FCC CERTIFICATION TEST REPORT

Report No.: DDT-B21112202-3E01

Applicant	:	Nauto, Inc.
Address	:	220 Portage Avenue, Palo Alto, California 94306
Equipment under Test	:	Mark Button, N3
Model No.	:	810-00003-01
Trade Mark	:	Nauto
FCC ID	:	2AKJ5-N3MB
Manufacturer	:	Nauto, Inc.
Address	:	220 Portage Avenue, Palo Alto, California 94306

Issued By: Tianjin Dongdian Testing Service Co., Ltd.

Address: Building D-1, No. 19, Weisi Road, Microelectronics Industrial Park Development Area, Tianjin, China.

Tel: +86-22-58038033, E-mail: ddt@dgddt.com, http://www.ddttest.com

REPORT

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Test Report Declare

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Test Standard Used:

FCC Rules and Regulations Part 15 Subpart C.

Test Procedure Used:

ANSI C63.10:2013

We Declare:

The equipment described above is tested by Tianjin Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Tianjin Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

Report No.:	DDT-B21112202-3E01		
Date of Receipt:	Apr. 27, 2022	**Date of Test:**	Apr. 27, 2022 ~ Apr. 29, 2022

Prepared By: ***Approved By:***

Sunny Zhang

Sunny Zhang/Engineer ***Leon Li/RF Manager***

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Tianjin Dongdian Testing Service Co., Ltd. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Apr. 29, 2022	

1. Summary of Test Results

Description of Test Item	Standard	Verdict
Peak Output Power	FCC Part 15: 15.247 ANSI C63.10:2013	Pass[3]
6dB Bandwidth and 99% Bandwidth	FCC Part 15: 15.247 ANSI C63.10:2013	Pass[1]
Power Spectral Density	FCC Part 15:15.247 ANSI C63.10:2013	Pass[1]
Band Edge Compliance (conducted method)	FCC Part 15: 15.209 FCC Part 15: 15.247 ANSI C63.10: 2013	Pass[1]
RF Conducted Spurious Emissions	FCC Part 15: 15.209 FCC Part 15: 15.247 ANSI C63.10: 2013	Pass[1]
Radiated Emission	FCC Part 15: 15.205 FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10:2013	Pass[2]
Emission in restricted frequency bands	FCC Part 15: 15.205 FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10:2013	Pass[2]
Antenna Requirement	FCC 15.203 &15.247(b)	Pass

Note1:
The above "pass[1]" items data are refer from the original report issued by SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch (Date of Test: 2019/5/16 ~ 2019/5/28), The detailed data can refer to Appendix- BLE.
Note2:
The above "pass[2]" item is tested by Tianjin Dongdian Testing Service Co., Ltd.
Note3:
The above "pass[3]" item is verify by Tianjin Dongdian Testing Service Co., Ltd.

2. General Test Information

2.1. Description of EUT

EUT* Name	:	Mark Button, N3
Model Number	:	810-00003-01
EUT Function Description	:	Please reference user manual of this device
Power Supply	:	USB
Radio Specification	:	Bluetooth V4.0 LE
Operation Frequency	:	2402 MHz - 2480 MHz
Modulation	:	GFSK
Data Rate	:	1 Mbps
Antenna Type	:	Integrated antenna, maximum PK gain: -1.0 dBi
Sample Number	:	N/A

Note: EUT is the ab. of equipment under test.

Channel information					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	14	2430	28	2458
1	2404	15	2432	29	2460
2	2406	16	2434	30	2462
3	2408	17	2436	31	2464
4	2410	18	2438	32	2466
5	2412	19	2440	33	2468
6	2414	20	2442	34	2470
7	2416	21	2444	35	2472
8	2418	22	2446	36	2474
9	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	39	2480
12	2426	26	2454		
13	2428	27	2456		

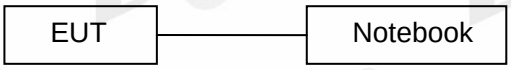
2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Description	SN
N/A	N/A	N/A	N/A	N/A

2.3. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	Description	SN
Notebook	SMASUNG	900X4C	N/A	HWUR91E CB00076E

2.4. Block diagram of EUT configuration for test



Test software: PUTTY.EXE
The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table.

