

FCC Radio Test Report

FCC ID: 2AXJ4C420

This report concerns: Class II Permissive Change

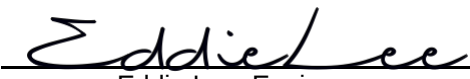
Report No. : BTL-FCCP-3-2307G106
Equipment : Smart Wire-Free Security Camera
Model Name : Tapo C420
Brand Name : tp-link, tapo
Applicant : TP-Link Corporation Limited
Address : Room 901, 9/F. , New East Ocean Centre, 9 Science Museum Road, Tsim Sha Tsui, Kowloon, Hong Kong
Manufacturer : TP-Link Corporation Limited
Address : Room 901, 9/F. , New East Ocean Centre, 9 Science Museum Road, Tsim Sha Tsui, Kowloon, Hong Kong

Radio Function : Sub 1G

FCC Rule Part(s) : FCC CFR Title 47, Part 15, Subpart C (15.247)
Measurement : ANSI C63.10-2013
Procedure(s)

Date of Receipt : 2023/7/19
Date of Test : 2023/10/19
Issued Date : 2023/10/23

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

Prepared by : 
 Eddie Lee, Engineer

Approved by : 
 Jerry Chuang, Supervisor



BTL Inc.

No.18, Ln. 171, Sec. 2, Jiuzong Rd., Neihu Dist., Taipei City 114, Taiwan

Tel: +886-2-2657-3299 Fax: +886-2-2657-3331 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** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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** 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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REVISION HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCCP-3-2307G106	R00	Original Report.	2023/10/23	Valid

1 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards.

Standard(s) Section	Description	Test Result	Judgement	Remark
15.205 15.209 15.247(d)	Radiated Emissions	APPENDIX A	Pass	-----

NOTE:

- (1) "N/A" denotes test is not applicable in this Test Report.
- (2) The report format version is TP.1.1.1.
- (3) The device is demonstrated to full compliance of below stated standard requirements according to the test report listed in the below table:

Report Number	Version	Issue Date	RF Function	Standard
BTL-FCCP-2-2204C109A	R02	2022/9/30	Sub 1G	FCC CFR Title 47, Part 15, Subpart C

According to the declaration of the manufacturer, the difference between previous device is only changed battery.

After evaluated, the changes with respect to the original one, only radiated emissions below 1 GHz tests need to be verified.

1.1 REFERENCE TEST GUIDANCE

KDB 662911 D01 Multiple Transmitter Output v02r01

1.2 TEST FACILITY

The test locations stated below are under the TAF Accreditation Number 0659.

The test location(s) used to collect the test data in this report are:

No. 72, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan
(FCC DN: TW0659)

☐ C06 ☒ CB21 ☐ CB22

1.3 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k = 2$, providing a level of confidence of approximately **95 %**. The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{CISPR} requirement.

A. Radiated emissions test :

Test Site	Measurement Frequency Range	U (dB)
CB21	0.03 GHz ~ 0.2 GHz	4.17
	0.2 GHz ~ 1 GHz	4.72
	1 GHz ~ 6 GHz	5.21
	6 GHz ~ 18 GHz	5.51
	18 GHz ~ 26 GHz	3.69
	26 GHz ~ 40 GHz	4.23

NOTE:

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

1.4 TEST ENVIRONMENT CONDITIONS

Test Item	Environment Condition	Test Voltage	Tested by
Radiated emissions below 1 GHz	Refer to data	AC 120V	Kevin Zhen

2 GENERAL INFORMATION

2.1 DESCRIPTION OF EUT

Equipment	Smart Wire-Free Security Camera
Model Name	Tapo C420
Brand Name	tp-link, tapo
Model Difference	N/A
Power Source	#1 DC voltage supplied from AC Adapter. #2 Supplied from battery.
Power Rating	#1 I/P: 100-240V~ 50/60Hz 0.2A Max. O/P: 5V---1A #2 DC3.6V, 6700mAh, 24.12Wh
Products Covered	1 * Adapter: A8-501000 1 * Battery: Tapo A100 1 * USB Cable 1 * Bracket
Operation Band	902 MHz ~ 928 MHz
Modulation Technology	GFSK
Transfer Rate	50 kbps
Test Model	Tapo C420
Sample Status	Engineering Sample
EUT Modification(s)	N/A

