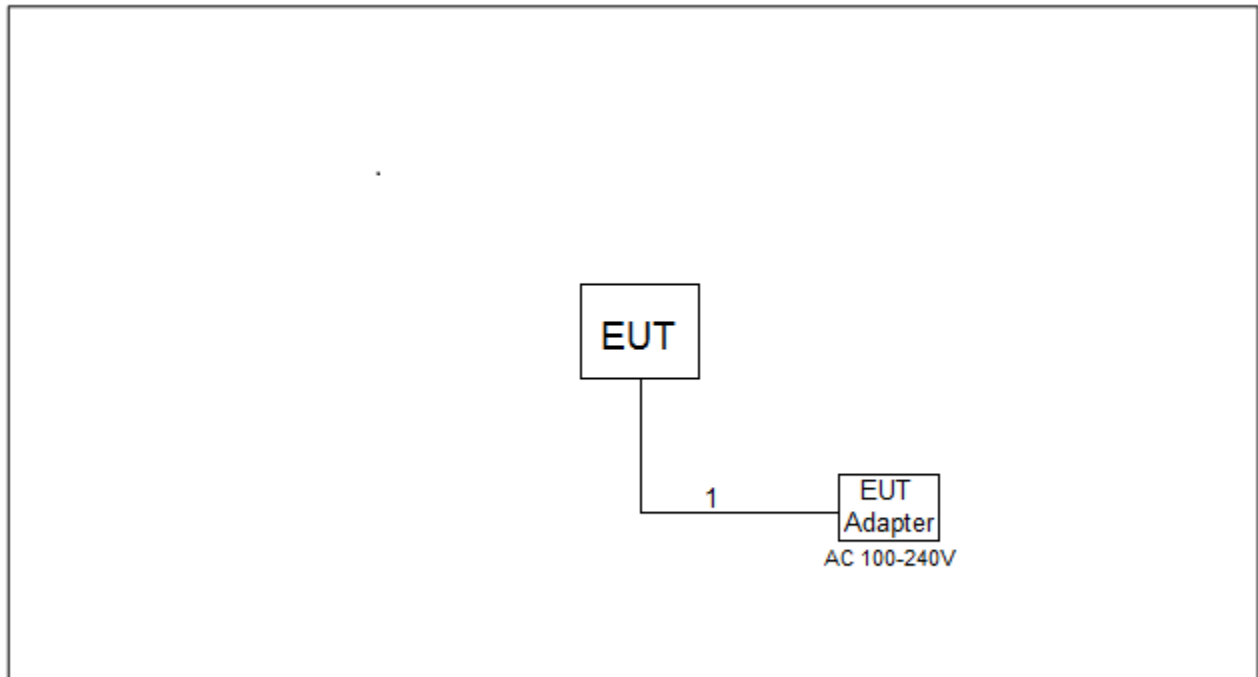
- (1) For radiated emission above 1 GHz test, the spurious points of 1GHz~26.5GHz have been pre-tested and in this report only recorded the worst case. The remaining spurious points are all below the limit value of 20dB.
- (2) For AC power line conducted emissions and radiated emission below 1 GHz test, the Channel 00 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	IPOP V4.0		
Frequency (MHz)	920.9	921.7	922.3
-	Default	Default	Default

2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.5 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.
-	-	-	-	-

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	1.2m

3. AC POWER LINE CONDUCTED EMISSIONS

3.1 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.

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.

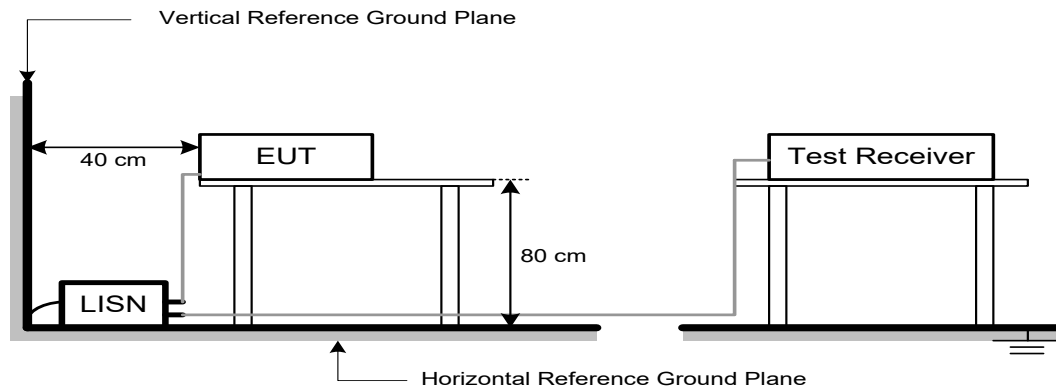
The following table is the setting of the receiver:

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

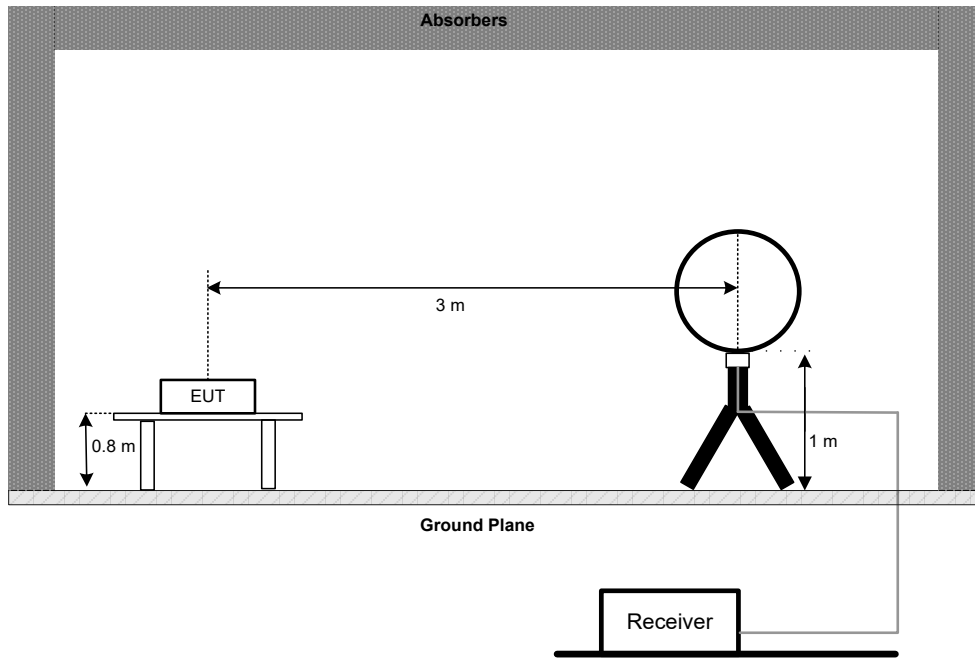
Spectrum Parameters	Setting
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000 MHz for QP detector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

4.3 DEVIATION FROM TEST STANDARD

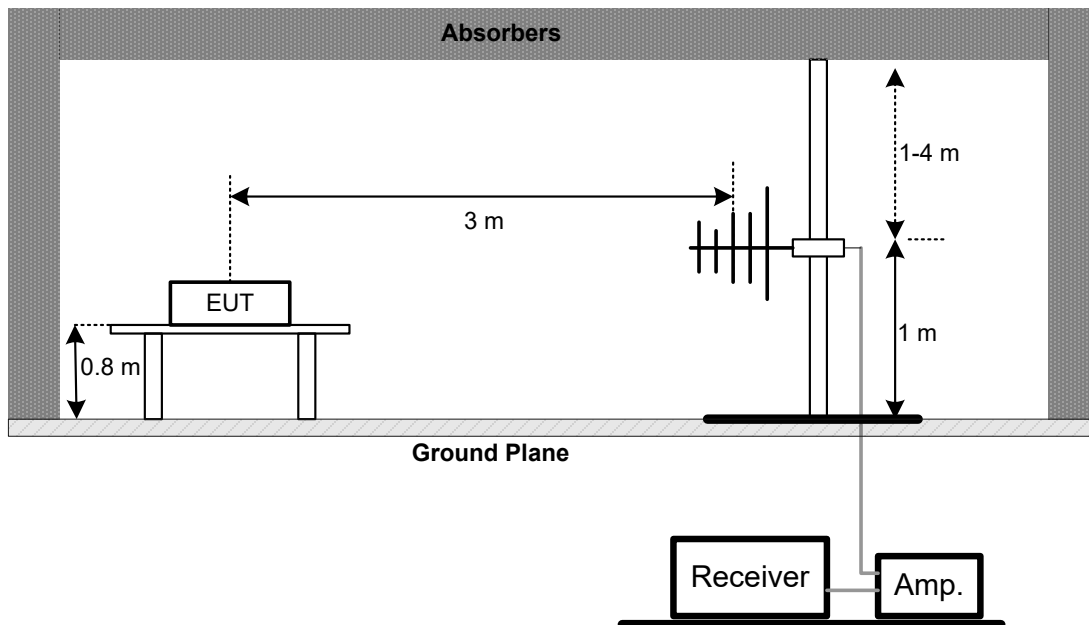
No deviation.

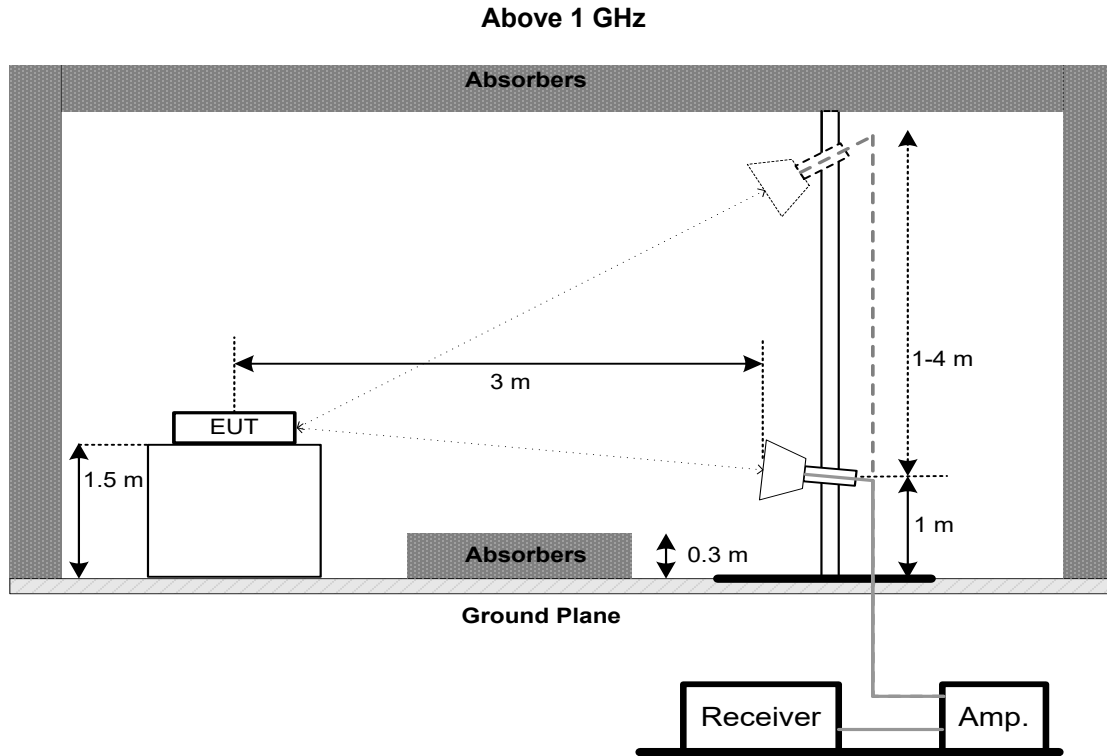
4.4 TEST SETUP

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	≥ 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	2 MHz
RBW	100 kHz
VBW	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

For 99% Emission Bandwidth:

Spectrum Parameters	Setting
Span Frequency	2 MHz
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

- 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:

Spectrum Parameters	Setting
Span Frequency	$\geq 3 \times \text{RBW}$
RBW	3 MHz
VBW	3 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

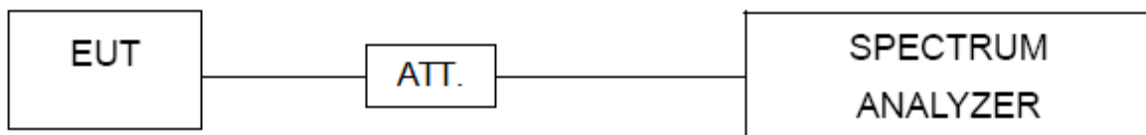
Spectrum Parameters	Setting
Span Frequency	At least 1.5 times the OBW
RBW	1% to 5% of the OBW, not to exceed 1 MHz
VBW	$\geq 3 \times \text{RBW}$
Detector	RMS
Trace	Max Hold
Sweep Time	$\leq (\text{number of points in sweep}) \times T$ (Note)

Note: Where T is defined in 11.6 of ANSI C63.10-2013.