Tested mode, channel, information			
Mode	Setting Tx Power	Channel	Frequency (MHz)
GFSK	0	CH0	2402
	0	CH19	2440
	0	CH39	2480

2.5. Deviations of test standard

No deviation.

2.6. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature range:	21-25 ℃
Humidity range:	25-75%
Pressure range:	86-106 kPa

2.7. Test laboratory

Tianjin Dongdian Testing Service Co., Ltd.
Address: Building D-1, No. 19, Weisi Road, Microelectronics Industrial Park Development Area, Tianjin, China.
Tel: +86-22-58038033, http://www.ddttest.com, Email: ddt@dgddt.com
NVLAP (National Voluntary Laboratory Accreditation Program) CODE: 500036-0
CNAS (China National Accreditation Service for Conformity Assessment) CODE: L13402
FCC Designation Number: CN5004; FCC Test Firm Registration Number: 368676
ISED (Innovation, Science and Economic Development Canada) Company Number: 27768
Conformity Assessment Body Identifier: CN0125
VCCI Facility Registration Number: C-20089, T-20093, R-20125, G-20122

2.8. Measurement uncertainty

Test Item	Uncertainty
Bandwidth	0.14%
Peak Output Power (Conducted) (Spectrum Analyzer)	0.12 dB (10 MHz ≤ f < 3.6 GHz);
	0.32 dB (3.6 GHz ≤ f < 8 GHz)
Peak Output Power (Conducted) (Power Sensor)	0.51 dB
Power Spectral Density	0.12 dB (10 MHz ≤ f < 3.6 GHz);
	0.32 dB (3.6 GHz ≤ f < 8 GHz)
Frequencies Stability	6.7×10^{-8} (Antenna couple method)
	3.4×10^{-8} (Conducted method)
Conducted Spurious Emissions	0.12 dB (10 MHz ≤ f < 3.6 GHz);
	0.32 dB (3.6 GHz ≤ f < 8 GHz)
	0.52 dB (8 GHz ≤ f < 22 GHz)
Uncertainty for Radio Frequency (RBW < 20 kHz)	3×10^{-7}
Temperature	±2℃
Humidity	±1%
Uncertainty for Radiation Emission Test (30 MHz - 1 GHz)	2.72 dB (Antenna Polarize: V)
	2.72 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission Test (1 GHz - 40 GHz)	2.74 dB (1 - 6 GHz)
	2.72 dB (6 GHz - 18 GHz)
	3.54 dB (18 GHz - 26 GHz)
	4.30 dB (26 GHz - 40 GHz)
Uncertainty for Power Line Conduction Emission Test	3.40 dB (150 kHz - 30 MHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3. Equipment Used During Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
RF Connected Test (MWRFtest system)					
Microwave Signal Generator	R&S	SMF100A	101396	2021/06/08	1 Year
MXG Vector Signal Generator	Keysight	N5182A	MY50143288	2022/03/07	1 Year
EMI Test Receiver	R&S	ESU26	100243	2022/03/03	1 Year
Wideband Radio Communication Tester	R&S	CMW500	158800	2021/05/25	1 Year
Power Sensor	KEYSIGHT	U2021XA	MY59150007	2022/03/23	1 Year
DC Power Supply	inSTEK	PSP-2010	EN122317	2022/02/12	1 Year
Test Software	MWRFtest	MTS8310	V03	N/A	N/A
Radiated Emission -10m EMI Chamber					
Active Loop Antenna	R&S	HFH2-Z2	100269	2021/05/08	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	2021/05/08	1 Year
Broadband Horn Antenna	TESEQ	BHA 9118	31754	2021/10/12	1 Year
Low noise amplifier	MITEQ	TPA0118-36	0914	2022/02/16	1 Year
EMI Test Receiver	R&S	ESCI	101024	2022/03/03	1 Year
EMI Test Receiver	R&S	ESCI	101030	2021/05/15	1 Year
Bilog Antenna	TESEQ	CBL6112D	29068	2020/10/12	2 Year
Bilog Antenna	TESEQ	CBL6112D	29069	2020/10/12	2 Year
Amplifier	Sonoma	310N	300913	2022/02/15	1 Year
Amplifier	Sonoma	310N	300914	2022/02/15	1 Year
Ant Mast	Innco	MA4000	N/A	N/A	N/A
Ant Mast	Innco	MA4000	N/A	N/A	N/A
Mast Controller	Innco	CO2000	N/A	N/A	N/A
Mast Controller	Innco	CO2000	N/A	N/A	N/A
RF Selector 4CH	TOYO	NS4904N	Selector1	N/A	N/A
RF Selector 4CH	TOYO	NS4904N	Selector2	N/A	N/A
Test software	TOYO	EP5/RSE	Ver 1.9.1	N/A	N/A
Test software	Audix	E3	V 6.11111b	N/A	N/A