NOTE:

- (1) The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or 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	Type	Connector	Gain (dBi)
1	TP-LINK®	Tapo C420(US)1.0	Monopole	N/A	-5.04

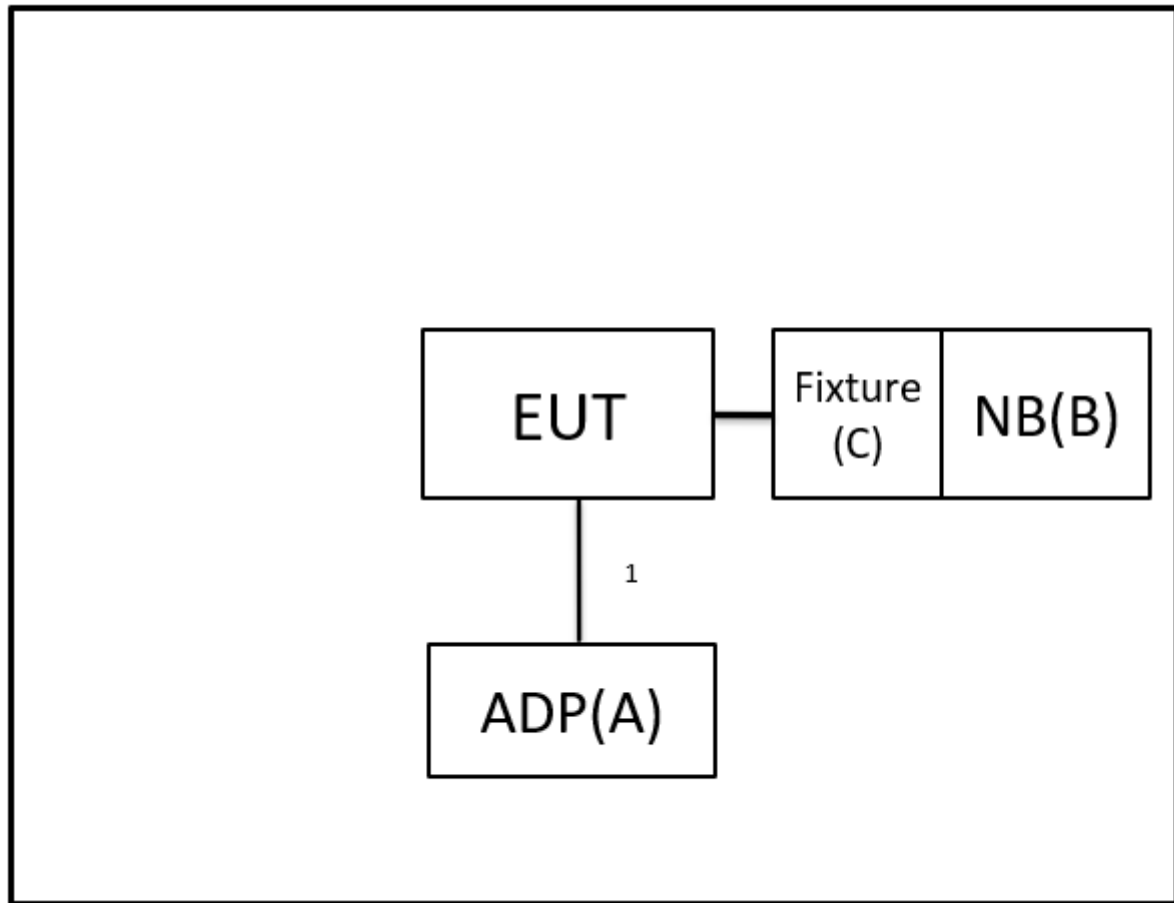
- (4) The above Antenna information are derived from the antenna data sheet provided by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

2.2 TEST MODES

Test Items	Test mode	Channel	Note
Transmitter Radiated Emissions (below 1GHz)	TX Mode	00	-

2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Equipment letters and Cable numbers refer to item numbers described in the tables of clause 2.4.



2.4 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.	Remarks
A	Adapter	Dongguan Aohai Technology Co.Ltd	A8-501000	N/A	Supplied by test requester
B	NB	HP	TPN-I119	N/A	Furnished by test lab.
C	Fixture	N/A	N/A	N/A	Furnished by test lab.