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

- 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 Reference Level:

Spectrum Parameters	Setting
Span Frequency	≥ 1.5 times the bandwidth.
RBW	100 kHz
VBW	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

For Emission Level:

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

- 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:

Spectrum Parameters	Setting
Span Frequency	900 kHz
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. 23, 2023
3	TWO-LINE V-NETWORK	R&S	ENV216	101447	Jan. 23, 2023
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
5	Cable	N/A	RG223	12m	Mar. 08, 2023
6	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	Jun. 17, 2022 Jun. 17, 2023
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	Receiver	Agilent	N9038A	MY52130039	Jan. 22, 2023
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
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. 18, 2023
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	May 27, 2023
3	Amplifier	Agilent	8449B	3008A02584	Jul. 03, 2022 Jul. 03, 2023
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	Talent microwave	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. 03, 2022 Jul. 03, 2023
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. 03, 2022 Jul. 03, 2023
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

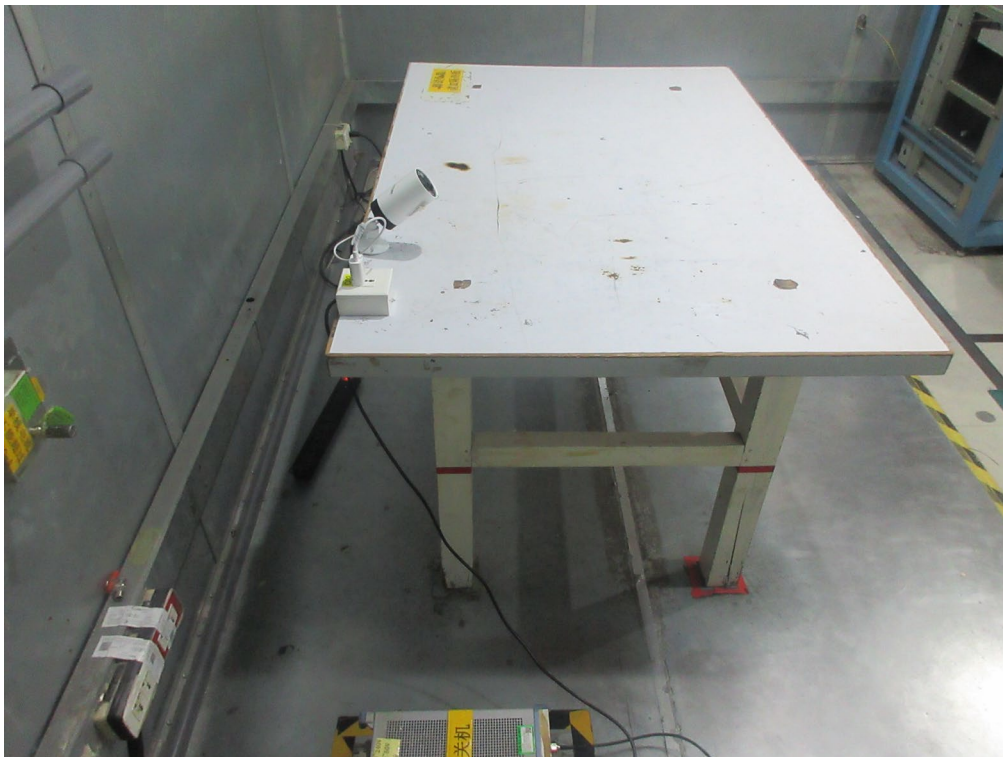
Remark: "N/A" denotes no model name, serial no. or calibration specified.

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

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

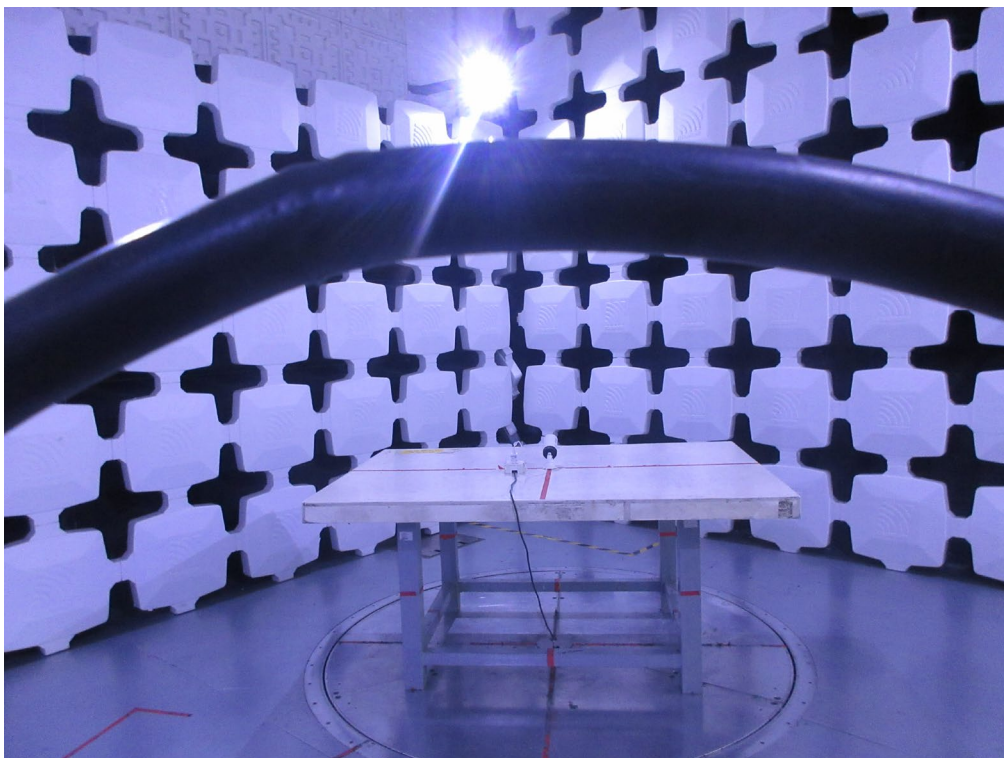
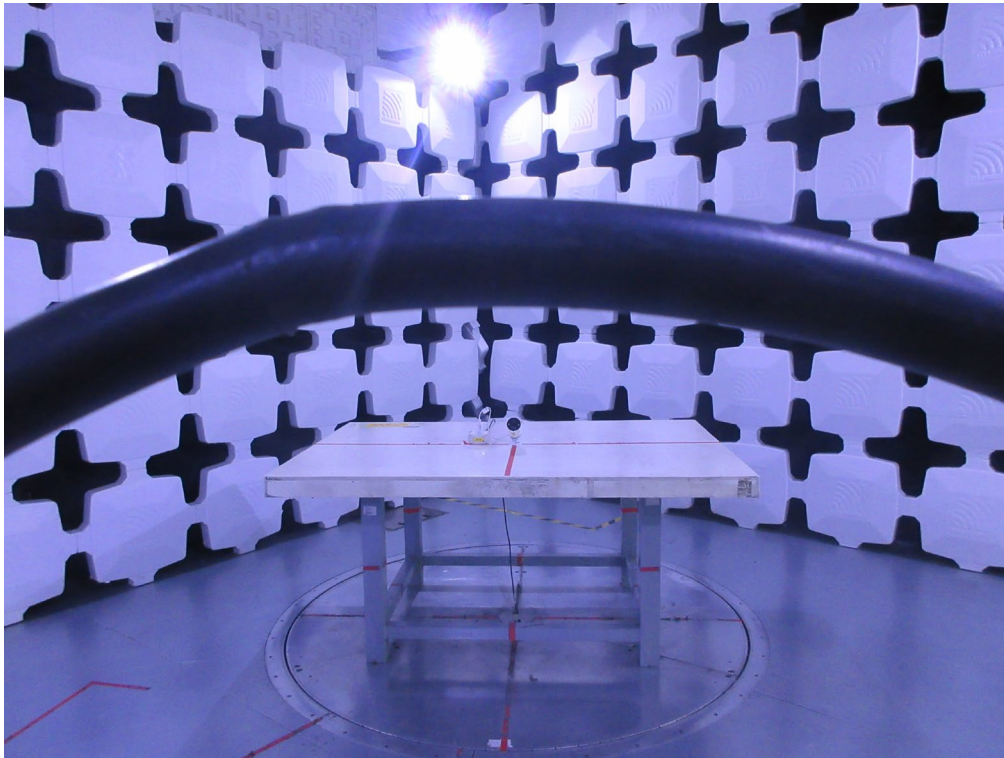
10. EUT TEST PHOTO

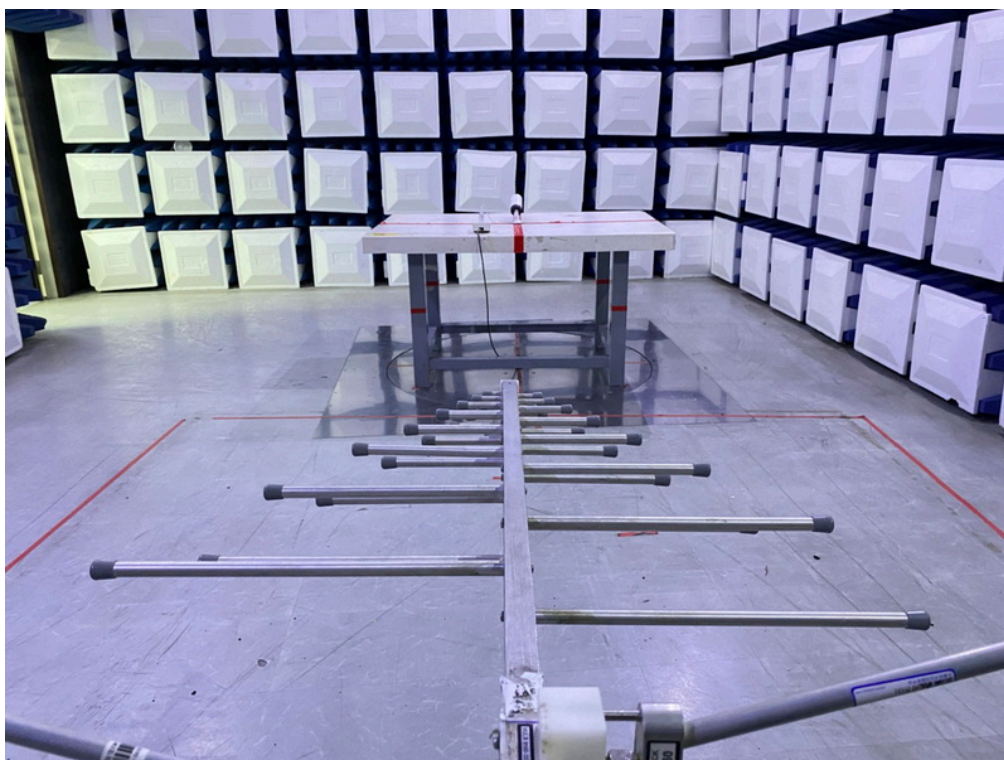
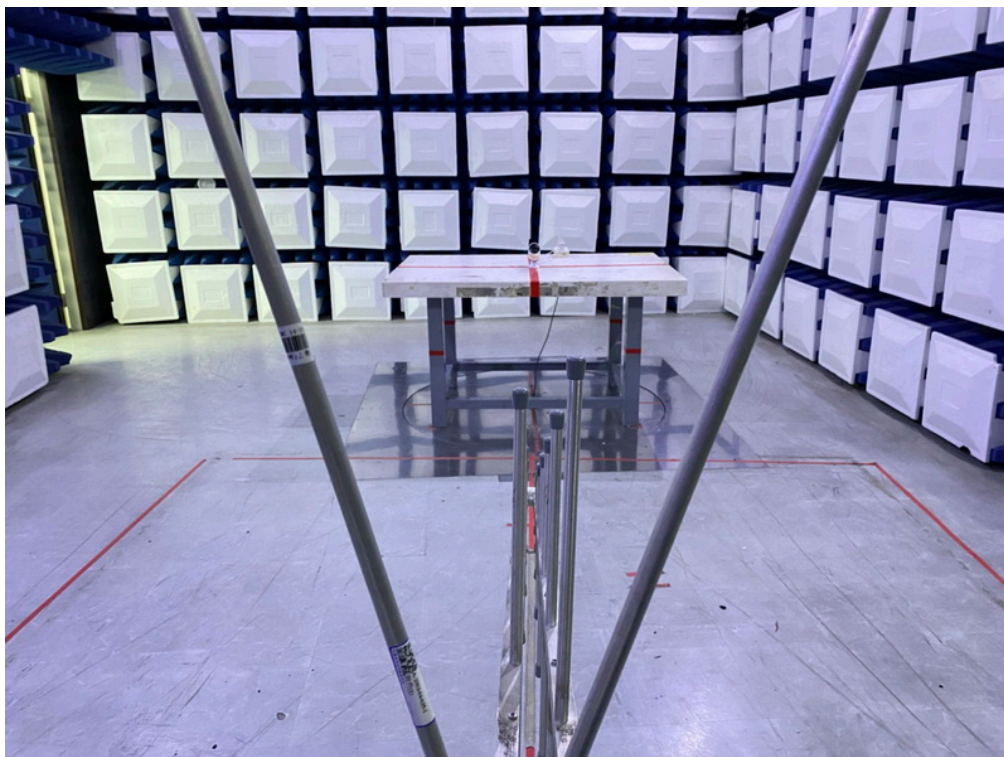
AC Power Line Conducted Emissions Test Photos