4. Maximum Peak Output Power

4.1. Re-Test statement

The EUT is operating at the same power level with the original testing of SGS-CSTC Standards Technical Services, Co., Ltd. Shenzhen Branch.

4.2. Block diagram of test setup

4.3. Limits

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. If transmitting antennas of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.4. Test procedure

Connect each EUT's antenna output to power sensor by RF cable and attenuator.
Measure the PK output power of each antenna port by power sensor.

4.5. Test result

Remark

	The Original Reports	Re-Test Reports
File name:	test report BLE	Test Report BLE rev1
Test location:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch	Tianjin Dongdian Testing Service Co., Ltd.

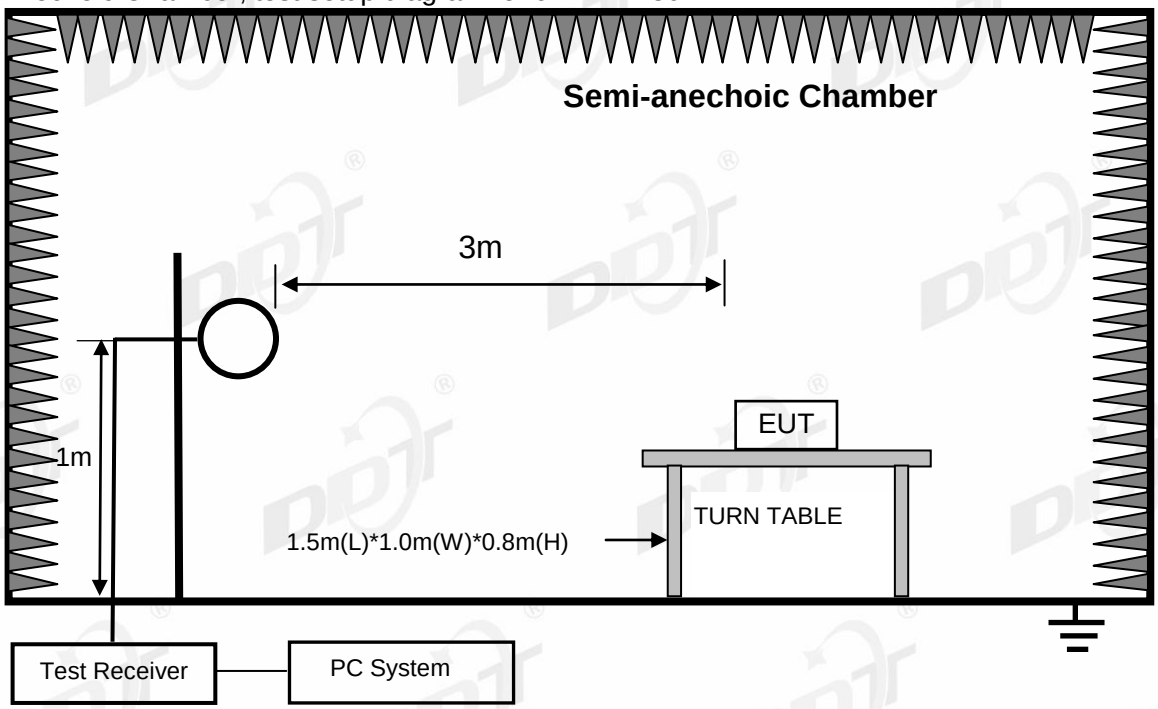
Power

Mode	Test Channel	The Original Reports Level [dBm]	Re-Test Reports Level [dBm]	Power level
BLE_1M	Lowest	1.59	1.42	0
	Middle	1.53	1.37	0
	Highest	1.36	1.41	0

