

FCC Radio Test Report

FCC ID: 2ALZB-AG1103

Report No. : BTL-FCCP-2-2102T091
Equipment : IEEE 802.11 2X2 MU-MIMO ac/a/b/g/n Wireless LAN +Bluetooth NGFF Module
Model Name : W8997-1216
Brand Name : Marvell
Applicant : SECO S.p.A
Address : Via Achille Grandi 20, 52100 Arezzo Italy

Radio Function : Bluetooth Low Energy 5.0

FCC Rule Part(s) : FCC Part15, Subpart C (15.247)
Measurement Procedure(s) : ANSI C63.10-2013
FCC KDB 414788 D01 Radiated Test Site v01r01
FCC KDB 558074 D01 15.247 Meas Guidance v05r02

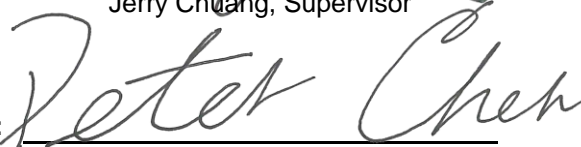
Date of Receipt : 2021/2/9
Date of Test : 2021/2/9 ~ 2021/8/25
Issued Date : 2021/10/6

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

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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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REVISION HISTORY

Report No.	Version	Description	Issued Date
BTL-FCCP-2-2102T091	R00	Original Report.	2021/7/28
BTL-FCCP-2-2102T091	R01	Revised report to address TCB's comments.	2021/8/16
BTL-FCCP-2-2102T091	R02	Revised report to address TCB's comments.	2021/8/26
BTL-FCCP-2-2102T091	R03	Revised report to address TCB's comments.	2021/9/29
BTL-FCCP-2-2102T091	R04	Revised report to address TCB's comments.	2021/10/1
BTL-FCCP-2-2102T091	R05	Revised report to address TCB's comments.	2021/10/6

1 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards.

FCC Part 15, Subpart C (15.247)				
Standard(s) Section	Description	Test Result	Judgement	Remark
15.207	AC Power Line Conducted Emissions	APPENDIX A	Pass	-----
15.205 15.209 15.247(d)	Radiated Emissions	APPENDIX B APPENDIX C	Pass	-----
15.247(b)(3)	Output Power	APPENDIX D	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) This test report is issued for the RF module (FCC ID: 2ALZB-AG1103) to be incorporated to the host device (Model number: Unity22 / Unity32), Product name: Display Unity 22" / Display Unity 32"). Since the RF module has been certificated, after evaluation, above test items were criticized and reconfirmed in this report.
- (4) After spot check, this revision does not change original radio parameters.

1.1 TEST FACILITY

The test facilities used to collect the test data in this report:

No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

The test sites and facilities are covered under FCC RN: 674415 and DN: TW0659.

☒ C05 ☐ CB08 ☐ CB11 ☒ CB15 ☐ CB16
☒ SR05

1.2 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. AC power line conducted emissions test:

Test Site	Method	Measurement Frequency Range	U (dB)
C05	CISPR	150 kHz ~ 30MHz	3.44

B. Radiated emissions test :

Test Site	Measurement Frequency Range	U,(dB)
CB15	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

C. Conducted test :

Test Item	U,(dB)
Output Power	1.06

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	Environment Condition	Test Voltage	Tested by
AC Power Line Conducted Emissions	24 °C, 62 %	AC 120V	William Wei
Radiated emissions below 1 GHz	Refer to data	AC 120V	Hunter Chiang
Radiated emissions above 1 GHz	Refer to data	AC 120V	Hunter Chiang
Output Power	24.2 °C, 64 %	AC 120V	William Wei

1.4 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

Test Software	CMD			
Modulation Mode	2402 MHz	2440 MHz	2480 MHz	Data Rate
BLE5.0	DEF	DEF	DEF	1 Mbps

2 GENERAL INFORMATION

2.1 DESCRIPTION OF EUT

Equipment	IEEE 802.11 2X2 MU-MIMO ac/a/b/g/n Wireless LAN +Bluetooth NGFF Module
Model Name	W8997-1216
Brand Name	Marvell
Model Difference	N/A
Power Supply Rating	DC 3.3V from host equipment
Host device information	
Equipment	Display Unity 22" / Display Unity 32"
Model Name	Unity22 / Unity32
Brand Name	SECO
Model Difference	Differ in product size.
Power Source	DC voltage supplied from AC/DC Adapter.
Power Rating	DC 12V
Products Covered	1 * Adapter: EDAC / EA1050A-120
WIFI+BT Module	Marvell / W8997-1216
Operation Band	2400 MHz ~ 2483.5 MHz
Operation Frequency	2402 MHz ~ 2480 MHz
Maximum Output Power	3.55dBm (0.0023W)
Test Model	Unity22
Sample Status	Engineering Sample
EUT Modification(s)	N/A

NOTE:

- (1) For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
- (2) Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2442
01	2404	21	2444
02	2406	22	2446
03	2408	23	2448
04	2410	24	2450
05	2412	25	2452
06	2414	26	2454
07	2416	27	2456
08	2418	28	2458
09	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

- (3) Table for Filed Antenna:

Antenna	Manufacture	Part number	Type	Frequency Range (MHz)	Gain (dBi)
Main	dynaflex	616	Dipole	2400-2480	1.1
				5000-5800	2.5

2.2 TEST MODES

Test Items	Test mode	Channel	Note
AC power line conducted emissions	Normal/Idle	-	-
Transmitter Radiated Emissions (below 1GHz)	1 Mbps	39	-
Transmitter Radiated Emissions (above 1GHz)	1 Mbps	00/39	Bandedge
	1 Mbps	00/19/39	Harmonic
Output Power	1 Mbps	00/19/39	-

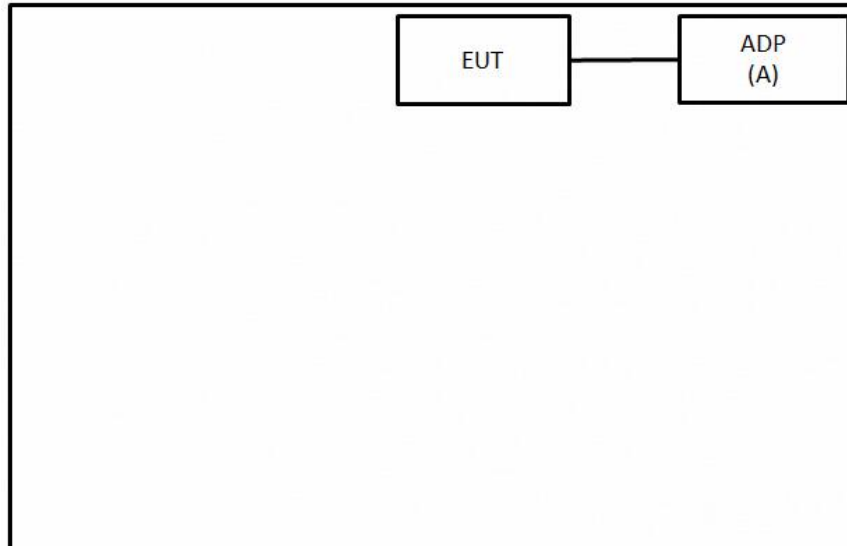
NOTE:

- (1) The Radiated emissions test was verified based on the worst conducted power and Bandwidth test results reported in the original report.
- (2) For radiated emission band edge test, both Vertical and Horizontal are evaluated, but only the worst case (Vertical) is recorded.
- (3) All X, Y and Z axes are evaluated, but only the worst case (Y axis) is recorded.
- (4) After pretest, Host device Display Unity 22" / Unity22 is found to be the worst case and used for final test.

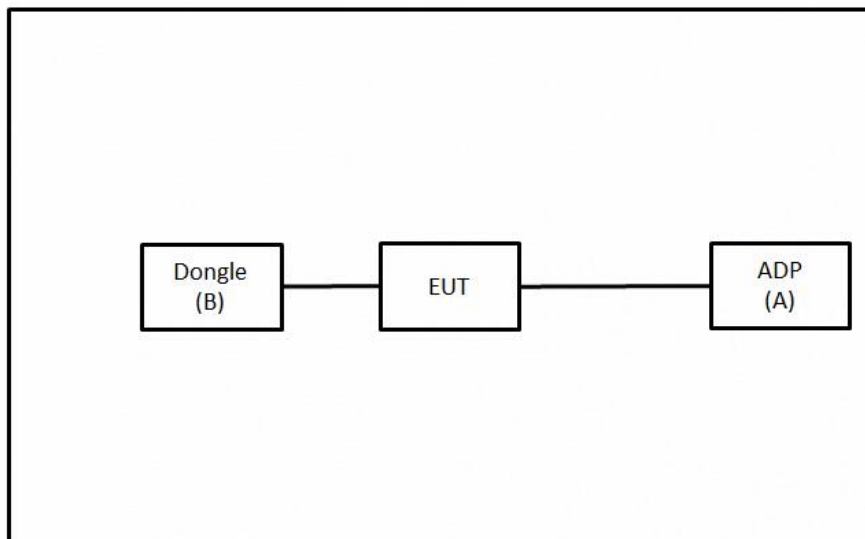
2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

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

AC Power Line Conducted Emissions Test



Radiated Emissions Test



2.4 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.	Remarks
A	Adapter	EDAC	EA1050A-120	N/A	Supplied by test requester
B	Dongle	Transcend	JetFlash700	N/A	Supplied by test requester

Item	Shielded	Ferrite Core	Length	Cable Type	Remarks
-	-	-	-	-	-

3 AC POWER LINE CONDUCTED EMISSIONS TEST

3.1 LIMIT

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56 *	56 - 46 *
0.50 - 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) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor (if use)
 Margin Level = Measurement Value – Limit Value
 Calculation example:

Reading Level		Correct Factor		Measurement Value
38.22	+	3.45	=	41.67

Measurement Value		Limit Value		Margin Level
41.67	-	60	=	-18.33

The following table is the setting of the receiver.