Radiated Emissions Test Photos

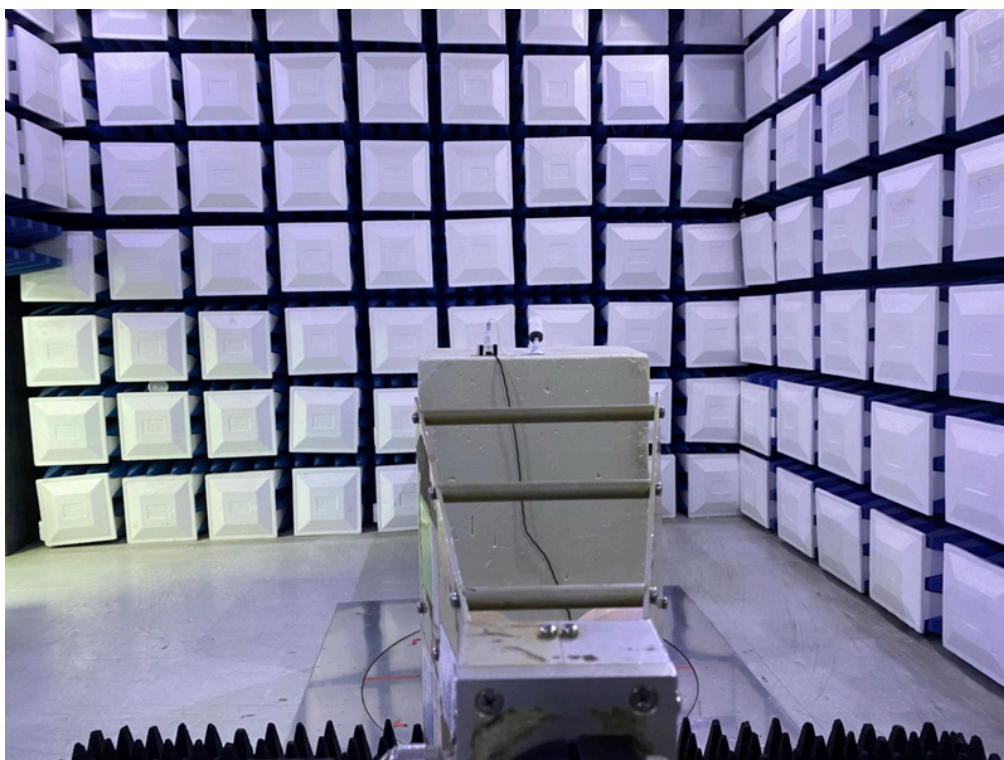
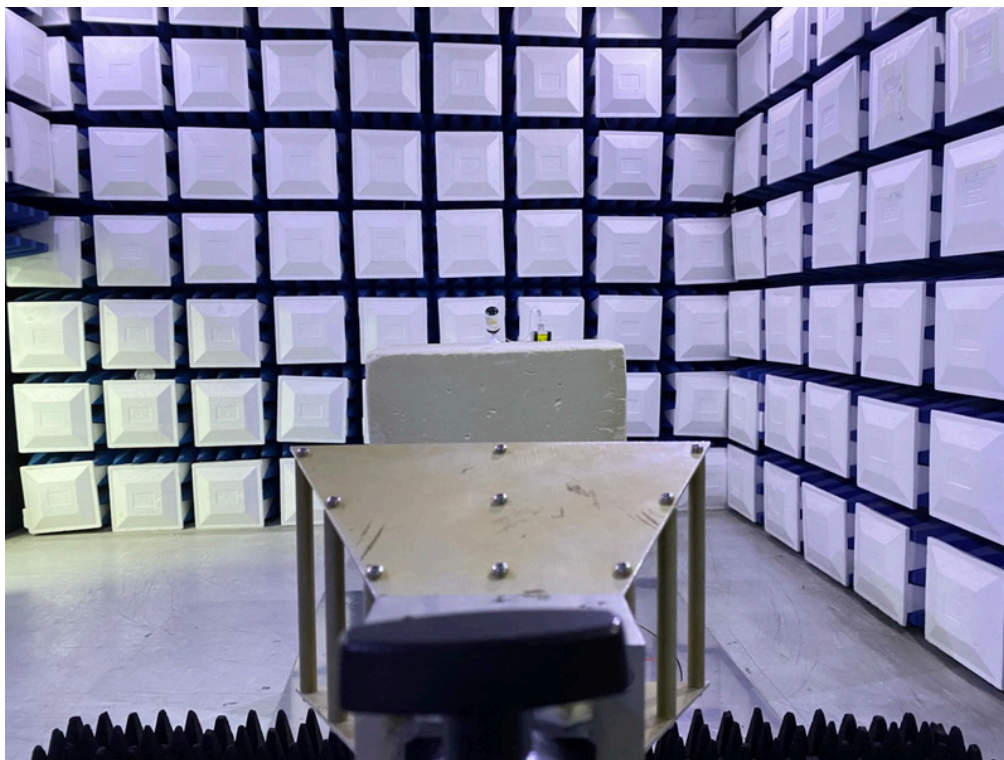
9 kHz to 30 MHz



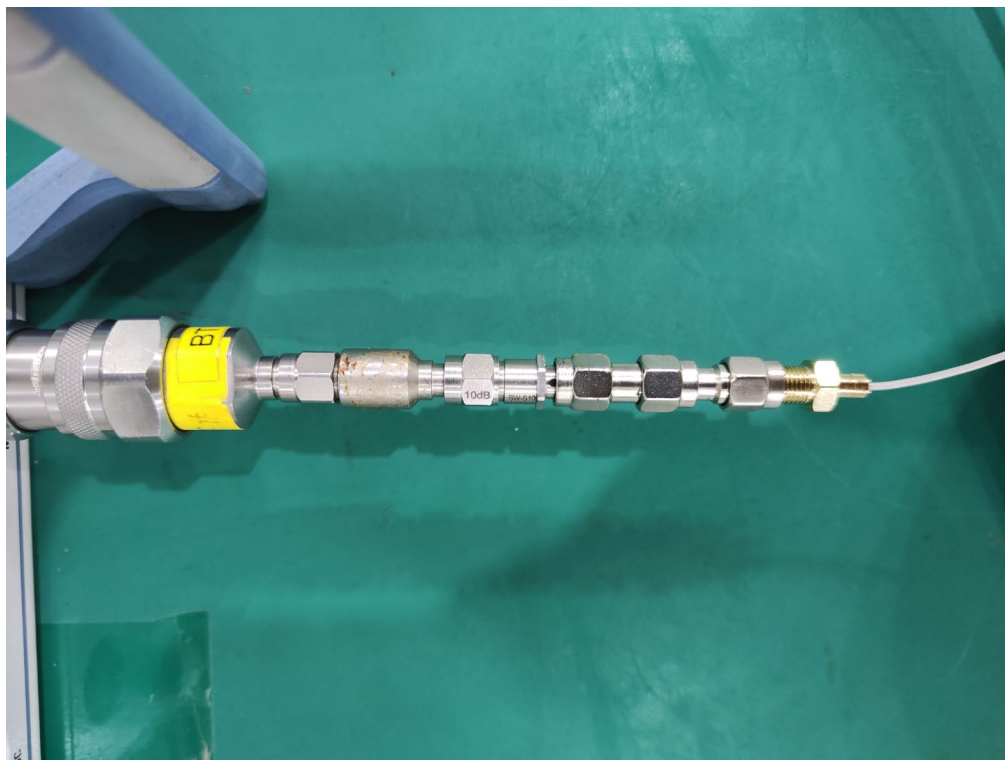
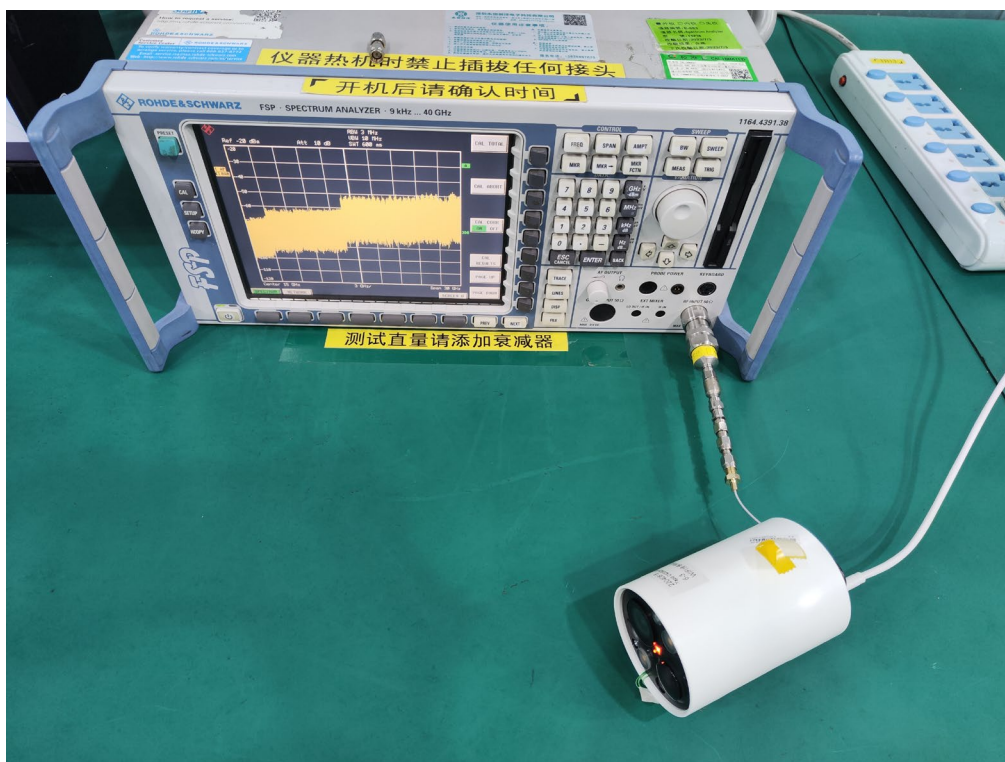
Radiated Emissions Test Photos**30 MHz to 1 GHz**