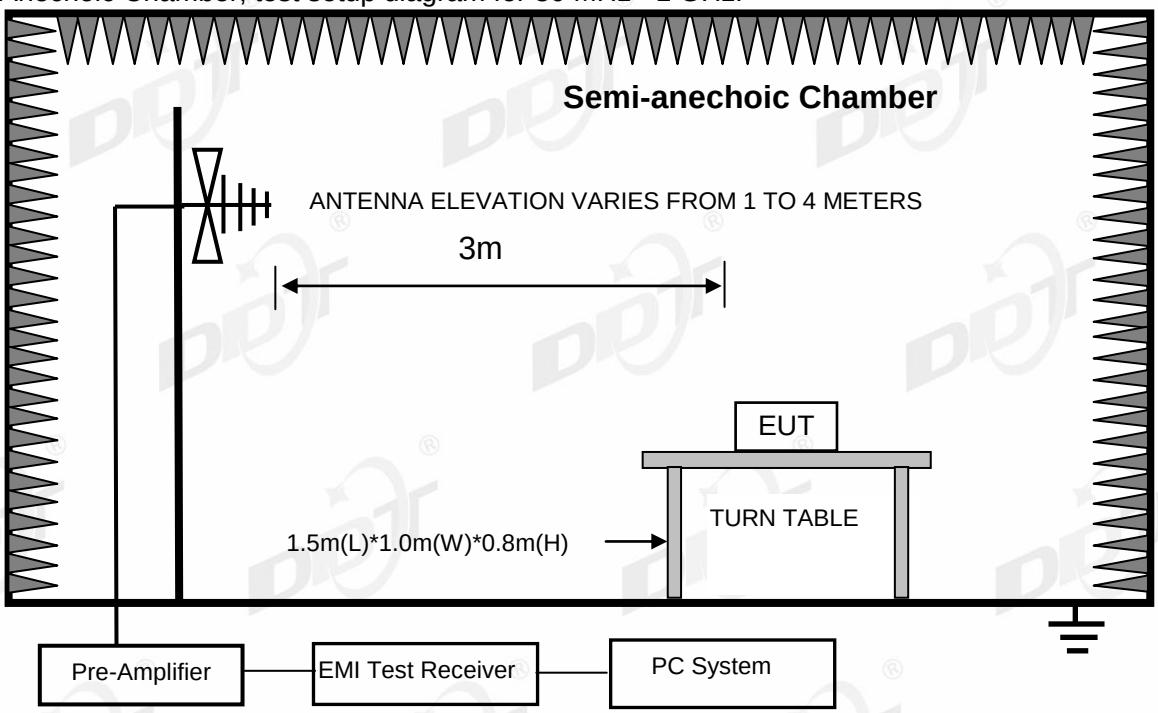
5. Radiated Emission

5.1. Block diagram of test setup

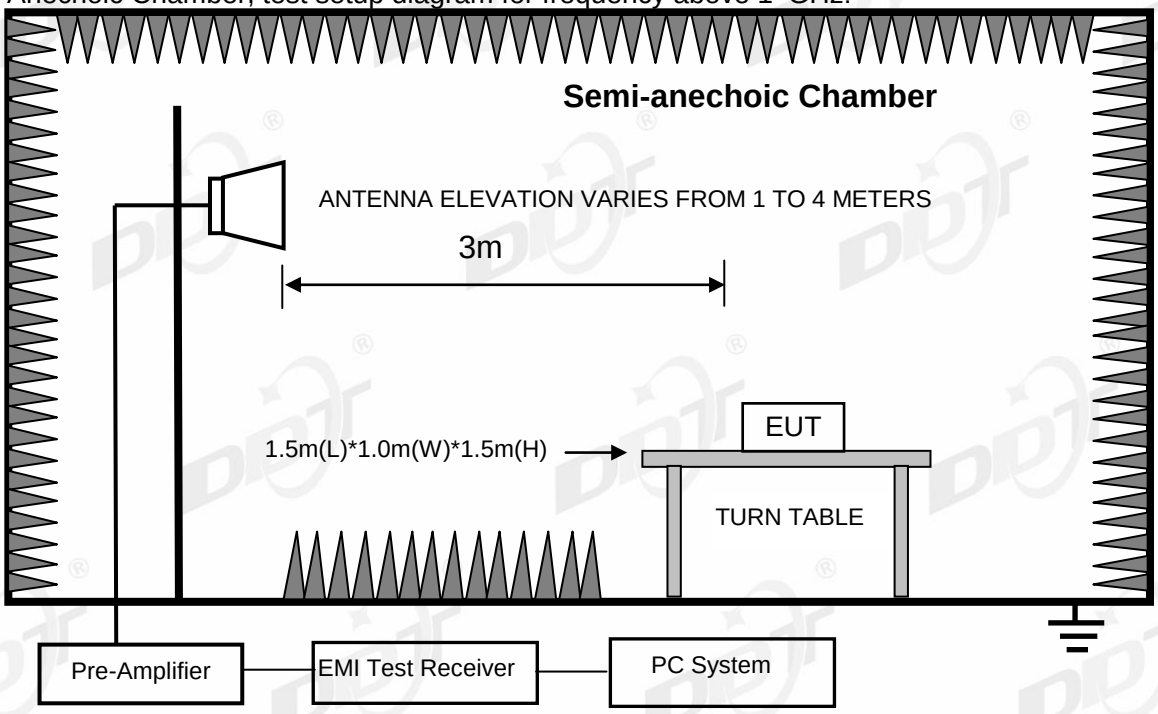
Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:



Anechoic Chamber, test setup diagram for 30 MHz - 1 GHz:



Anechoic Chamber, test setup diagram for frequency above 1 GHz:



Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

5.2. Limit

(1) FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.1772&4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.2072&4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2]Above 38.6

(2) FCC 15.209 Limit.

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
0.009 ~ 0.490	300	2400/F(kHz)	67.6-20log(F)
0.490 ~ 1.705	30	24000/F(kHz)	87.6-20log(F)
1.705 ~ 30.0	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9 - 90 kHz, 110 - 490 kHz and above 1000 MHz, radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30 MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$Limit_{3m}(dBuV/m) = Limit_{30m}(dBuV/m) + 40Log(30m/3m)$$

(3) Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20 dB below the fundamental emissions or comply with 15.209 limits.

5.3. Test Procedure

(1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber for below 1G and 150 cm above the ground plane inside a fully-anechoic chamber for above 1G.

(2) Test antenna was located 3 m from the EUT on an adjustable mast, and the antenna used as below table.

Test frequency range	Test antenna used	Test antenna distance
9 kHz - 30 MHz	Active Loop antenna	3 m
30 MHz - 1 GHz	Trilog Broadband Antenna	3 m
1 GHz - 18 GHz	Double Ridged Horn Antenna (1 GHz - 18 GHz)	3 m
18 GHz - 40 GHz	Horn Antenna (18 GHz - 40 GHz)	3 m

According ANSI C63.10:2013 clause 6.4.4.2 and 6,5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also

is positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. For measurement above 30 MHz, the trilog Broadband Antenna or Horn Antenna was located 3 m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

(3) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9 kHz to 25 GHz:

(a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1 m to 4 m (Except loop antenna, it's fixed 1 m above ground.)