Receiver Parameter	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

3.2 TEST PROCEDURE

- a. The EUT was placed 0.8 m above the horizontal ground plane with the EUT being connected to the power mains through a line impedance stabilization network (LISN).
 All other support equipment were powered from an additional LISN(s).
 The LISN provides 50 Ohm/50uH of 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 to keep the cable above 40 cm.
- c. Excess I/O cables that are not connected to a peripheral shall be bundled in the center.
 The end of the cable will be terminated, using the correct terminating impedance.
 The overall length shall not exceed 1 m.
- d. The LISN is spaced at least 80 cm from the nearest part of the EUT chassis.
- e. For the actual test configuration, please refer to the related Item - EUT TEST PHOTO.

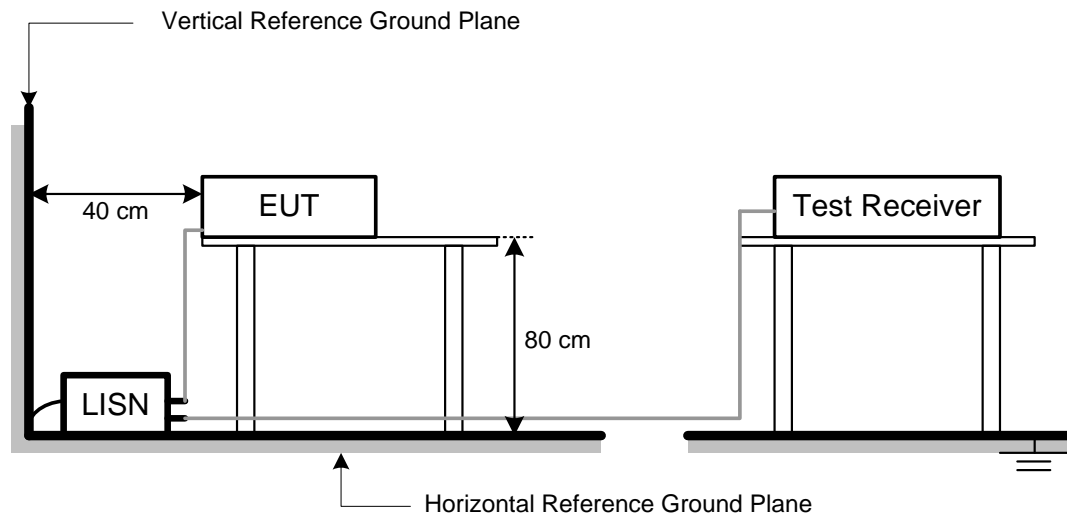
NOTE:

- (1) In the results, each reading is marked as Peak, QP or AVG per the detector used.
 BW=9 kHz (6 dB Bandwidth)
- (2) All readings are Peak unless otherwise stated QP or AVG in column of Note. Both the QP and the AVG readings must be less than the limit for compliance.

3.3 DEVIATION FROM TEST STANDARD

No deviation.

3.4 TEST SETUP



3.5 TEST RESULT

Please refer to the APPENDIX A.

4 RADIATED EMISSIONS TEST

4.1 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 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

Mode	VBW(Hz)
BLE (1M)	2.7k

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

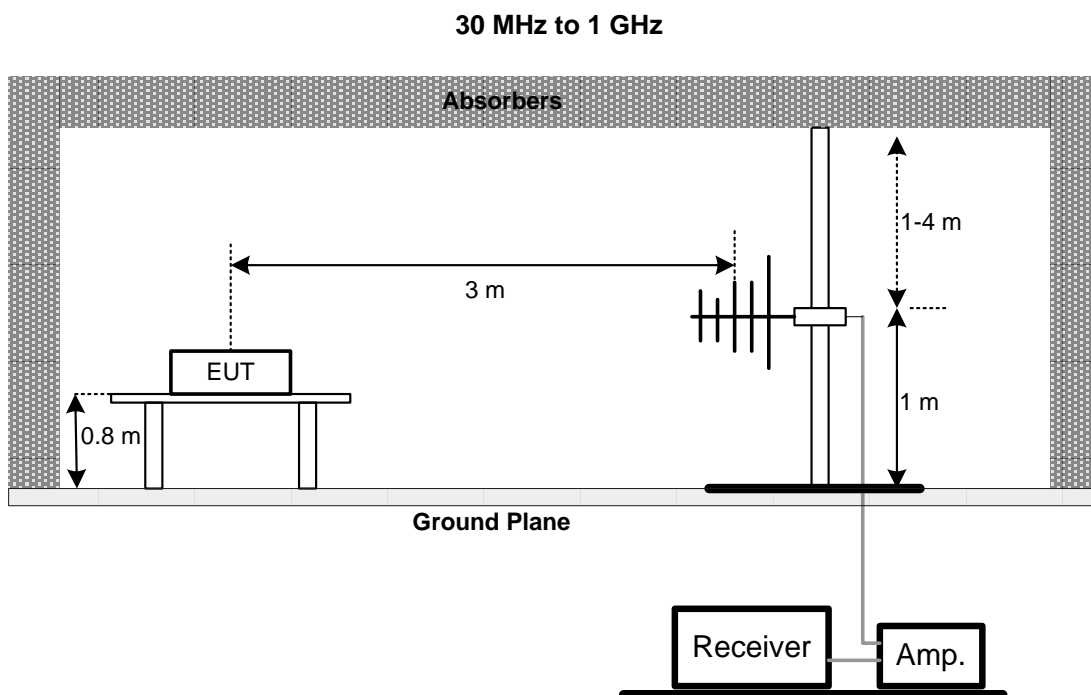
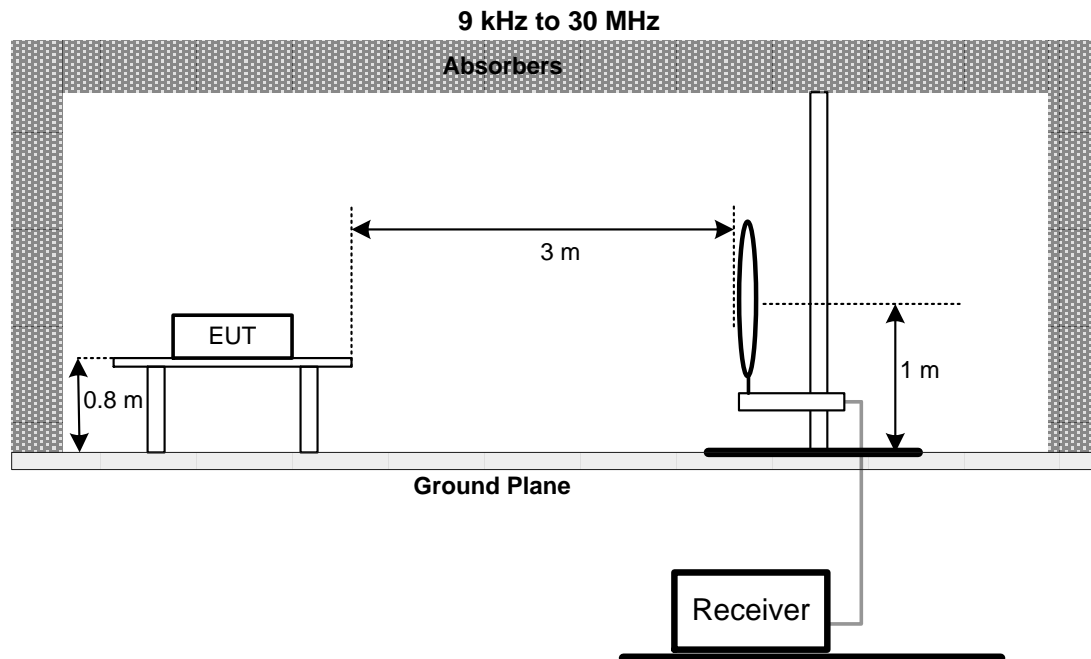
4.2 TEST PROCEDURE