Item	Shielded	Ferrite Core	Length	Cable Type	Remarks
1	No	No	0.5m	USB To Mico USB Cable	Supplied by test requester

3 RADIATED EMISSIONS TEST

3.1 LIMIT

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

LIMITS OF RADIATED EMISSIONS MEASUREMENT (9 kHz to 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
960~1000	500	3

LIMITS OF RADIATED EMISSIONS MEASUREMENT (Above 1000 MHz)

Frequency (MHz)	Radiated Emissions (dBuV/m)		Measurement Distance (meters)
	Peak	Average	
Above 1000	74	54	3

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

Calculation example:

Reading Level		Correct Factor		Measurement Value
19.11	+	2.11	=	21.22

Measurement Value		Limit Value		Margin Level
21.22	-	54	=	-32.78

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average

Spectrum Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9KHz~90KHz for PK/AVG detector
Start ~ Stop Frequency	90KHz~110KHz for QP detector
Start ~ Stop Frequency	110KHz~490KHz for PK/AVG detector
Start ~ Stop Frequency	490KHz~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

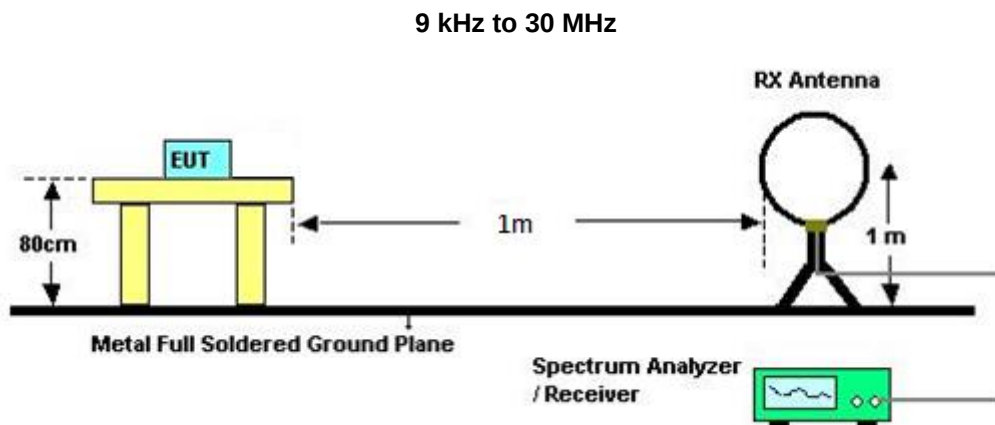
3.2 TEST PROCEDURE

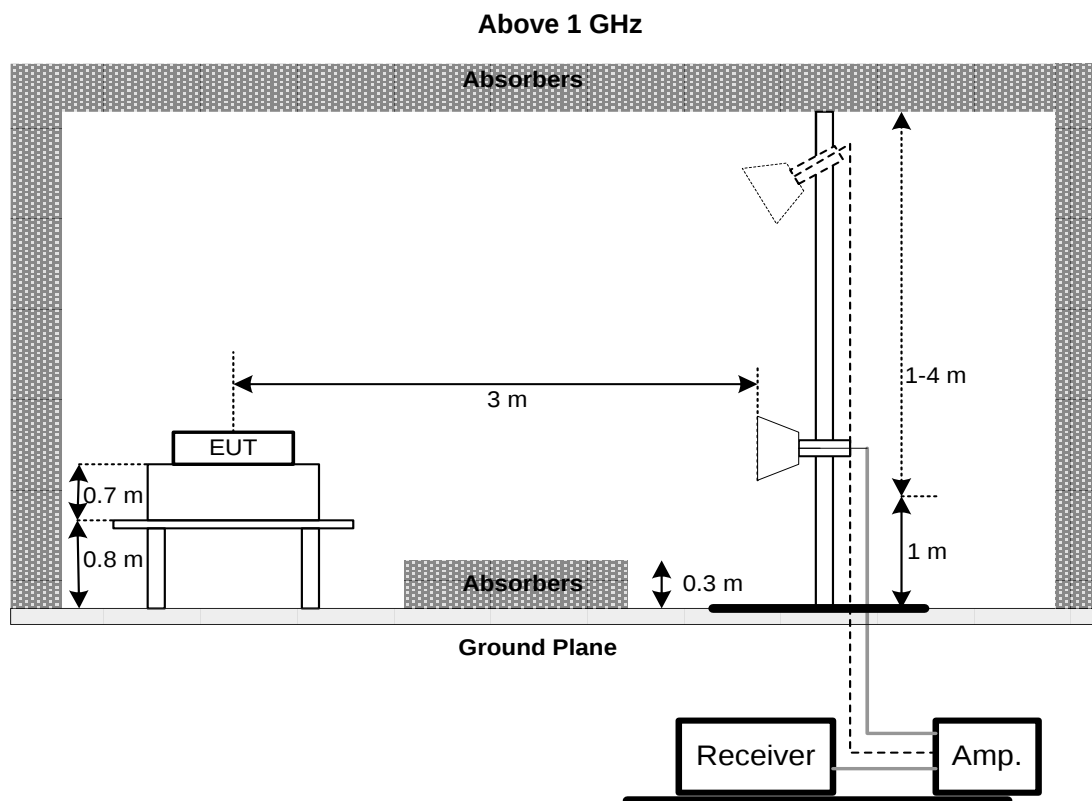
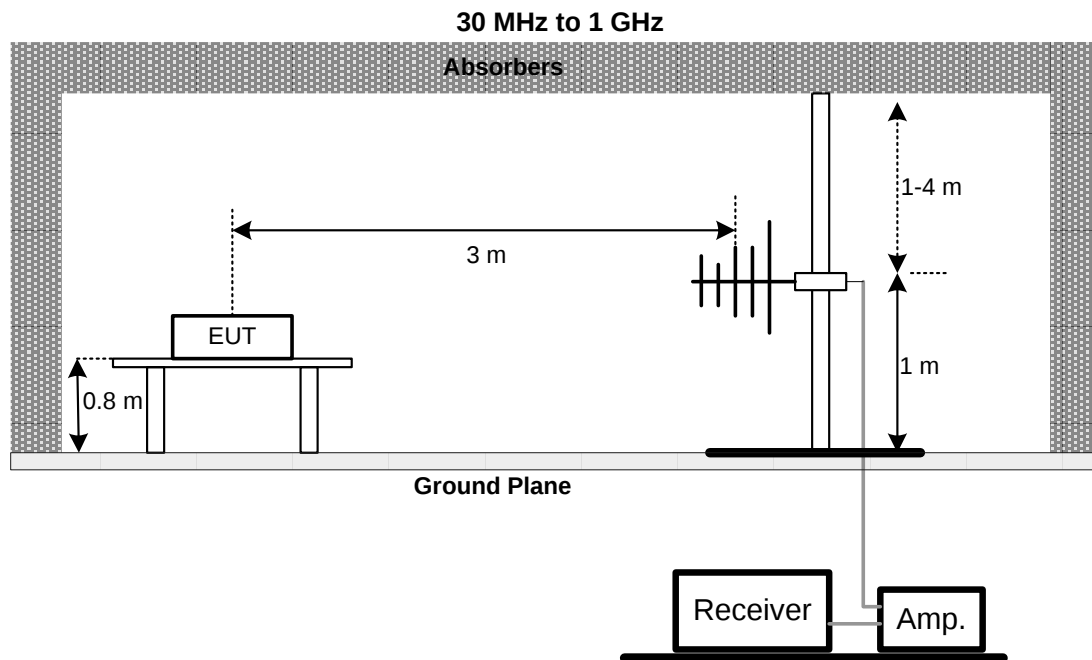
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- The measuring distance of 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 1GHz)
- The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- 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 1GHz)
- For the actual test configuration, please refer to the related Item – EUT TEST PHOTO.

3.3 DEVIATION FROM TEST STANDARD

No deviation.

3.4 TEST SETUP





3.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

3.6 TEST RESULT – BELOW 30 MHZ

There were no emissions found below 30 MHz within 20 dB of the limit.

3.7 TEST RESULT – 30 MHZ TO 1 GHZ

Please refer to the APPENDIX A.

3.8 TEST RESULT – ABOVE 1 GHZ

N/A.