(b) Change work frequency or channel of device if practicable.

(c) Change modulation type of device if practicable.

(d) Change power supply range from 85% to 115% of the rated supply voltage

(e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9 kHz to 25 GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 18 GHz to 25 GHz, so below final test was performed with frequency range from 9 kHz to 18 GHz.

(4) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipment and all of the interface cables were changed according to ANSI C63.10:2013 on Radiated Emission test.

(5) The emissions from 9 kHz to 1 GHz were measured based on CISPR QP detector except for the frequency bands 9 - 90 kHz, 110 - 490 kHz, for emissions from 9 kHz - 90 kHz,110 kHz - 490 kHz and above 1 GHz were measured based on average detector, for emissions above 1 GHz, peak emissions also be measured and need comply with Peak limit.

(6) The emissions from 9 kHz to 1 GHz, QP or average values were measured with EMI receiver with below RBW.

Frequency band	RBW
9 kHz - 150 kHz	200 Hz
150 kHz - 30 MHz	9 kHz
30 MHz - 1 GHz	120 kHz

(7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1 MHz, VBW is set at 3 MHz for Peak measure; According ANSI C63.10:2013 clause 4.1.4.2.2 procedure for average measure.

(8) X axis, Y axis, Z axis are tested, and worse setup X axis is reported.

5.4. Test result

Pass. (See below detailed test result)

All the emissions except fundamental emission from 9 kHz to 25 GHz were comply with 15.209 limits.

Note1: According exploratory test, the emission levels are 20 dB below the limit detected from 9 kHz to 30 MHz and 18 GHz to 25 GHz, so the final test was performed with frequency range from 30 MHz to 18 GHz and recorded in below.

Note2: For emissions below 1 GHz, according exploratory explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions below 1 GHz, the final test was only performed with EUT working in BLE transmitting mode.

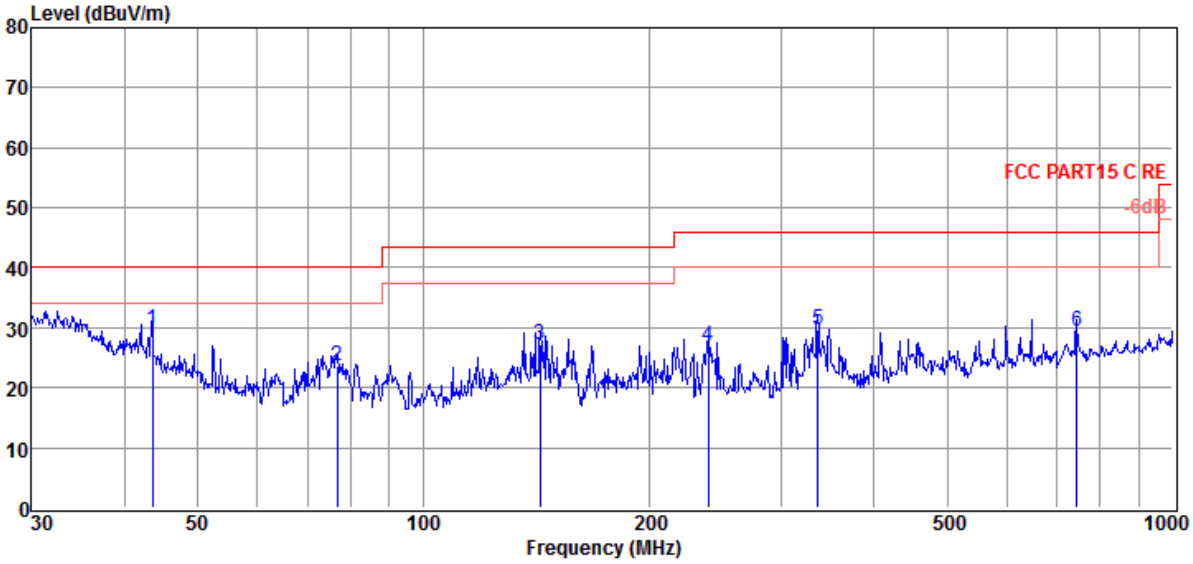
Note3: For emissions above 1 GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