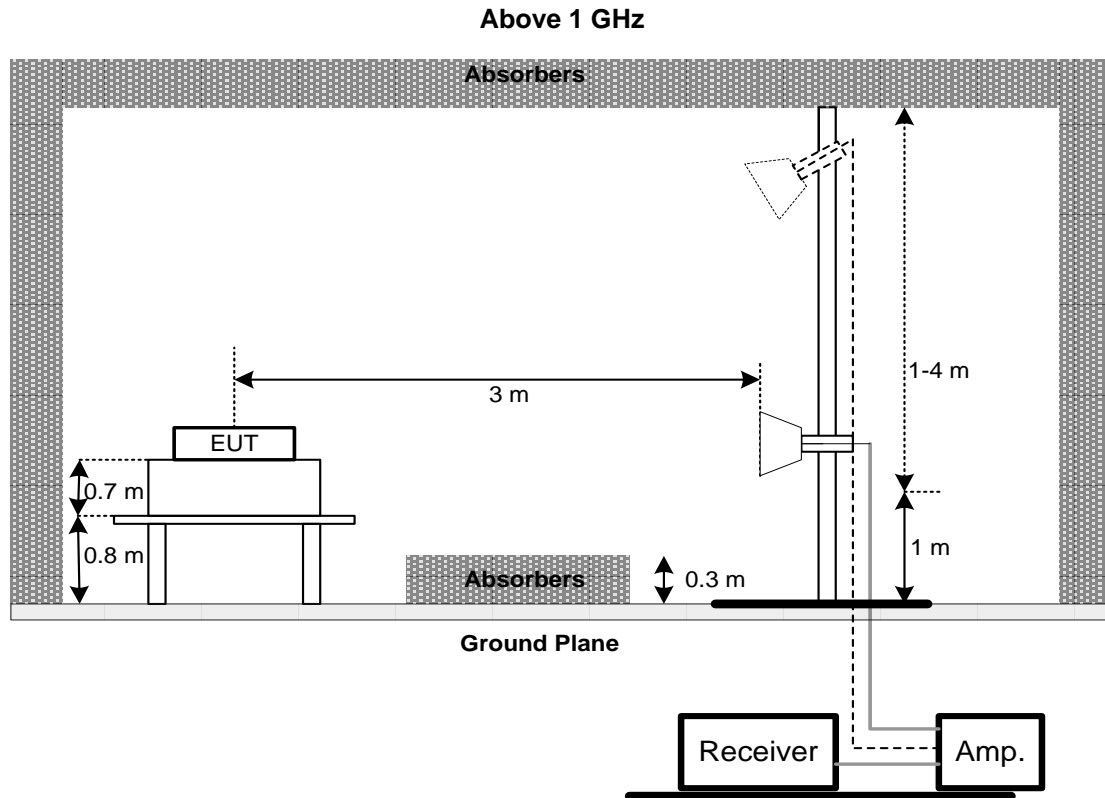
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance 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 1GHz)
- c. 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.
- 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 1GHz.
- 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 1GHz)
- 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 1GHz)
- i. For the actual test configuration, please refer to the related Item – EUT TEST PHOTO.
- j. For the radiated emission test sites for measurements from 9 kHz to 30 MHz, in accordance with FCC KDB 414788, an alternative test site may be used for the measurement. The open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result. Therefore the result from the semi-anechoic chamber tests is shown in this section of the test report.

4.3 DEVIATION FROM TEST STANDARD

No deviation.

4.4 TEST SETUP





4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 TEST RESULT – BELOW 30 MHZ

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

4.7 TEST RESULT – 30 MHZ TO 1 GHZ

Please refer to the APPENDIX B.

4.8 TEST RESULT – ABOVE 1 GHZ

Please refer to the APPENDIX C.

NOTE:

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

5 OUTPUT POWER TEST

5.1 LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(1)	Maximum peak conducted output power	0.125 Watts (20.97 dBm)	2400-2483.5	PASS

5.2 TEST PROCEDURE

- The EUT was directly connected to the power meter and antenna output port as show in the block diagram below.
- The maximum peak conducted output power was performed in accordance with ANSI C63.10, subclause 11.9.1.3 and section 8.1 of KDB 558074 D01.

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 D.

6 LIST OF MEASURING EQUIPMENTS

AC Power Line Conducted Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	TWO-LINE V-NETWORK	R&S	ENV216	101050	2020/6/11	2021/6/10
2	Test Cable	EMCI	EMC400-BM-BM-5000	170501	2020/6/8	2021/6/7
3	EMI Test Receiver	R&S	ESCI	100080	2020/6/15	2021/6/14
4	Measurement Software	EZ	EZ EMC (Version NB-03A1-01)	N/A	N/A	N/A

Radiated Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Preamplifier	EMCI	EMC02325B	980217	2021/4/8	2022/4/7
2	Preamplifier	EMCI	EMC012645B	980267	2021/4/8	2022/4/7
3	Preamplifier	EMCI	EMC001340	980555	2021/4/8	2022/4/7
4	Test Cable	EMCI	EMC-SM-SM-1000	180809	2021/4/8	2022/4/7
5	Test Cable	EMCI	EMC104-SM-SM-3000	151205	2021/4/8	2022/4/7
6	Test Cable	EMCI	EMC-SM-SM-7000	180408	2021/4/8	2022/4/7
7	MXE EMI Receiver	Agilent	N9038A	MY554200087	2021/5/27	2022/5/26
8	Signal Analyzer	Agilent	N9010A	MY52220990	2021/8/18	2022/8/17
9	Loop Ant	Electro-Metrics	EMCI-LPA600	274	2021/6/1	2022/5/31
10	Horn Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	2021/6/2	2022/6/1
11	Horn Ant	Schwarzbeck	BBHA 9170	BBHA 9170340	2021/7/9	2022/7/8
12	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	VULB 9168-352	2021/7/23	2022/7/22
13	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0625	2021/7/23	2022/7/22
14	Measurement Software	EZ	EZ EMC (Version NB-03A1-01)	N/A	N/A	N/A

Output Power						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Power Meter	Anritsu	ML2487A	6K00004714	2020/9/3	2021/9/2
2	Power Sensor	Anritsu	MA2491A	034138	2020/9/3	2021/9/2

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

7 EUT TEST PHOTO

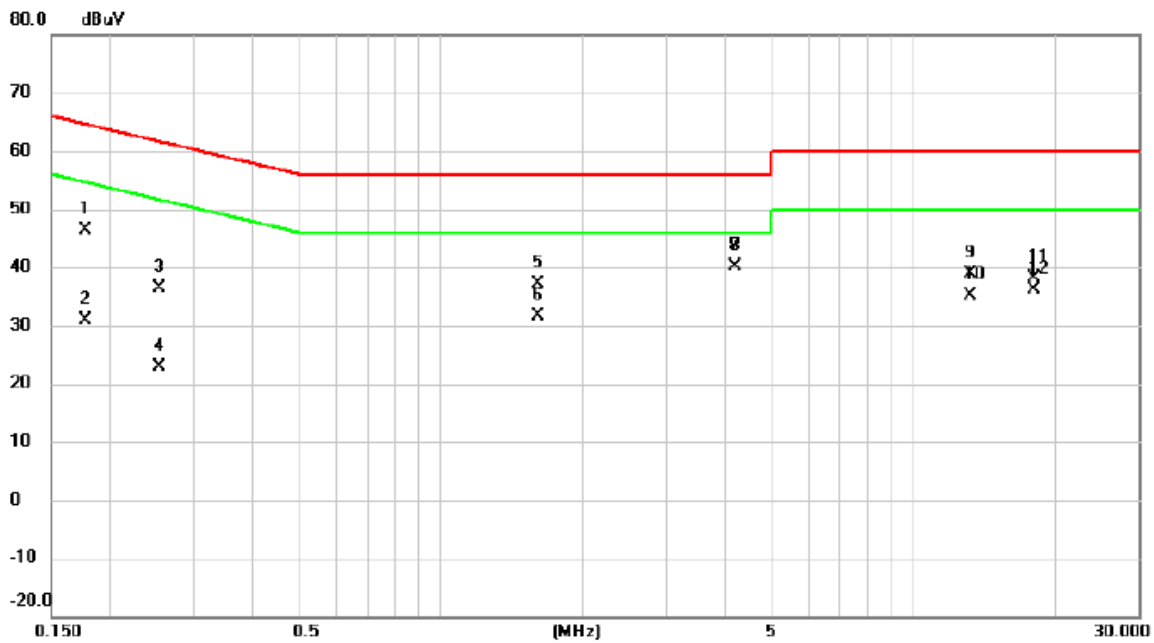
Please refer to document Appendix No.: TP-2102T091-FCCP-1 (APPENDIX-TEST PHOTOS).

8 EUT PHOTOS

Please refer to document Appendix No.: EP-2102T091-2 (APPENDIX-EUT PHOTOS).