NOTE:

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

4 LIST OF MEASURING EQUIPMENTS

Radiated Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Preamplifier	EMCI	EMC330N	980850	2023/9/6	2024/9/5
2	Test Cable	EMCI	EMC104-SM-1000	180809	2023/7/10	2024/7/9
3	Test Cable	EMCI	EMC104-SM-SM-3000	220322	2023/3/14	2024/3/13
4	Test Cable	EMCI	EMC104-SM-SM-7000	220324	2023/3/14	2024/3/13
5	EXA Signal Analyzer	keysight	N9020B	MY57120120	2023/2/24	2024/2/23
6	Log-bicon Antenna	Schwarzbeck	VULB9168	1369	2023/5/9	2024/5/8
7	6dB Attenuator	EMCI	EMCI-N-6-06	AT-06001	2023/5/9	2024/5/8
8	Measurement Software	EZ	EZ_EMC (Version NB-03A1-01)	N/A	N/A	N/A

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

5 EUT TEST PHOTO

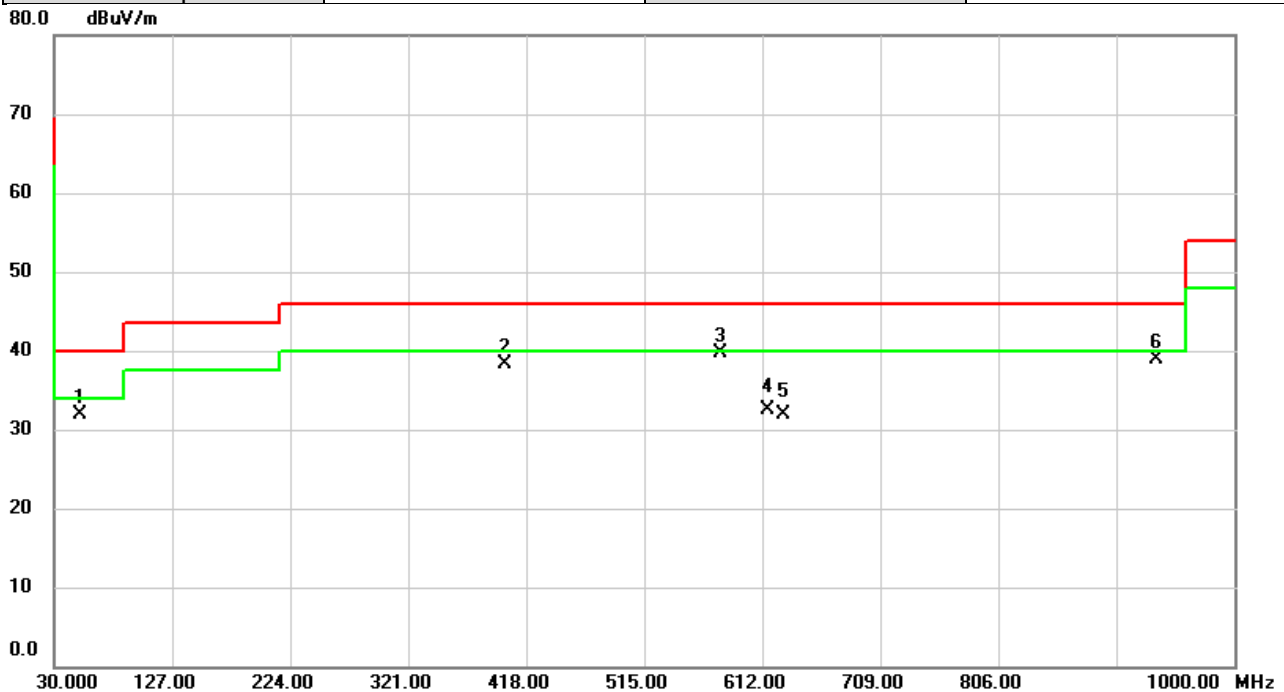
Please refer to document Appendix No.: TP-2307G106-FCCP-1 (APPENDIX-TEST PHOTOS).

6 EUT PHOTOS

Please refer to document Appendix No.: EP-2307G106-1 (APPENDIX-EUT PHOTOS).