Radiated Emissions Test Photos

Above 1 GHz

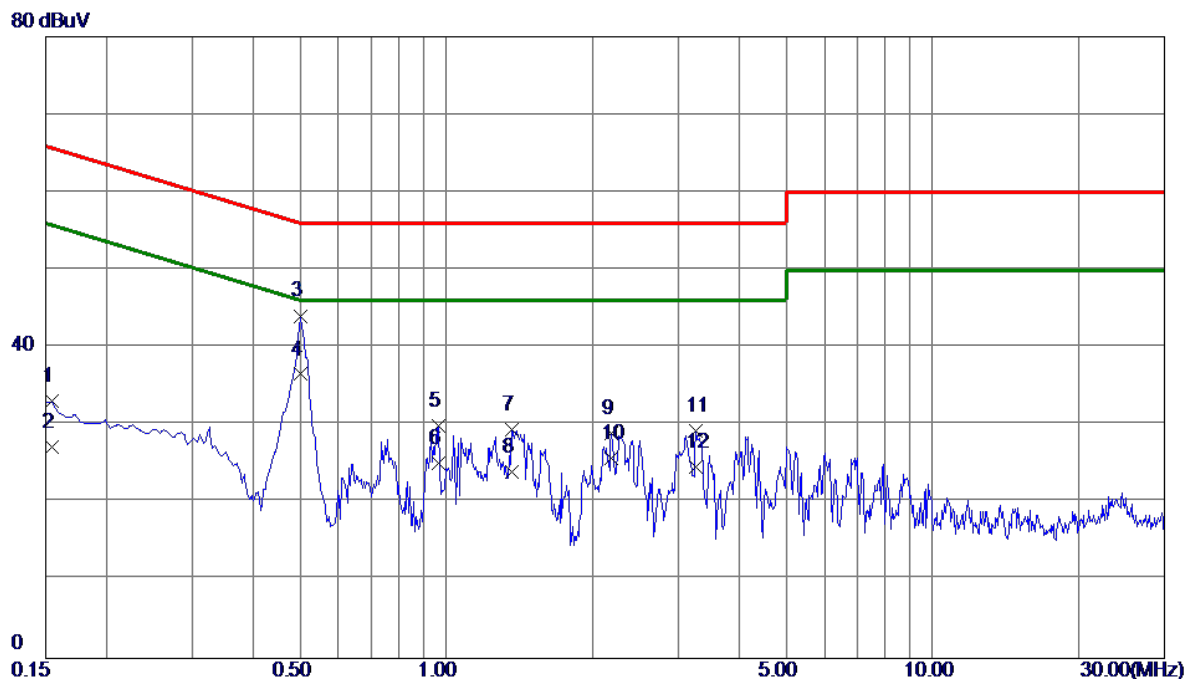


Conducted Test Photos



APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS

Test Mode	TX Mode Channel 00	Phase	Line
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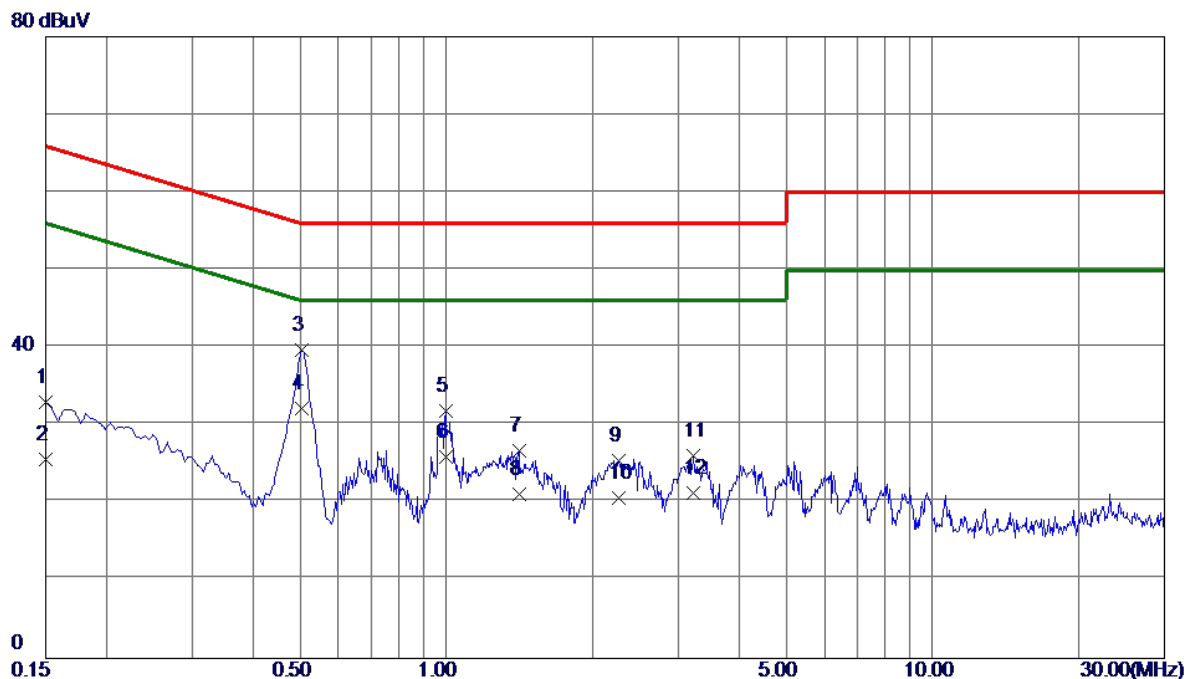
No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.1545	23.43	9.66	33.09	65.75	-32.66	QP	
2	0.1545	17.60	9.66	27.26	55.75	-28.49	AVG	
3	0.5010	34.32	9.76	44.08	56.00	-11.92	QP	
4 *	0.5010	26.80	9.76	36.56	46.00	-9.44	AVG	
5	0.9645	20.09	9.82	29.91	56.00	-26.09	QP	
6	0.9645	15.30	9.82	25.12	46.00	-20.88	AVG	
7	1.3650	19.52	9.85	29.37	56.00	-26.63	QP	
8	1.3650	14.19	9.85	24.04	46.00	-21.96	AVG	
9	2.1885	19.02	9.90	28.92	56.00	-27.08	QP	
10	2.1885	15.80	9.90	25.70	46.00	-20.30	AVG	
11	3.2595	19.27	9.99	29.26	56.00	-26.74	QP	
12	3.2595	14.70	9.99	24.69	46.00	-21.31	AVG	

REMARKS:

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

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

Test Mode	TX Mode Channel 00	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	23.24	9.70	32.94	66.00	-33.06	QP	
2	0.1500	15.91	9.70	25.61	56.00	-30.39	AVG	
3	0.5055	29.96	9.79	39.75	56.00	-16.25	QP	
4 *	0.5055	22.30	9.79	32.09	46.00	-13.91	AVG	
5	0.9960	22.03	9.86	31.89	56.00	-24.11	QP	
6	0.9960	16.10	9.86	25.96	46.00	-20.04	AVG	
7	1.4100	16.82	9.88	26.70	56.00	-29.30	QP	
8	1.4100	11.30	9.88	21.18	46.00	-24.82	AVG	
9	2.2695	15.51	9.94	25.45	56.00	-30.55	QP	
10	2.2695	10.71	9.94	20.65	46.00	-25.35	AVG	
11	3.2280	16.04	10.02	26.06	56.00	-29.94	QP	
12	3.2280	11.20	10.02	21.22	46.00	-24.78	AVG	

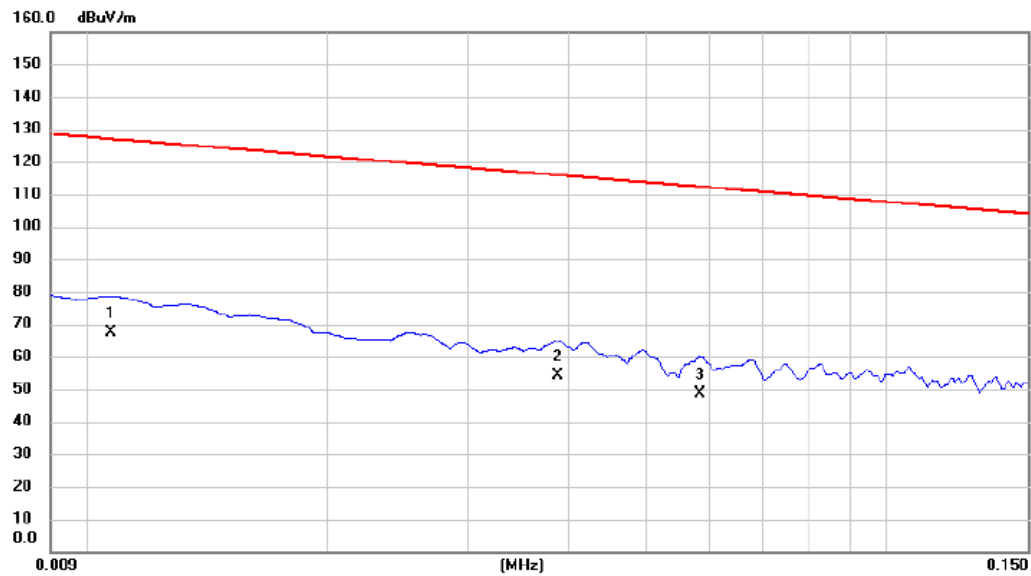
REMARKS:

(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 Channel 00	Polarization	Ant 0°
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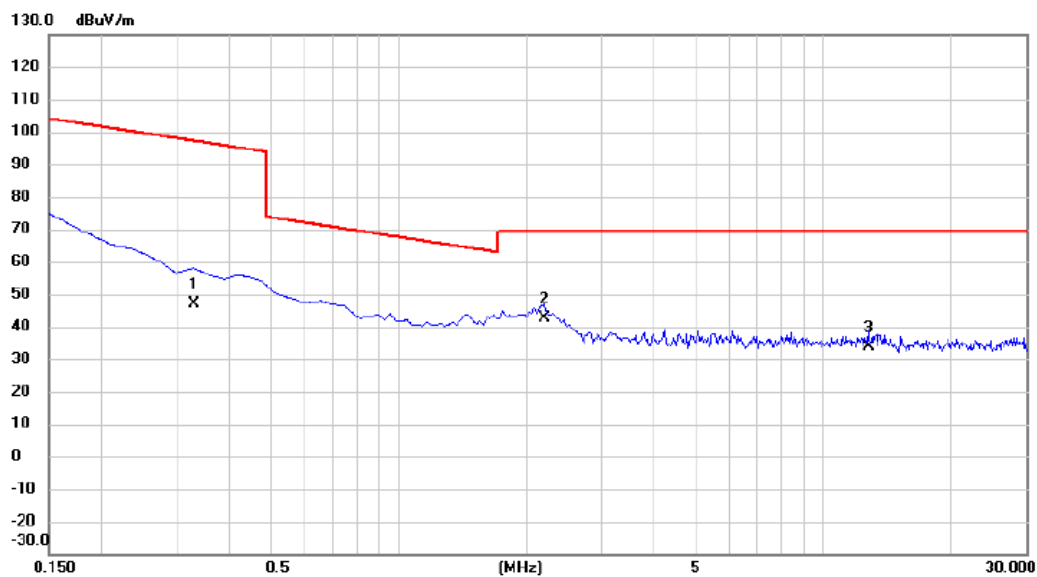


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	0.0107	50.26	17.22	67.48	127.02	-59.54	AVG		
2		0.0388	40.35	13.86	54.21	115.83	-61.62	AVG		
3		0.0585	35.19	13.60	48.79	112.26	-63.47	AVG		

REMARKS:

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

Test Mode	TX Mode Channel 00	Polarization	Ant 0°
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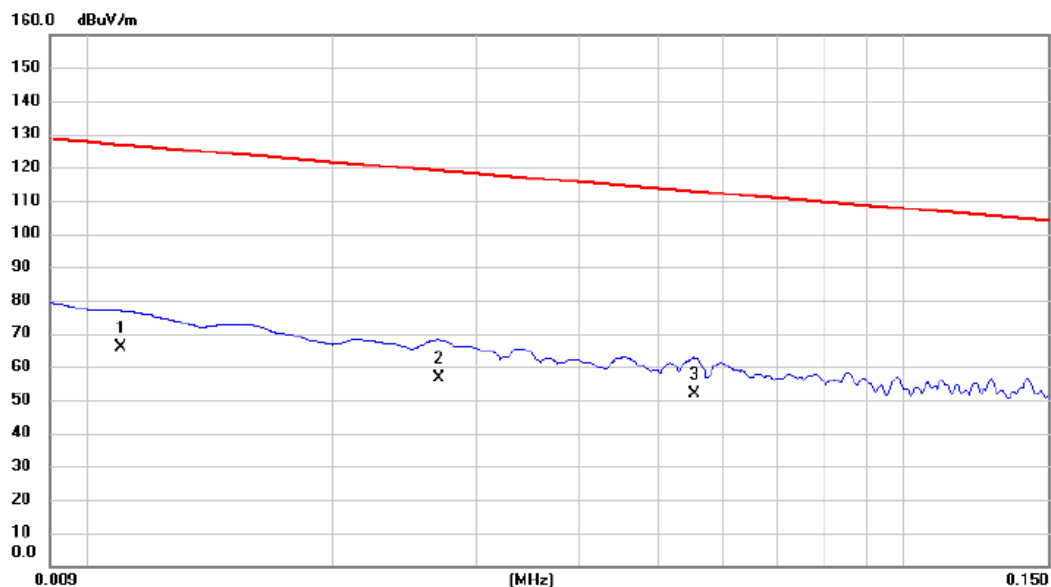


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		0.3291	33.25	13.81	47.06	97.26	-50.20	AVG		
2	*	2.2096	30.10	12.39	42.49	69.54	-27.05	QP		
3		12.7766	21.48	12.26	33.74	69.54	-35.80	QP		

REMARKS:

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

Test Mode	TX Mode Channel 00	Polarization	Ant 90°
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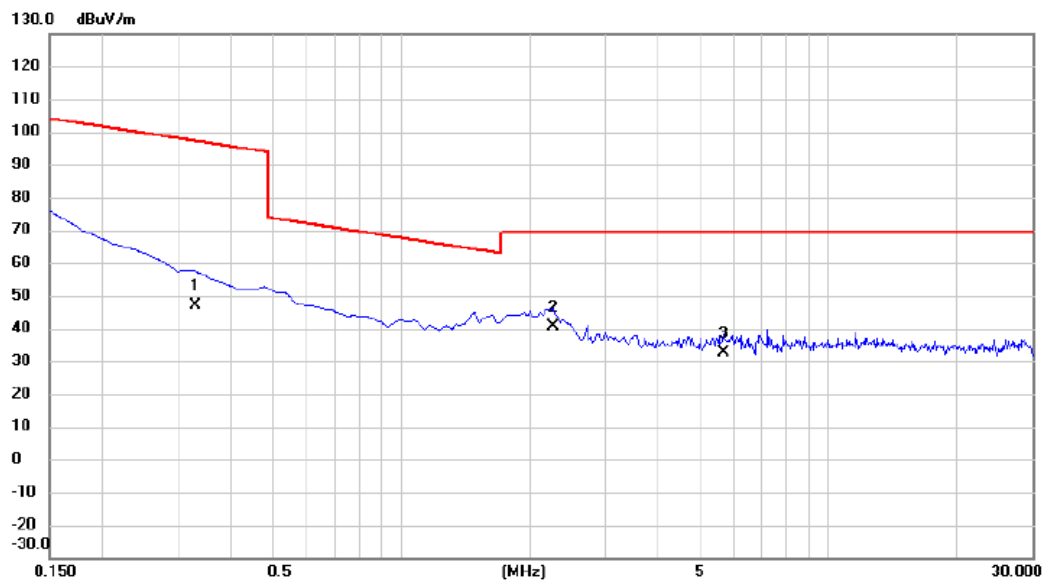


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		0.0110	48.51	17.12	65.63	126.78	-61.15	AVG		
2		0.0270	42.37	14.13	56.50	118.98	-62.48	AVG		
3	*	0.0554	38.29	13.60	51.89	112.73	-60.84	AVG		

REMARKS:

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

Test Mode	TX Mode Channel 00	Polarization	Ant 90°
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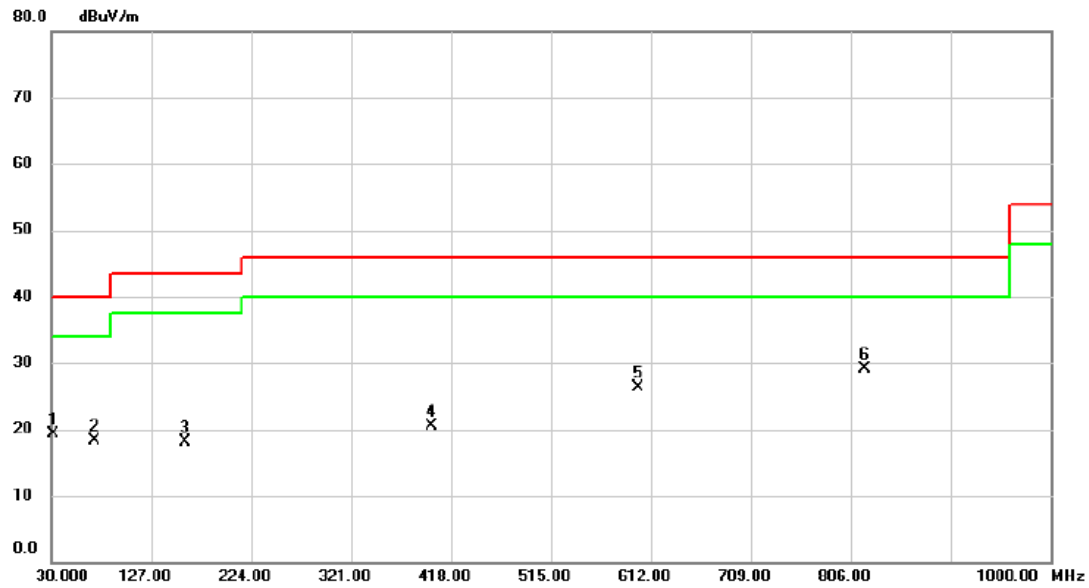
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		0.3291	33.02	13.81	46.83	97.26	-50.43	AVG		
2	*	2.2694	28.15	12.37	40.52	69.54	-29.02	QP		
3		5.6723	20.46	12.33	32.79	69.54	-36.75	QP		

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 Channel 00	Polarization	Vertical
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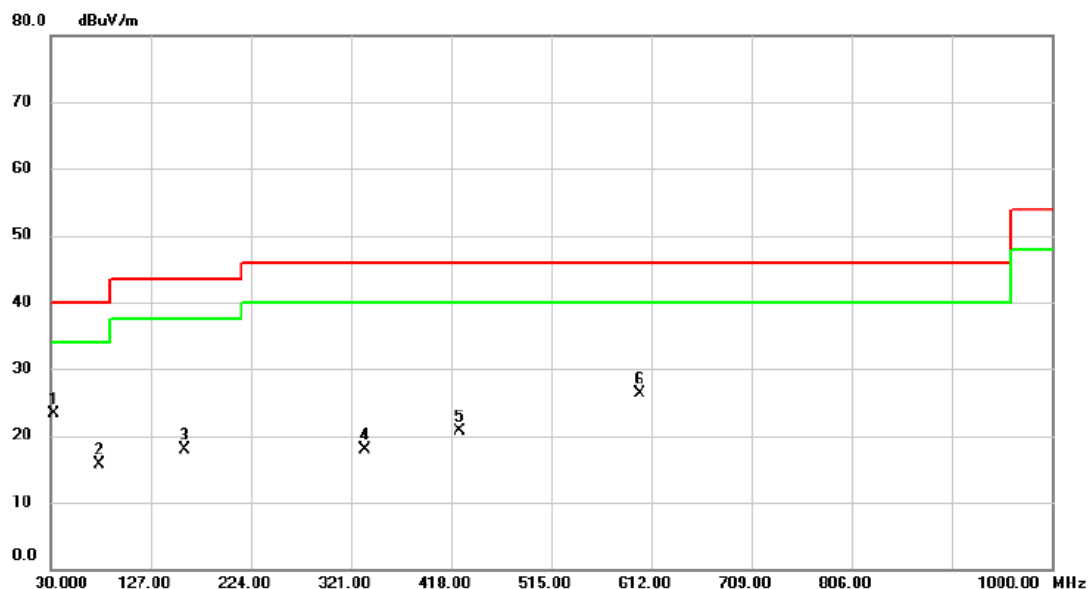
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		31.9400	35.01	-15.74	19.27	40.00	-20.73	peak	
2		71.7100	35.06	-16.68	18.38	40.00	-21.62	peak	
3		159.9800	30.80	-12.72	18.08	43.50	-25.42	peak	
4		399.5700	29.41	-8.96	20.45	46.00	-25.55	peak	
5		599.3900	31.09	-4.80	26.29	46.00	-19.71	peak	
6	*	819.5800	30.08	-0.98	29.10	46.00	-16.90	peak	

REMARKS:

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

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

Test Mode	TX Mode Channel 00	Polarization	Horizontal
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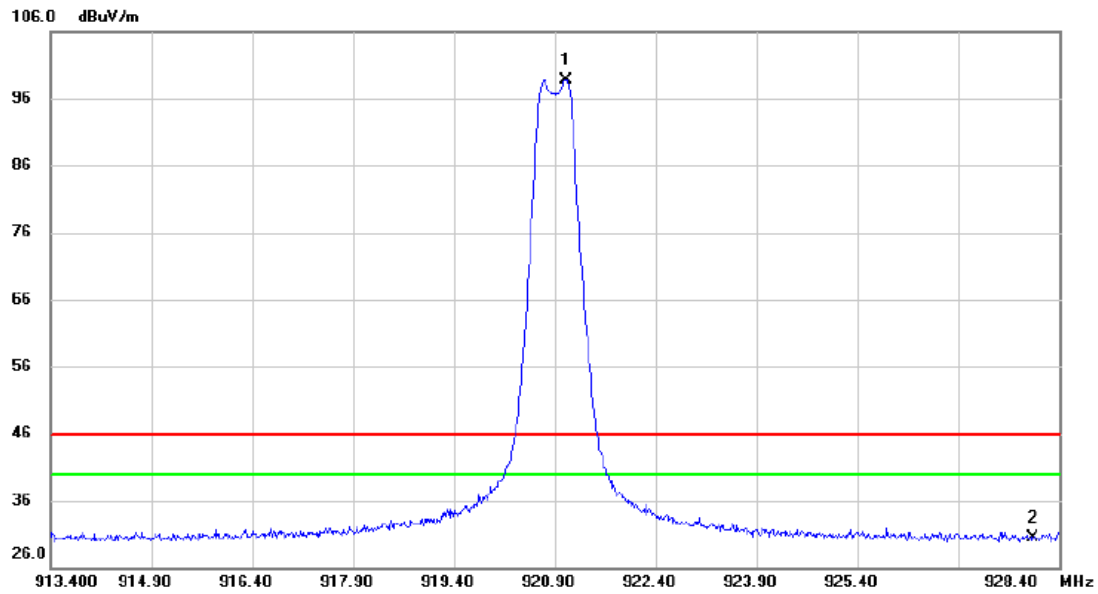
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	32.9100	38.87	-15.62	23.25	40.00	-16.75	peak	
2		77.5300	33.66	-17.92	15.74	40.00	-24.26	peak	
3		159.9800	30.72	-12.72	18.00	43.50	-25.50	peak	
4		334.5800	28.54	-10.54	18.00	46.00	-28.00	peak	
5		426.7300	28.94	-8.18	20.76	46.00	-25.24	peak	
6		600.3600	31.13	-4.79	26.34	46.00	-19.66	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 920.9 MHz _CH00	Polarization	Vertical
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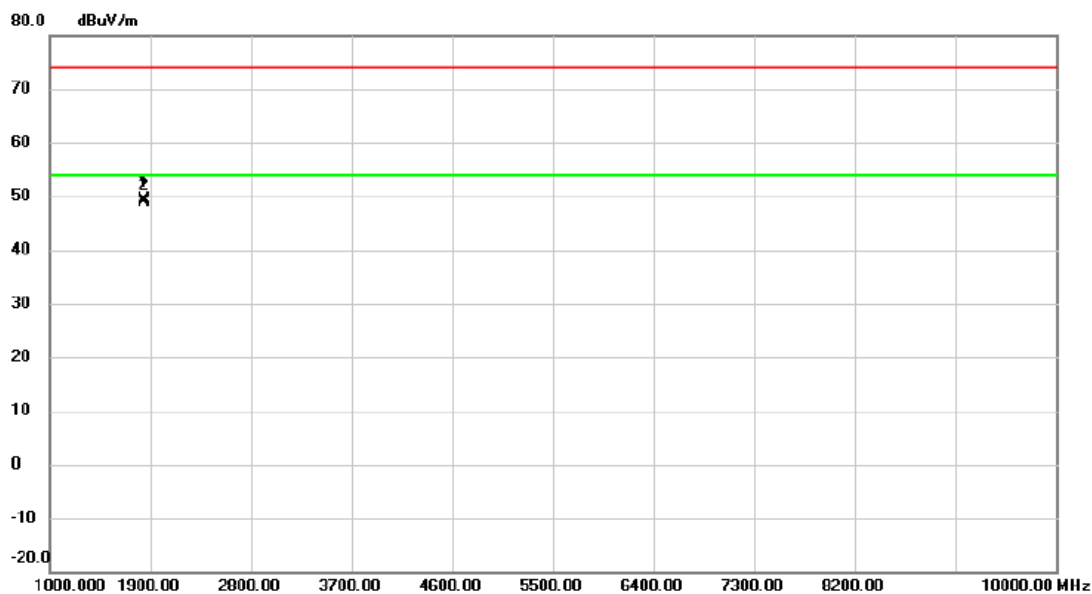