APPENDIX A AC POWER LINE CONDUCTED EMISSIONS

Test Mode	Normal	Tested Date	2021/4/23
Test Frequency	-	Phase	Line

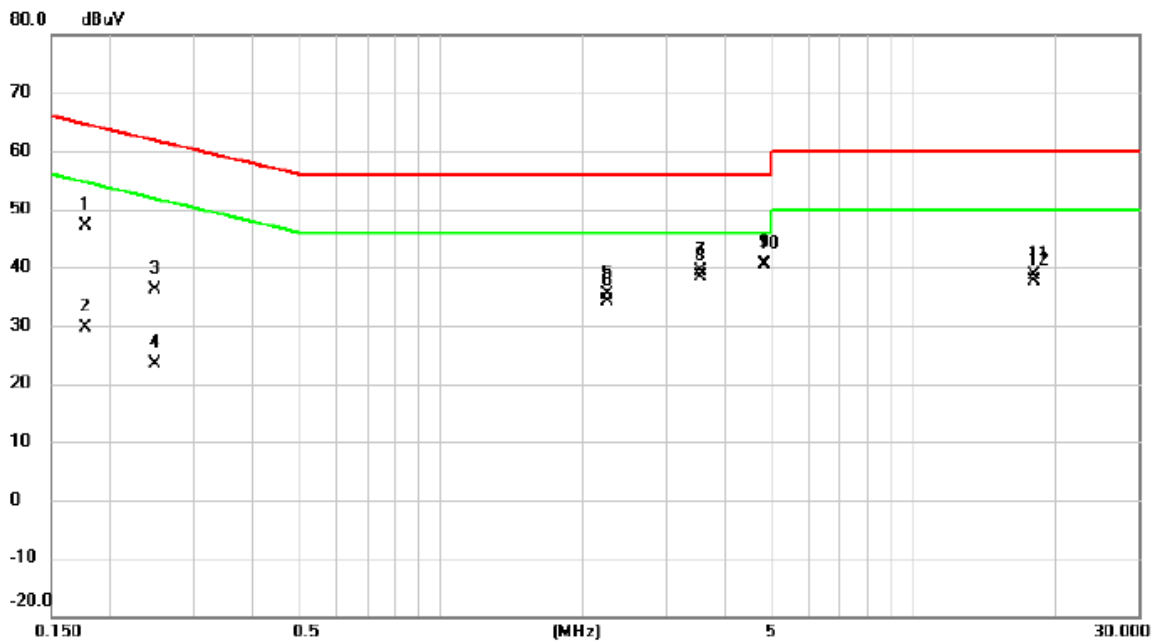


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1770	36.66	9.67	46.33	64.63	-18.30	QP	
2		0.1770	21.20	9.67	30.87	54.63	-23.76	AVG	
3		0.2535	26.75	9.68	36.43	61.64	-25.21	QP	
4		0.2535	13.08	9.68	22.76	51.64	-28.88	AVG	
5		1.6080	27.39	9.72	37.11	56.00	-18.89	QP	
6		1.6080	21.82	9.72	31.54	46.00	-14.46	AVG	
7		4.1820	30.44	9.80	40.24	56.00	-15.76	QP	
8	*	4.1820	30.22	9.80	40.02	46.00	-5.98	AVG	
9		13.1888	29.00	9.94	38.94	60.00	-21.06	QP	
10		13.1888	25.16	9.94	35.10	50.00	-14.90	AVG	
11		18.0173	28.17	9.96	38.13	60.00	-21.87	QP	
12		18.0173	26.29	9.96	36.25	50.00	-13.75	AVG	

REMARKS:

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

Test Mode	Normal	Tested Date	2021/4/23
Test Frequency	-	Phase	Neutral

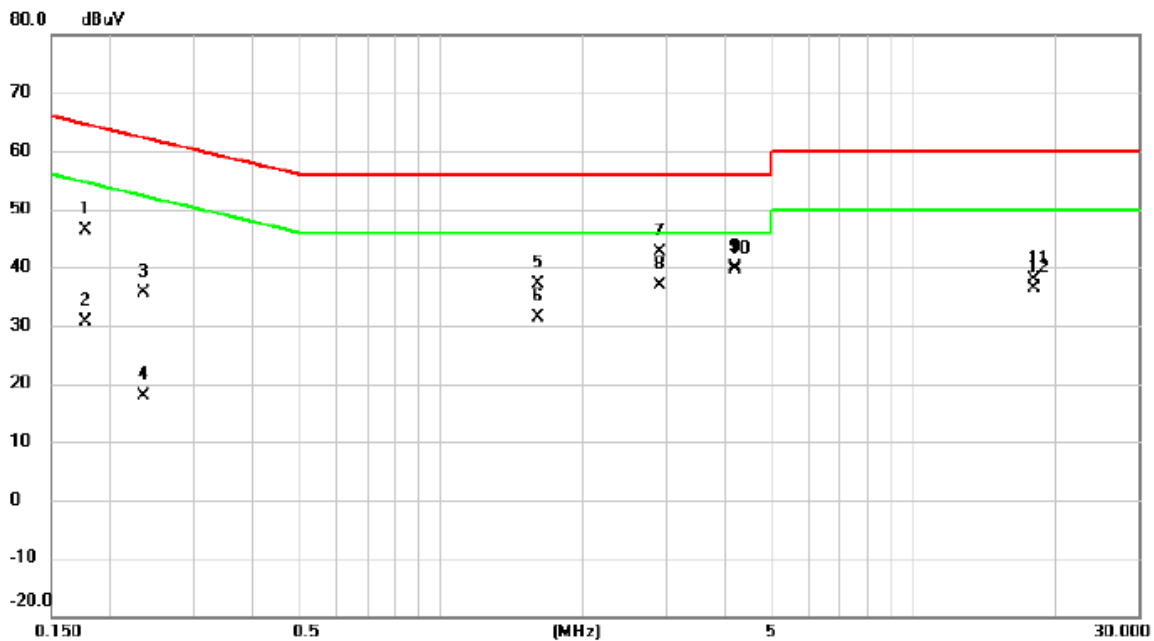


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1770	37.54	9.67	47.21	64.63	-17.42	QP	
2		0.1770	20.06	9.67	29.73	54.63	-24.90	AVG	
3		0.2490	26.55	9.68	36.23	61.79	-25.56	QP	
4		0.2490	13.65	9.68	23.33	51.79	-28.46	AVG	
5		2.2515	25.74	9.74	35.48	56.00	-20.52	QP	
6		2.2515	24.39	9.74	34.13	46.00	-11.87	AVG	
7		3.5385	29.50	9.78	39.28	56.00	-16.72	QP	
8		3.5385	28.64	9.78	38.42	46.00	-7.58	AVG	
9		4.8255	30.71	9.83	40.54	56.00	-15.46	QP	
10	*	4.8255	30.48	9.83	40.31	46.00	-5.69	AVG	
11		18.0150	28.69	9.96	38.65	60.00	-21.35	QP	
12		18.0150	27.63	9.96	37.59	50.00	-12.41	AVG	

REMARKS:

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

Test Mode	Idle	Tested Date	2021/4/23
Test Frequency	-	Phase	Line

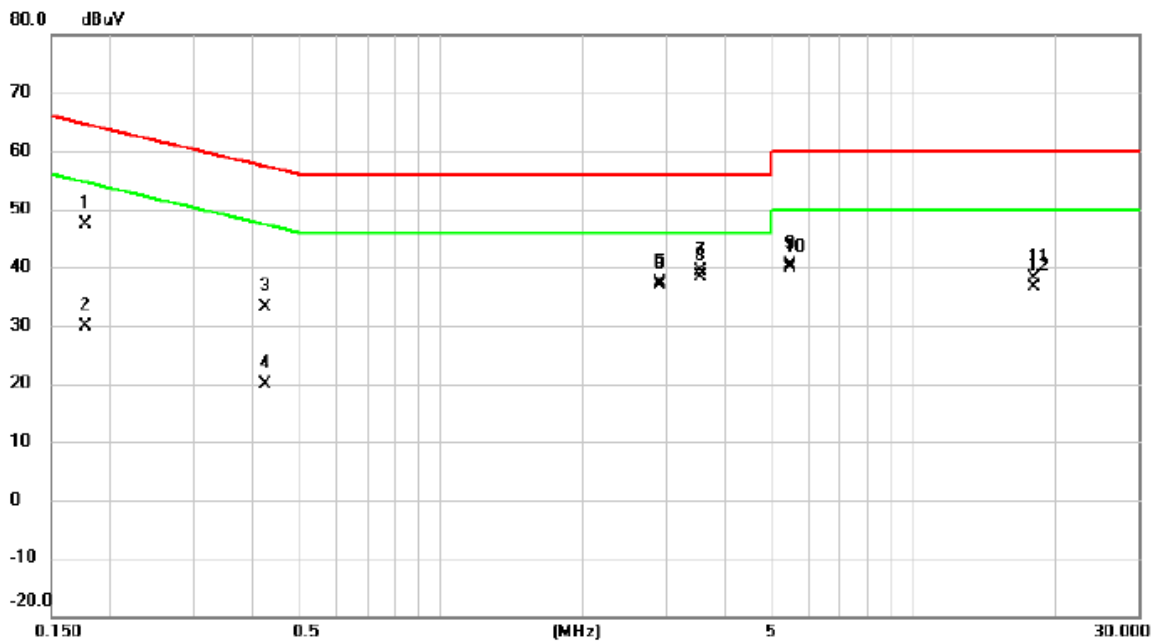


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1770	36.72	9.67	46.39	64.63	-18.24	QP	
2		0.1770	20.90	9.67	30.57	54.63	-24.06	AVG	
3		0.2355	25.95	9.68	35.63	62.25	-26.62	QP	
4		0.2355	8.32	9.68	18.00	52.25	-34.25	AVG	
5		1.6080	27.43	9.72	37.15	56.00	-18.85	QP	
6		1.6080	21.74	9.72	31.46	46.00	-14.54	AVG	
7		2.8950	32.97	9.76	42.73	56.00	-13.27	QP	
8		2.8950	27.00	9.76	36.76	46.00	-9.24	AVG	
9		4.1820	30.00	9.80	39.80	56.00	-16.20	QP	
10	*	4.1820	29.72	9.80	39.52	46.00	-6.48	AVG	
11		18.0128	27.81	9.96	37.77	60.00	-22.23	QP	
12		18.0128	26.43	9.96	36.39	50.00	-13.61	AVG	