APPENDIX A RADIATED EMISSIONS - 30 MHZ TO 1 GHZ

Test Mode	TX	Test Date	2023/10/19
Test Frequency	920.9MHz	Polarization	Vertical
Temp	23°C	Hum.	58%

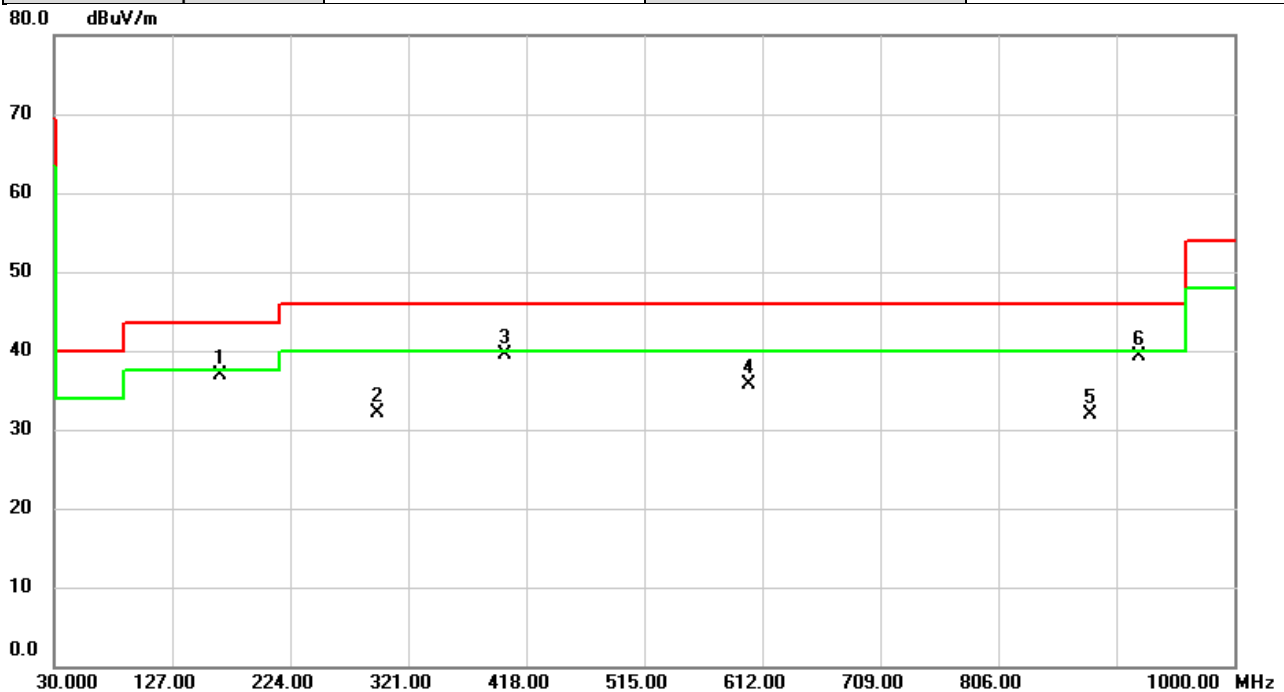


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		51.3723	43.26	-11.30	31.96	40.00	-8.04	peak	
2		400.0227	46.95	-8.60	38.35	46.00	-7.65	peak	
3	*	577.7590	44.23	-4.60	39.63	46.00	-6.37	peak	
4		616.5590	36.12	-3.71	32.41	46.00	-13.59	QP	
5		629.4600	35.40	-3.51	31.89	46.00	-14.11	QP	
6		935.9800	37.79	1.12	38.91	46.00	-7.09	peak	

REMARKS:

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

Test Mode	TX	Test Date	2023/10/19
Test Frequency	920.9MHz	Polarization	Horizontal
Temp	23°C	Hum.	58%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		166.4467	49.01	-12.11	36.90	43.50	-6.60	peak	
2		295.2303	43.40	-11.35	32.05	46.00	-13.95	peak	
3	*	399.9903	48.03	-8.60	39.43	46.00	-6.57	peak	
4		601.3300	39.68	-3.94	35.74	46.00	-10.26	peak	
5		881.9833	31.63	0.29	31.92	46.00	-14.08	peak	
6		921.1067	38.44	0.85	39.29	46.00	-6.71	peak	

REMARKS:

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

End of Test Report