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	921.0650	87.50	11.29	98.79	46.00	52.79	QP	No Limit
2		928.0000	18.93	11.50	30.43	46.00	-15.57	QP	

REMARKS:

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

Test Mode	TX 920.9 MHz _CH00	Polarization	Vertical
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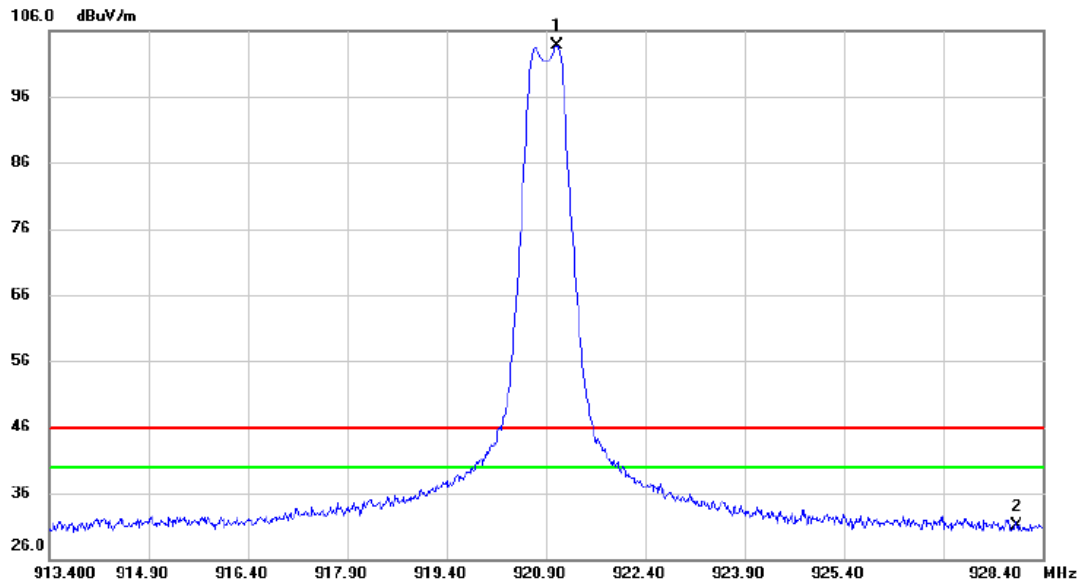


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	1842.160	52.88	-3.98	48.90	54.00	-5.10	AVG	
2		1843.180	53.34	-3.98	49.36	74.00	-24.64	peak	

REMARKS:

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

Test Mode	TX 920.9 MHz _CH00	Polarization	Horizontal
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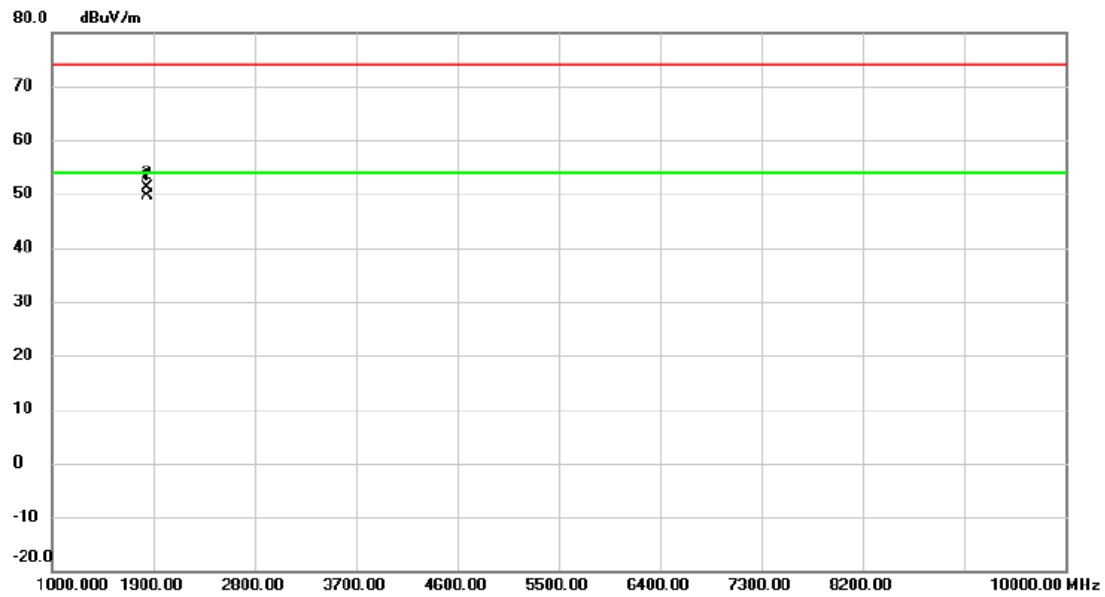


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	921.0650	92.36	11.29	103.65	46.00	57.65	QP	No Limit
2		928.0000	19.69	11.50	31.19	46.00	-14.81	QP	

REMARKS:

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

Test Mode	TX 920.9 MHz _CH00	Polarization	Horizontal
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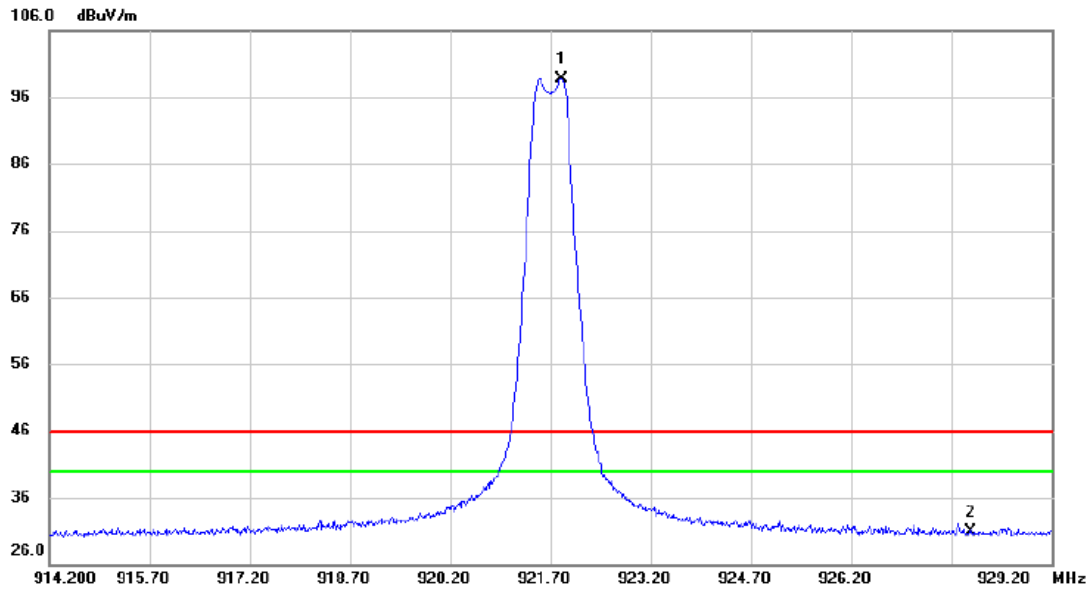


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	1842.140	53.55	-3.98	49.57	54.00	-4.43	AVG	
2		1842.180	55.09	-3.98	51.11	74.00	-22.89	peak	

REMARKS:

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

Test Mode	TX 921.7 MHz _CH01	Polarization	Vertical
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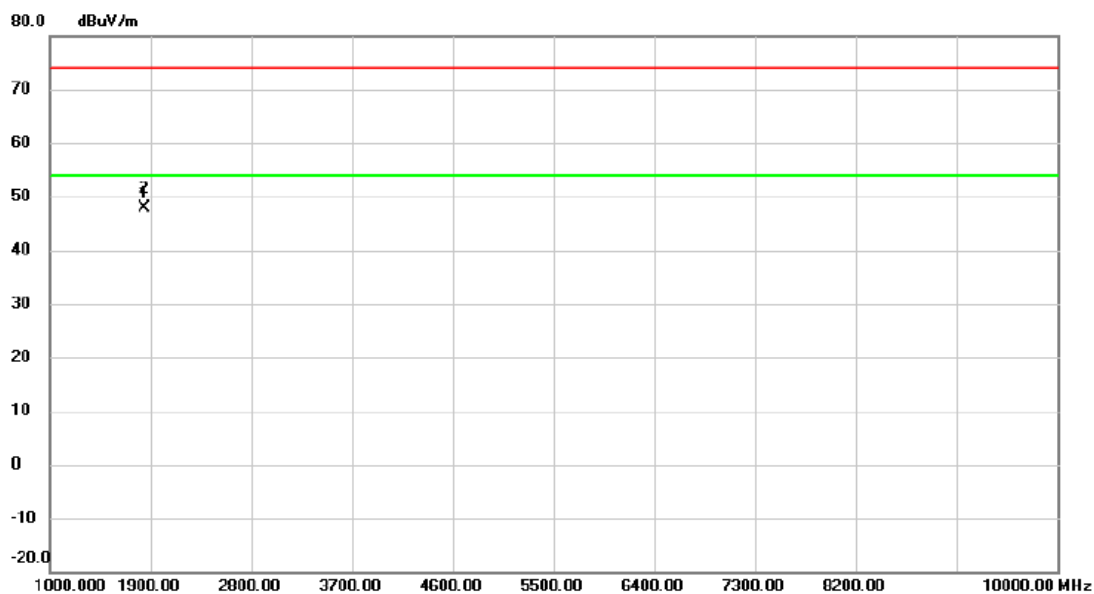


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	921.8650	87.45	11.32	98.77	46.00	52.77	QP	No Limit
2		928.0000	19.47	11.50	30.97	46.00	-15.03	QP	

REMARKS:

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

Test Mode	TX 921.7 MHz _CH01	Polarization	Vertical
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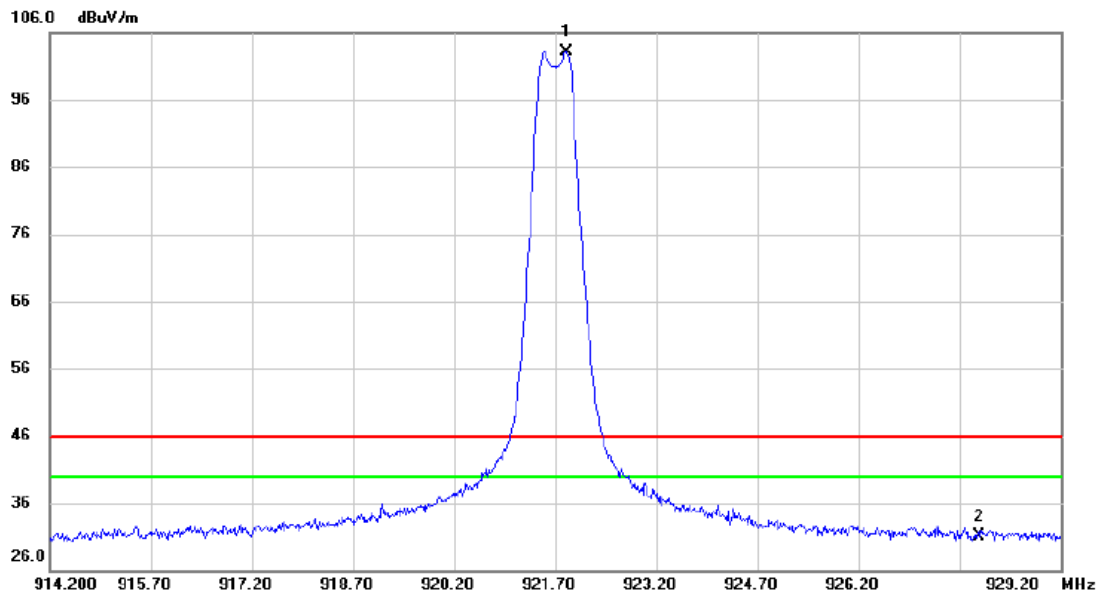
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		1845.240	51.79	-3.97	47.82	74.00	-26.18	peak	
2	*	1845.280	51.81	-3.97	47.84	54.00	-6.16	AVG	

REMARKS:

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

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

Test Mode	TX 921.7 MHz _CH01	Polarization	Horizontal
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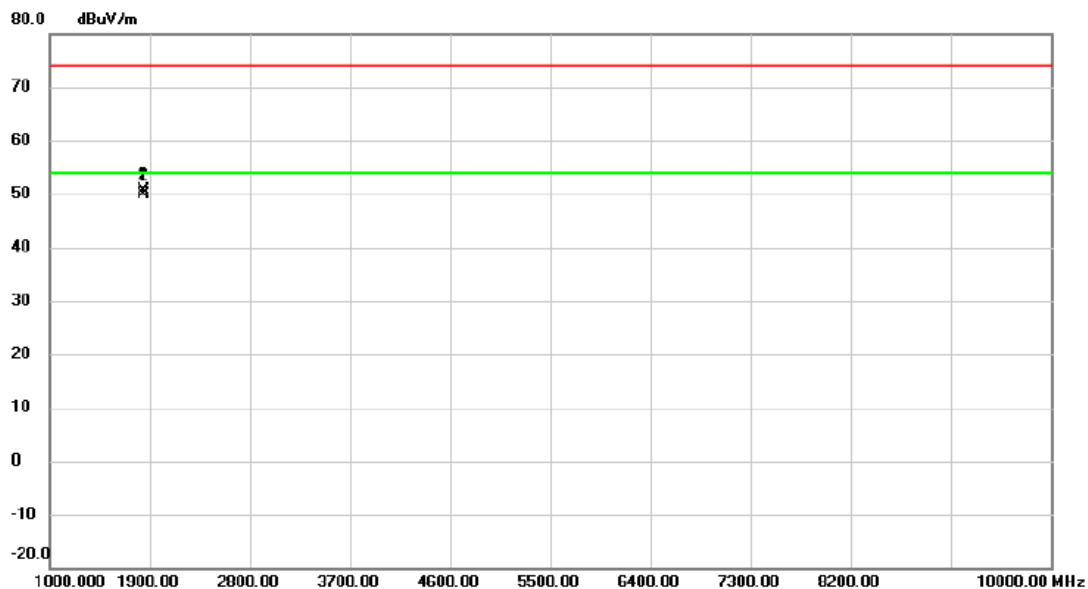


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	921.8650	91.75	11.32	103.07	46.00	57.07	QP	No Limit
2		928.0000	19.55	11.50	31.05	46.00	-14.95	QP	

REMARKS:

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

Test Mode	TX 921.7 MHz _CH01	Polarization	Horizontal
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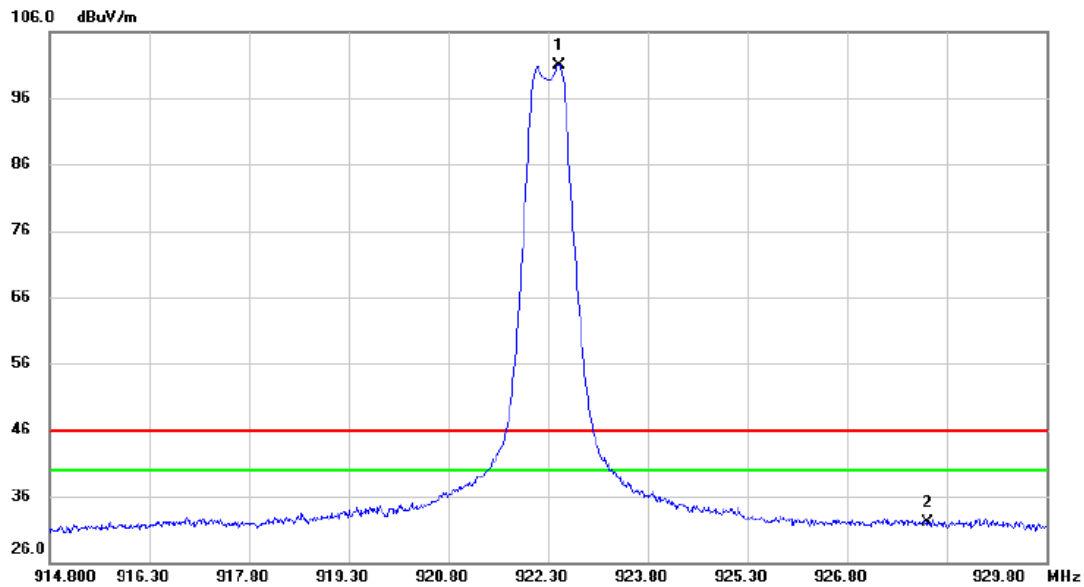


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		1845.280	54.69	-3.97	50.72	74.00	-23.28	peak	
2	*	1845.280	53.83	-3.97	49.86	54.00	-4.14	AVG	

REMARKS:

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

Test Mode	TX 922.3 MHz _CH02	Polarization	Vertical
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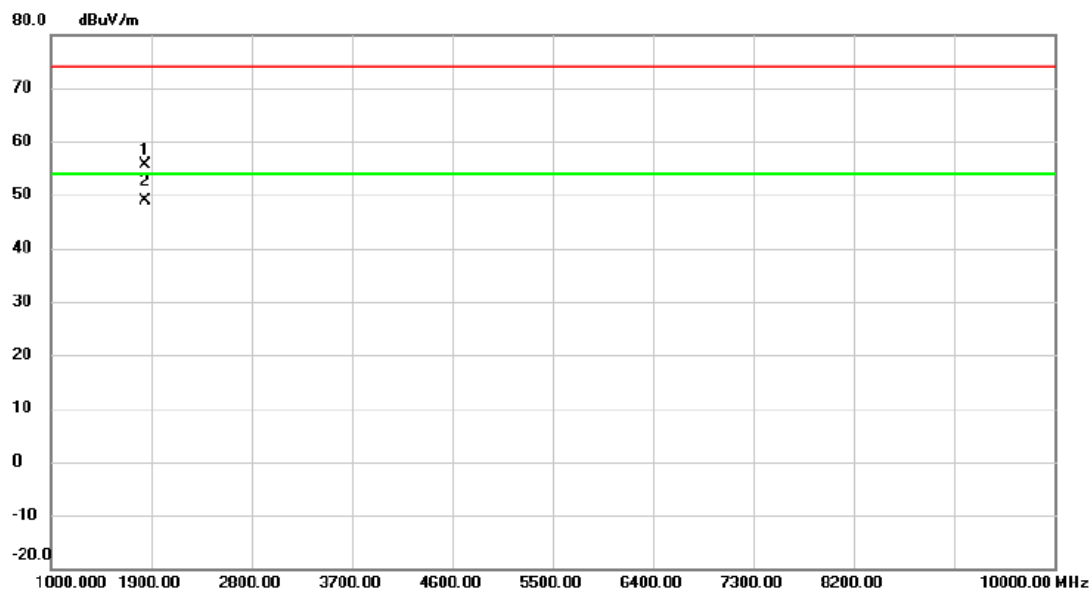
No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	922.4650	89.53	11.34	100.87	46.00	54.87	QP	No Limit
2	928.0000	20.65	11.50	32.15	46.00	-13.85	QP	

REMARKS:

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

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

Test Mode	TX 922.3 MHz _CH02	Polarization	Vertical
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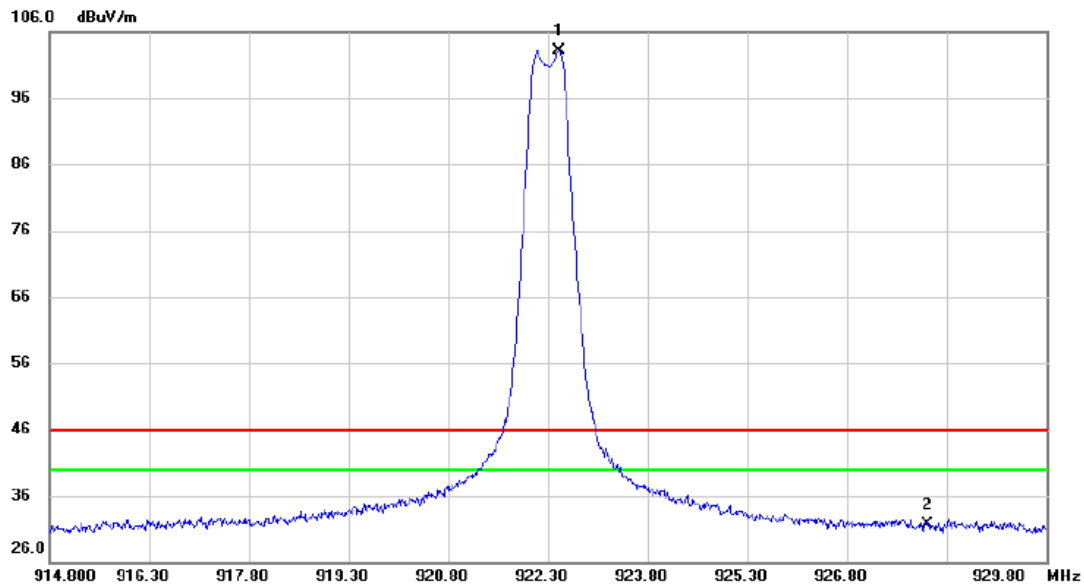


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		1845.256	59.49	-3.97	55.52	74.00	-18.48	peak	
2	*	1845.256	52.80	-3.97	48.83	54.00	-5.17	AVG	

REMARKS:

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

Test Mode	TX 922.3 MHz _CH02	Polarization	Horizontal
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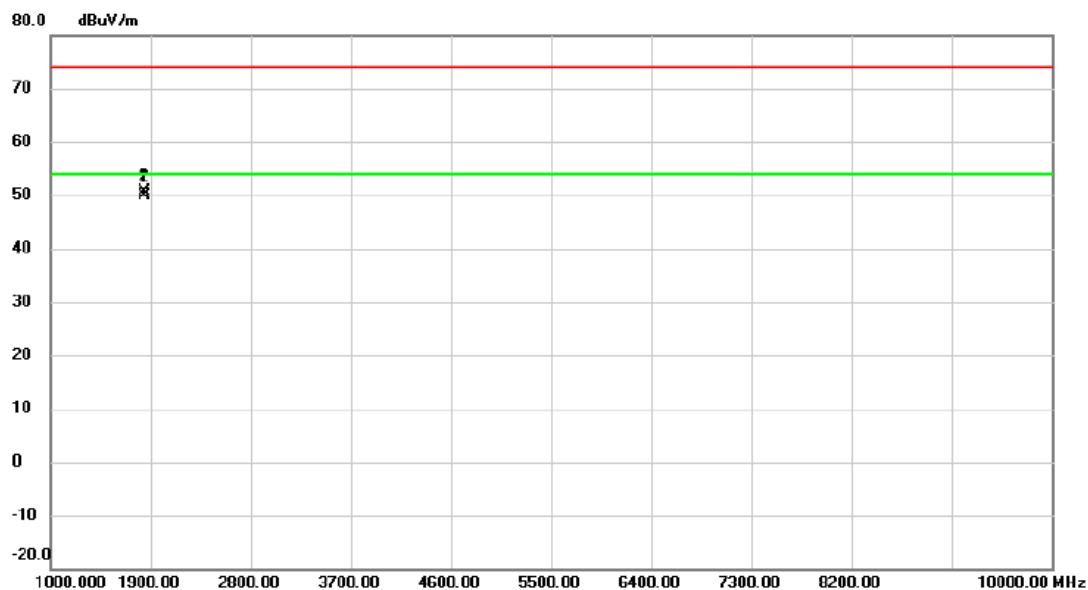
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	922.4650	91.71	11.34	103.05	46.00	57.05	QP	No Limit
2		928.0000	20.23	11.50	31.73	46.00	-14.27	QP	

REMARKS:

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

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

Test Mode	TX 922.3 MHz _CH02	Polarization	Horizontal
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No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		1845.250	54.69	-3.97	50.72	74.00	-23.28	peak	
2	*	1845.250	53.84	-3.97	49.87	54.00	-4.13	AVG	

REMARKS:

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

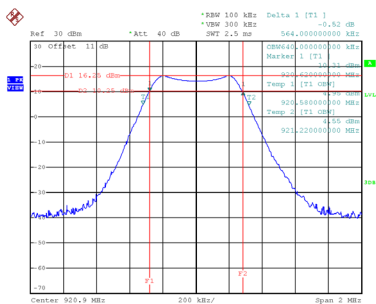
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX E - BANDWIDTH

Test Mode	TX Mode
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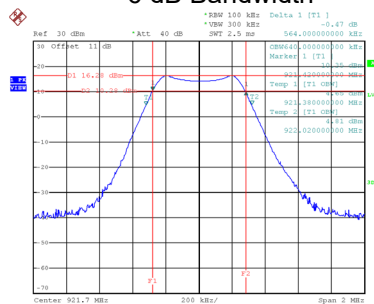
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	6 dB Bandwidth Min. Limit (MHz)	Test Result
00	920.9	0.564	0.540	0.50	Pass
01	921.7	0.564	0.540	0.50	Pass
02	922.3	0.564	0.540	0.50	Pass

CH00



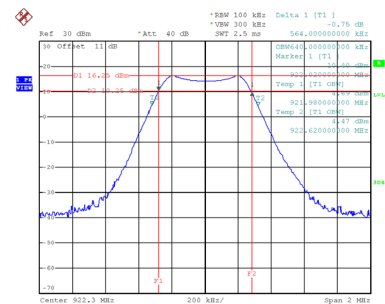
Date: 21.JUN.2022 13:33:10

CH01
6 dB Bandwidth



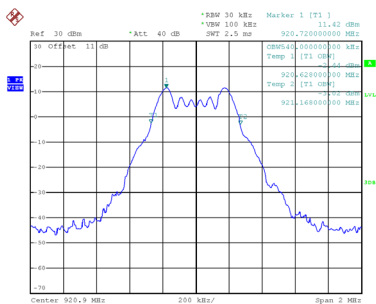
Date: 21.JUN.2022 13:34:18

CH02

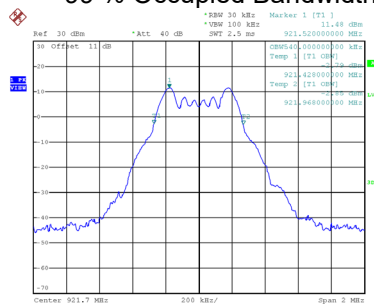


Date: 21.JUN.2022 13:31:59

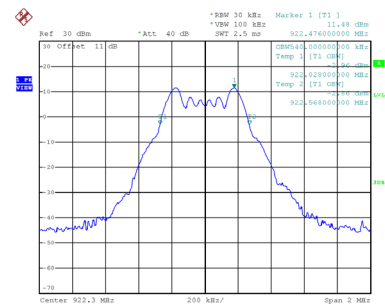
99 % Occupied Bandwidth



Date: 21.JUN.2022 13:36:14



Date: 21.JUN.2022 13:35:42

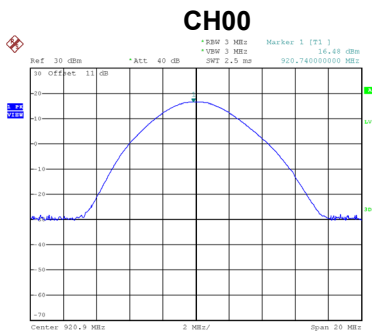


Date: 21.JUN.2022 13:36:45

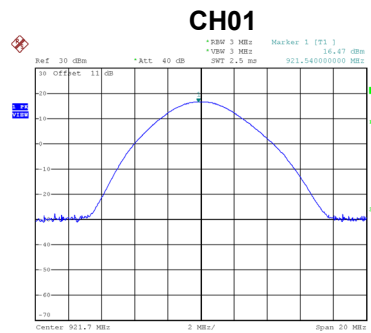
APPENDIX F - MAXIMUM OUTPUT POWER

Test Mode	TX Mode
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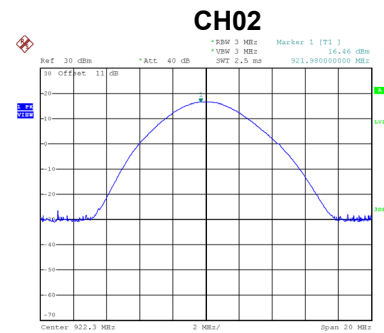
Channel	Frequency (MHz)	Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Test Result
00	920.9	16.48	30.00	1.0000	Pass
01	921.7	16.47	30.00	1.0000	Pass
02	922.3	16.46	30.00	1.0000	Pass



Date: 21.JUN.2022 11:45:13



Date: 21.JUN.2022 11:45:48

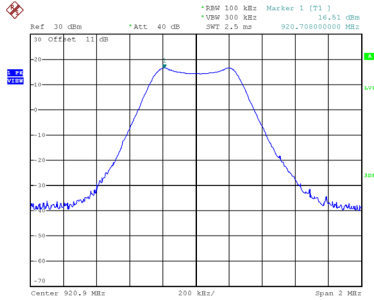


Date: 21.JUN.2022 11:46:51

APPENDIX G - CONDUCTED SPURIOUS EMISSION

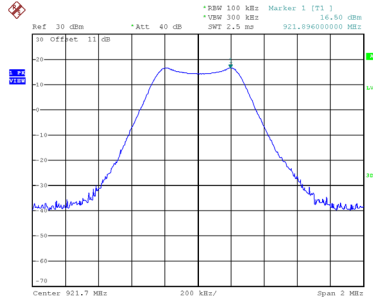
Test Mode TX Mode

Reference Level-CH00



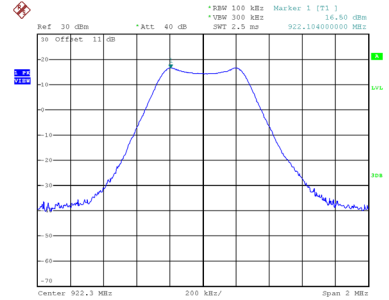
Date: 21.JUN.2022 11:48:36

Reference Level-CH01



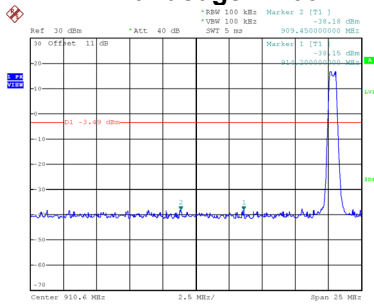
Date: 21.JUN.2022 11:48:02

Reference Level-CH02



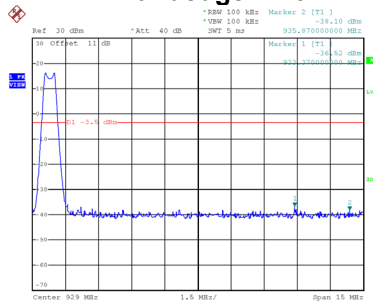
Date: 21.JUN.2022 11:47:38

Bandedge-CH00



Date: 21.JUN.2022 13:49:29

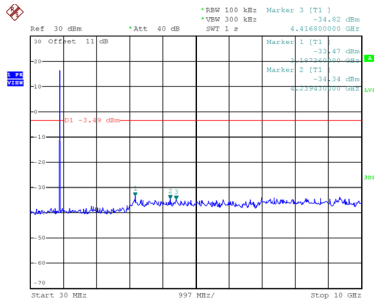
Bandedge-CH02



Date: 21.JUN.2022 13:40:15

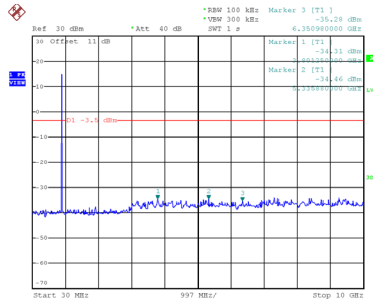
10th Harmonic of the fundamental frequency

CH00



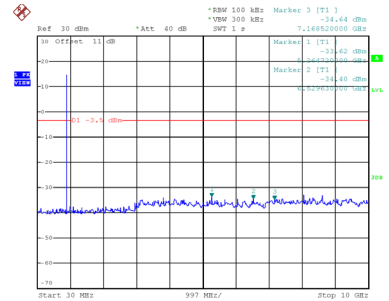
Date: 21.JUN.2022 13:51:20

CH01



Date: 21.JUN.2022 13:56:10

CH02

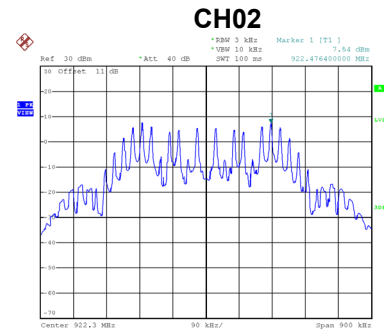
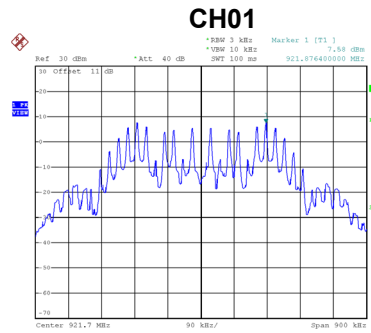
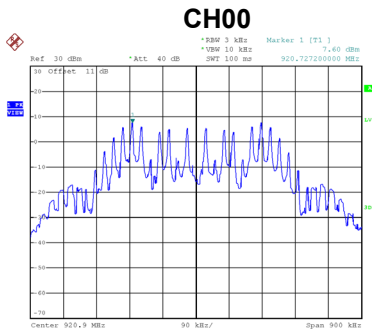


Date: 21.JUN.2022 13:43:16

APPENDIX H - POWER SPECTRAL DENSITY

Test Mode	TX Mode
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Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Max. Limit (dBm/3 kHz)	Test Result
00	920.9	7.60	8.00	Pass
01	921.7	7.58	8.00	Pass
02	922.3	7.54	8.00	Pass



End of Test Report