REMARKS:

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

Test Mode	Idle	Tested Date	2021/4/23
Test Frequency	-	Phase	Neutral



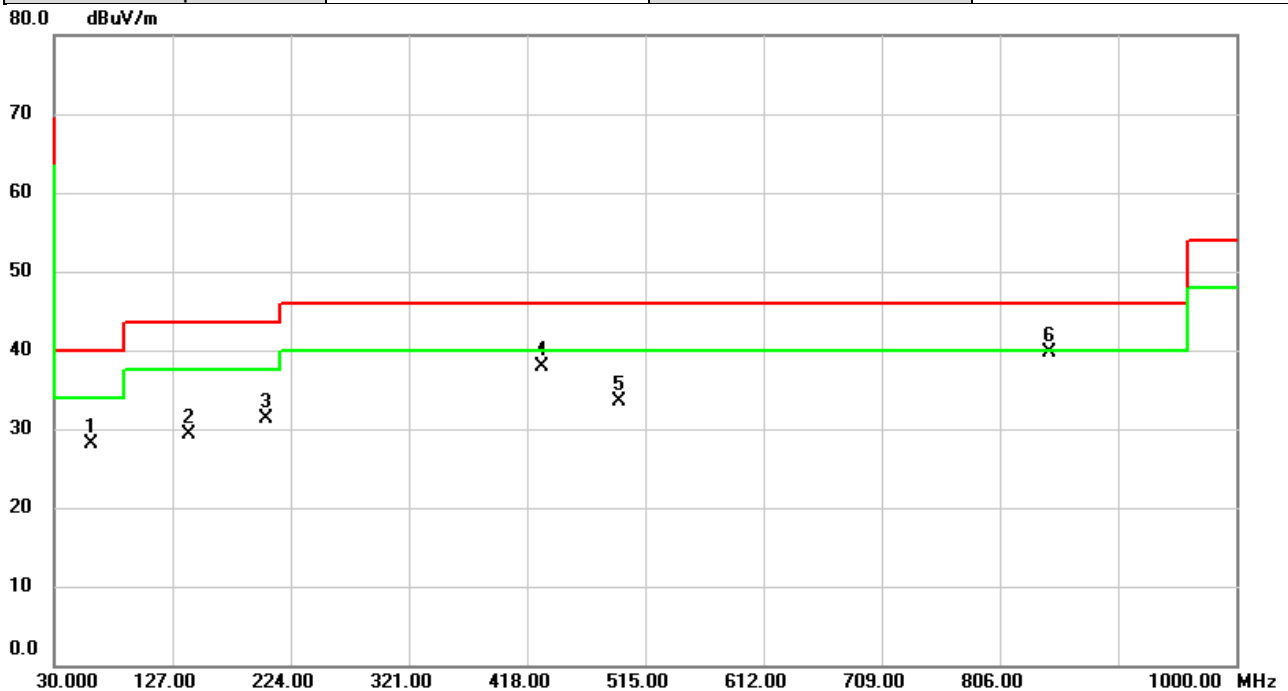
No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	0.1770	37.63	9.67	47.30	64.63	-17.33	QP	
2	0.1770	20.16	9.67	29.83	54.63	-24.80	AVG	
3	0.4245	23.57	9.68	33.25	57.36	-24.11	QP	
4	0.4245	10.17	9.68	19.85	47.36	-27.51	AVG	
5	2.8950	27.62	9.76	37.38	56.00	-18.62	QP	
6	2.8950	27.05	9.76	36.81	46.00	-9.19	AVG	
7	3.5385	29.60	9.78	39.38	56.00	-16.62	QP	
8 *	3.5385	28.71	9.78	38.49	46.00	-7.51	AVG	
9	5.4668	30.51	9.84	40.35	60.00	-19.65	QP	
10	5.4668	30.11	9.84	39.95	50.00	-10.05	AVG	
11	18.0105	28.07	9.96	38.03	60.00	-21.97	QP	
12	18.0105	26.62	9.96	36.58	50.00	-13.42	AVG	

REMARKS:

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

APPENDIX B RADIATED EMISSIONS - 30 MHZ TO 1 GHZ

Test Mode	BLE 5.0(1 Mbps)	Test Date	2021/5/24
Test Frequency	2480MHz	Polarization	Vertical
Temp	22°C	Hum.	57%

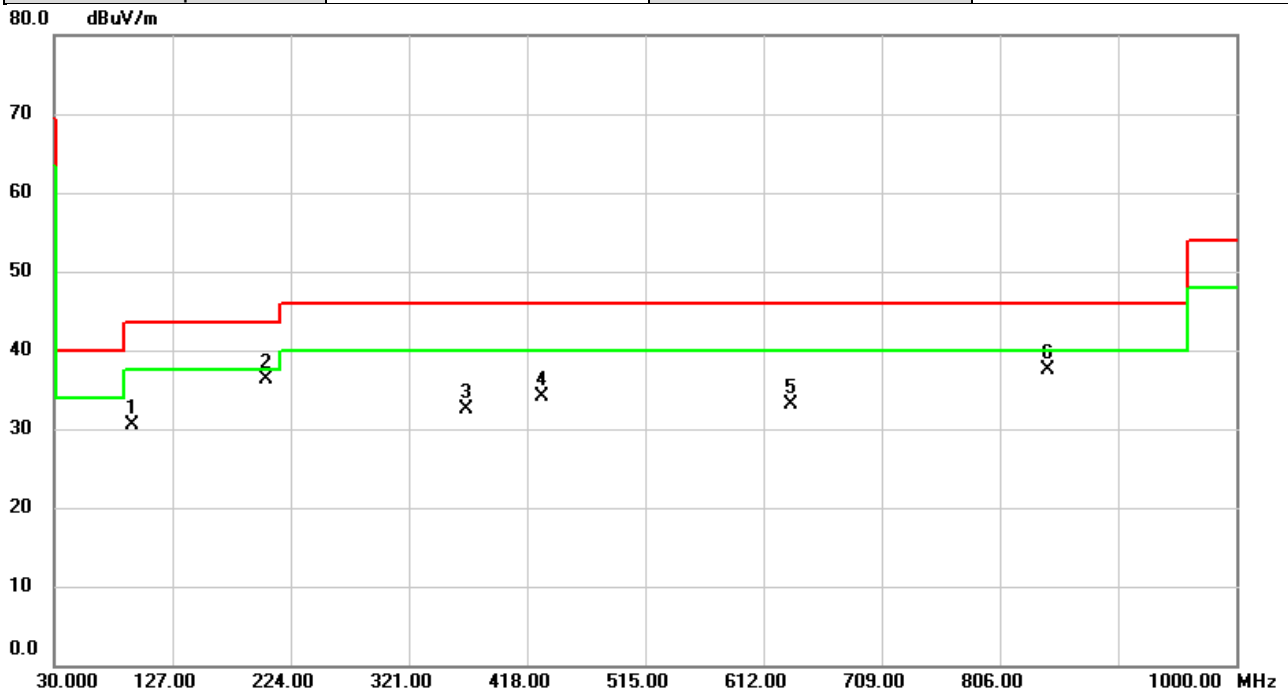


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		60.7167	36.96	-8.83	28.13	40.00	-11.87	peak	
2		141.1943	37.82	-8.61	29.21	43.50	-14.29	peak	
3		203.3713	41.96	-10.75	31.21	43.50	-12.29	peak	
4		430.8363	42.10	-4.13	37.97	46.00	-8.03	peak	
5		493.5953	36.42	-2.87	33.55	46.00	-12.45	peak	
6	*	846.8693	36.28	3.35	39.63	46.00	-6.37	peak	

REMARKS:

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

Test Mode	BLE 5.0(1 Mbps)	Test Date	2021/5/24
Test Frequency	2480MHz	Polarization	Horizontal
Temp	22°C	Hum.	57%



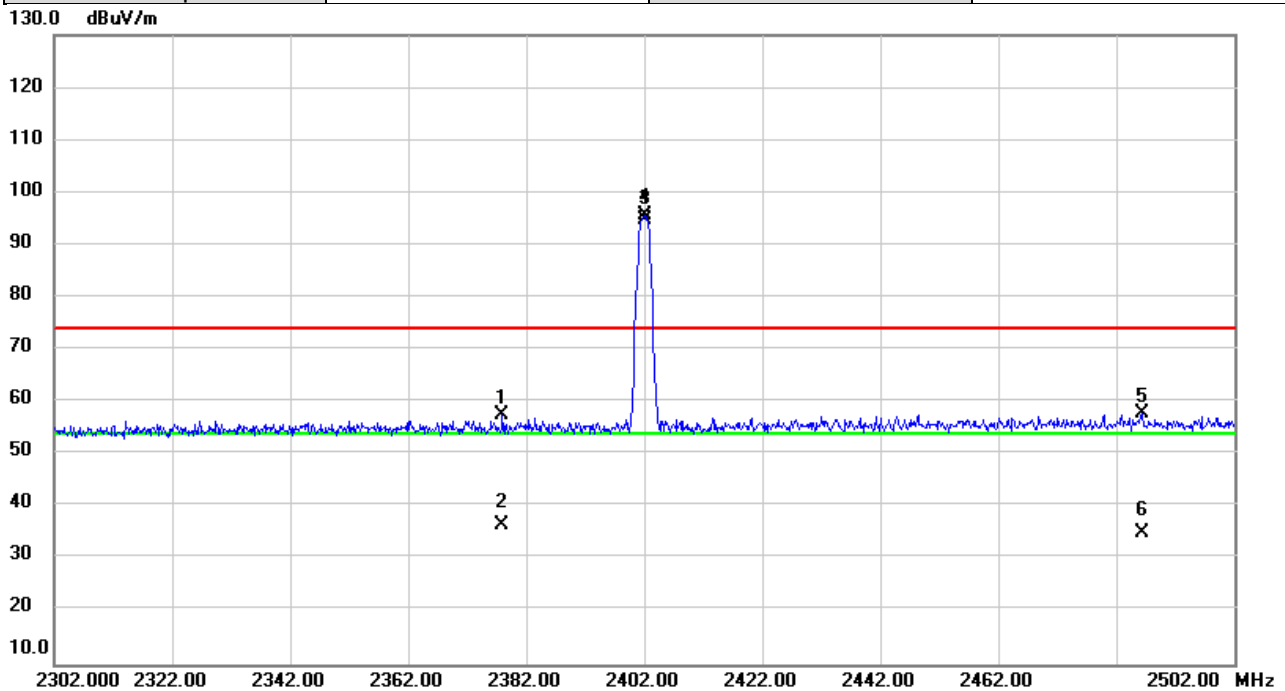
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		93.5350	44.77	-14.28	30.49	43.50	-13.01	peak	
2	*	203.4036	47.05	-10.75	36.30	43.50	-7.20	peak	
3		368.7886	38.08	-5.64	32.44	46.00	-13.56	peak	
4		430.8686	38.15	-4.13	34.02	46.00	-11.98	peak	
5		635.1183	33.18	-0.16	33.02	46.00	-12.98	peak	
6		845.9640	34.23	3.33	37.56	46.00	-8.44	peak	

REMARKS:

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

APPENDIX C RADIATED EMISSIONS - ABOVE 1 GHZ

Test Mode	BLE 5.0(1Mbps)	Test Date	2021/4/16
Test Frequency	2402MHz	Polarization	Vertical
Temp	22°C	Hum.	61%



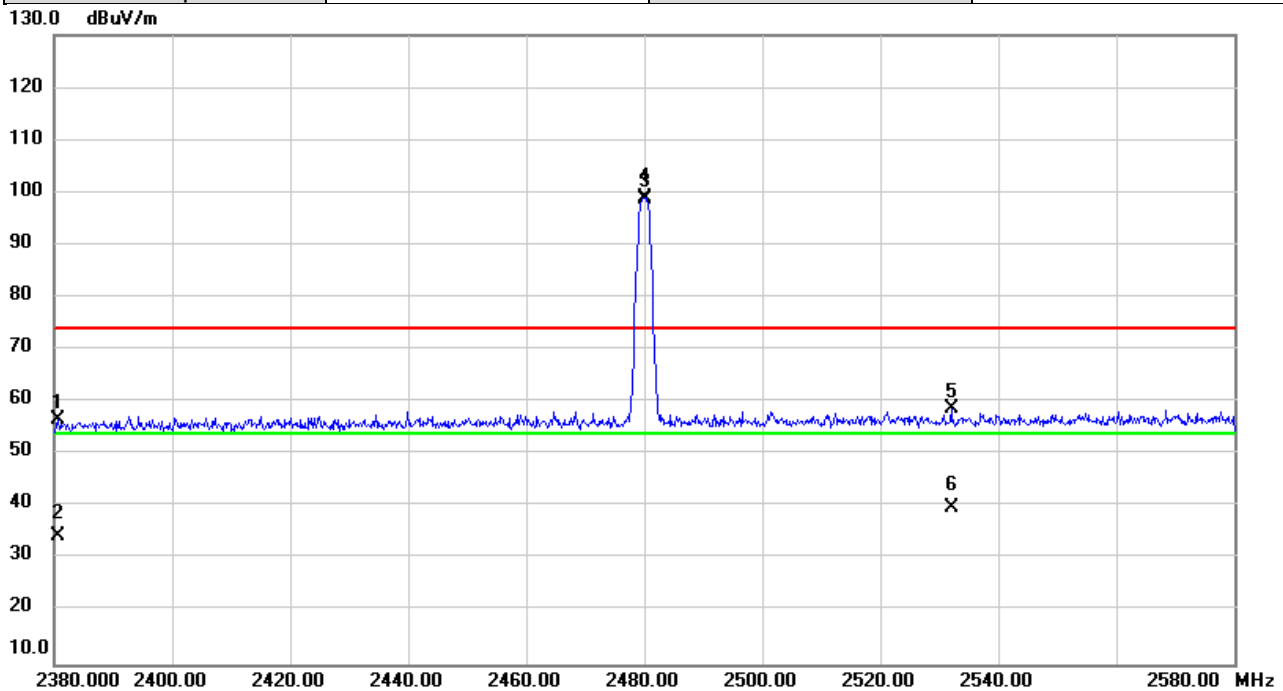
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2377.840	26.70	30.74	57.44	74.00	-16.56	peak	
2		2377.840	5.67	30.74	36.41	54.00	-17.59	AVG	
3	X	2402.000	64.69	30.84	95.53			peak	
4	*	2402.000	63.86	30.84	94.70			AVG	
5		2486.400	26.78	31.17	57.95	74.00	-16.05	peak	
6		2486.400	4.00	31.17	35.17	54.00	-18.83	AVG	

REMARKS:

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

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

Test Mode	BLE 5.0(1Mbps)	Test Date	2021/4/16
Test Frequency	2480MHz	Polarization	Vertical
Temp	22°C	Hum.	61%

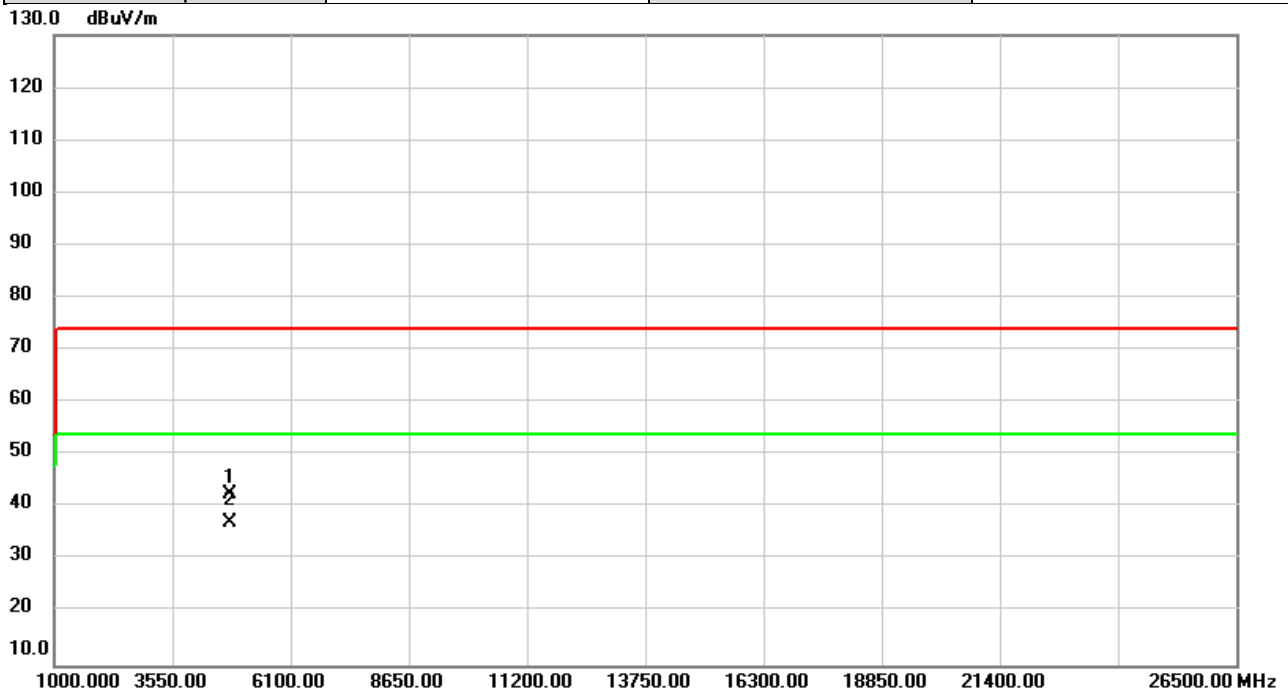


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2380.733	25.76	30.75	56.51	74.00	-17.49	peak	
2		2380.733	3.72	30.75	34.47	54.00	-19.53	AVG	
3	X	2480.000	67.91	31.15	99.06			peak	
4	*	2480.000	67.36	31.15	98.51			AVG	
5		2532.073	27.34	31.36	58.70	74.00	-15.30	peak	
6		2532.073	8.35	31.36	39.71	54.00	-14.29	AVG	

REMARKS:

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

Test Mode	BLE 5.0(1Mbps)	Test Date	2021/4/16
Test Frequency	2402MHz	Polarization	Vertical
Temp	22°C	Hum.	61%

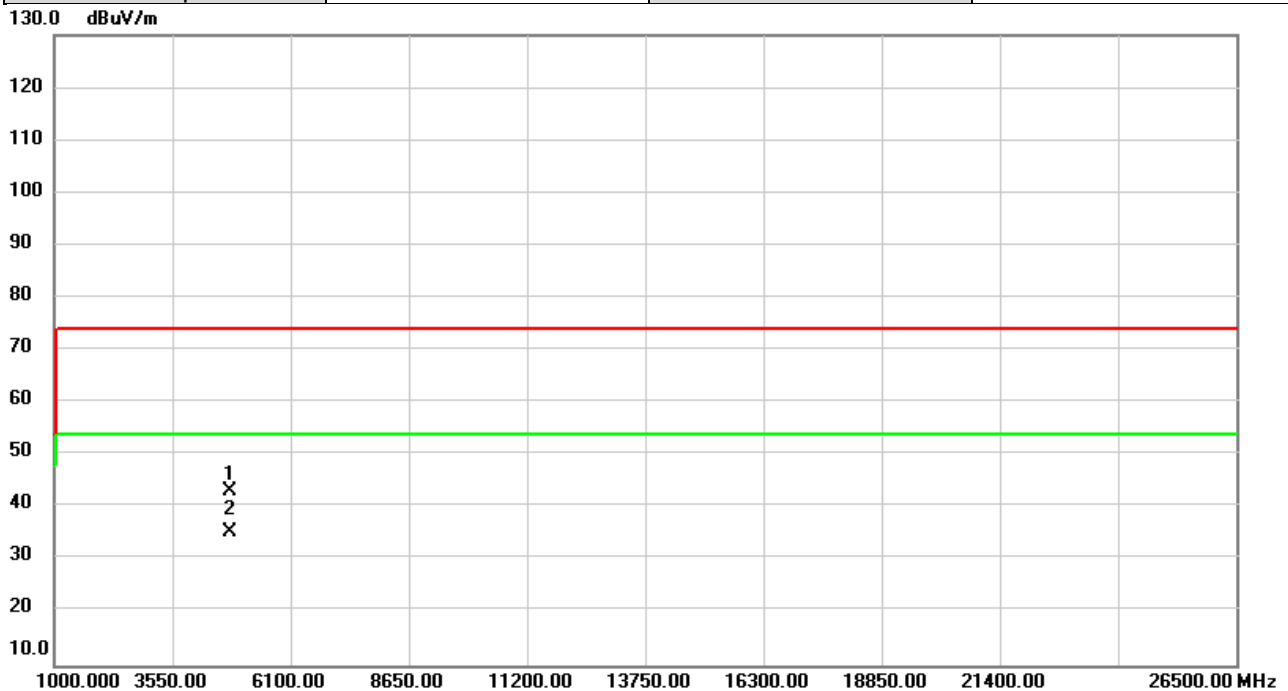


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	52.60	-10.03	42.57	74.00	-31.43	peak	
2	*	4804.000	47.09	-10.03	37.06	54.00	-16.94	AVG	

REMARKS:

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

Test Mode	BLE 5.0(1Mbps)	Test Date	2021/4/16
Test Frequency	2402MHz	Polarization	Horizontal
Temp	22°C	Hum.	61%

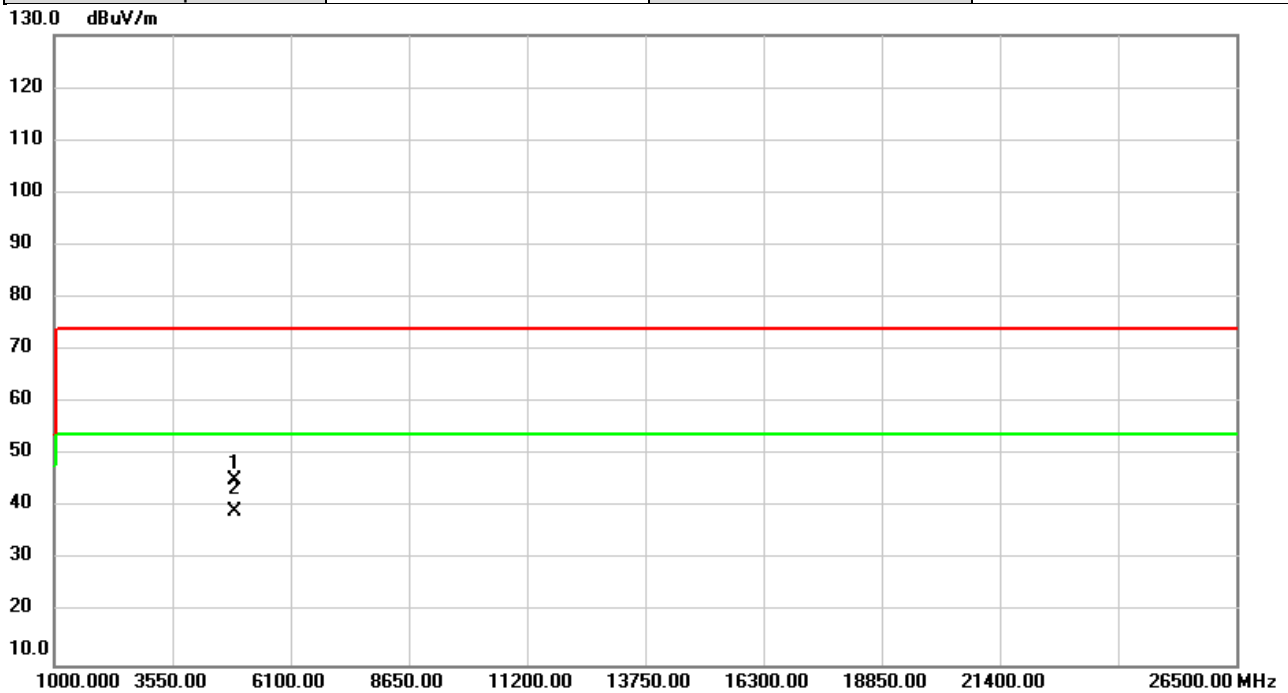


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4804.000	53.14	-10.03	43.11	74.00	-30.89	peak	
2	*	4804.000	45.37	-10.03	35.34	54.00	-18.66	AVG	

REMARKS:

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

Test Mode	BLE 5.0(1Mbps)	Test Date	2021/5/22
Test Frequency	2440MHz	Polarization	Vertical
Temp	22°C	Hum.	57%

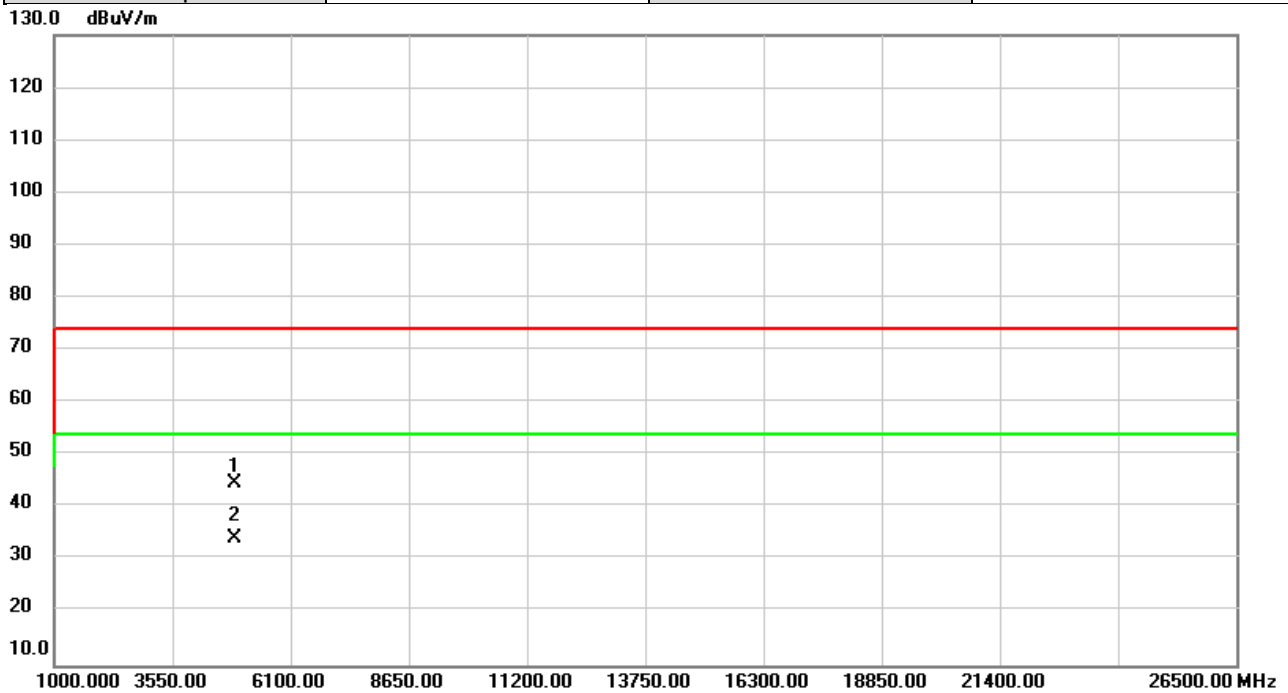


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	54.87	-9.77	45.10	74.00	-28.90	peak	
2	*	4880.000	49.06	-9.77	39.29	54.00	-14.71	AVG	

REMARKS:

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

Test Mode	BLE 5.0(1Mbps)	Test Date	2021/5/22
Test Frequency	2440MHz	Polarization	Horizontal
Temp	22°C	Hum.	57%

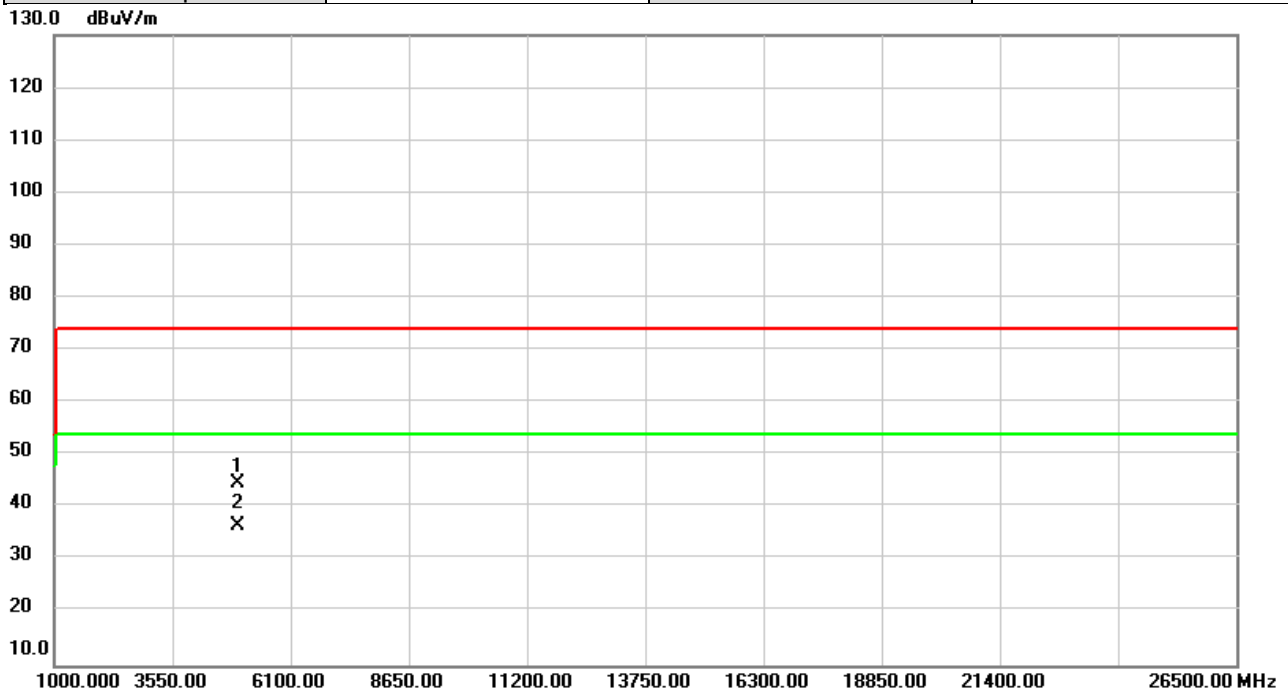


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	54.44	-9.77	44.67	74.00	-29.33	peak	
2	*	4880.000	44.02	-9.77	34.25	54.00	-19.75	AVG	

REMARKS:

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

Test Mode	BLE 5.0(1Mbps)	Test Date	2021/4/16
Test Frequency	2480MHz	Polarization	Vertical
Temp	22°C	Hum.	61%



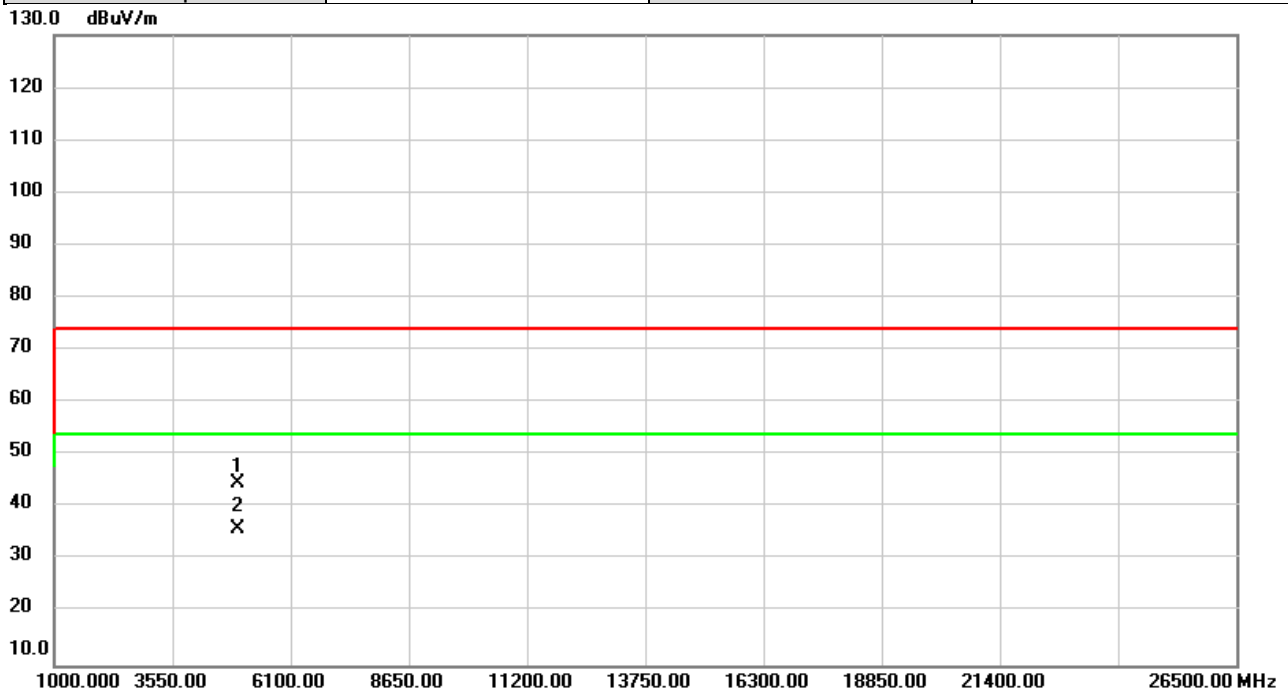
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	54.21	-9.49	44.72	74.00	-29.28	peak	
2	*	4960.000	46.11	-9.49	36.62	54.00	-17.38	AVG	

REMARKS:

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

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

Test Mode	BLE 5.0(1Mbps)	Test Date	2021/4/16
Test Frequency	2480MHz	Polarization	Horizontal
Temp	22°C	Hum.	61%



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4960.000	54.13	-9.49	44.64	74.00	-29.36	peak	
2	*	4960.000	45.31	-9.49	35.82	54.00	-18.18	AVG	

REMARKS:

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

APPENDIX D OUTPUT POWER

Test Mode :	BLE5.0 (1Mbps)	Tested Date	2021/5/29
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Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	3.55	0.0023	30.00	1.0000	Pass
2440	3.07	0.0020	30.00	1.0000	Pass
2480	2.95	0.0020	30.00	1.0000	Pass

End of Test Report