Radiated Emission test (below 1 GHz)

Radiated Emission Test Result

Test Site	: 10m Chamber		
Test Date	: 04-28-2022	**Tested By**	: Sunny
EUT	: Mark Button, N3	**Model Number**	: 810-00003-01
Power Supply	: USB	**Test Mode**	: Tx mode
Memo	:		

Data: 1



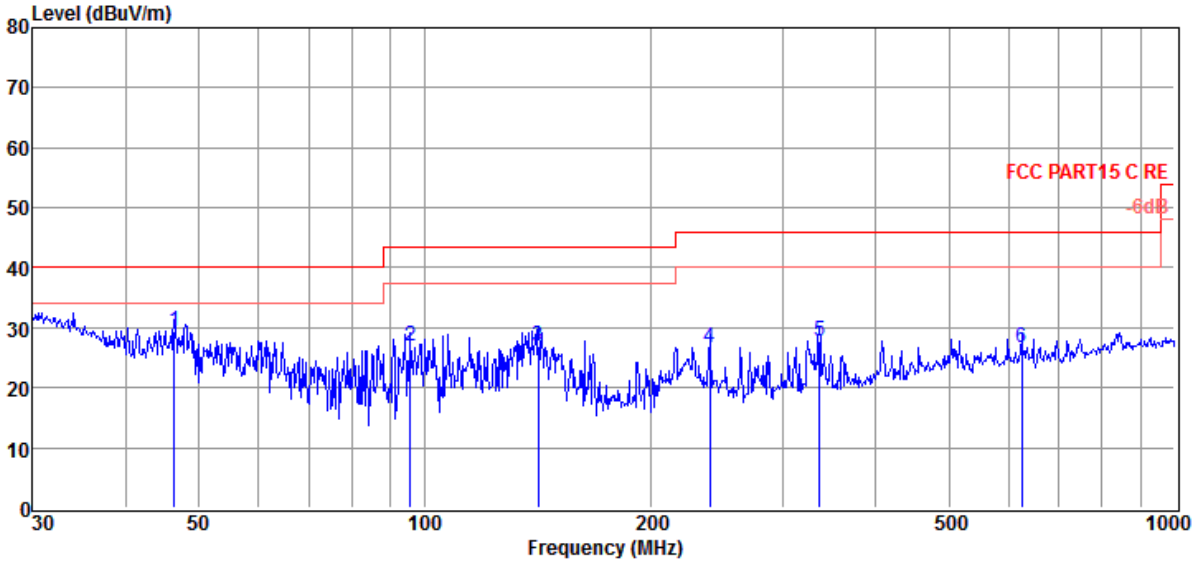
Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	43.51	-14.15	29.77	40.00	-10.23	173	334	QP	HORIZONTAL
2	76.78	-22.23	23.68	40.00	-16.32	174	162	QP	HORIZONTAL
3	143.33	-18.13	27.30	43.50	-16.20	186	2	QP	HORIZONTAL
4	239.99	-17.72	26.92	46.00	-19.08	161	356	QP	HORIZONTAL
5	336.04	-15.82	29.76	46.00	-16.24	182	114	QP	HORIZONTAL
6	744.87	-9.47	29.39	46.00	-16.61	167	65	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site	: 10m Chamber		
Test Date	: 04-28-2022	**Tested By**	: Sunny
EUT	: Mark Button, N3	**Model Number**	: 810-00003-01
Power Supply	: USB	**Test Mode**	: Tx mode
Memo	:		

Data: 2



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	46.34	-15.33	29.29	40.00	-10.71	105	263	QP	VERTICAL
2	95.76	-20.51	27.04	43.50	-16.46	133	347	QP	VERTICAL
3	141.83	-17.91	26.87	43.50	-16.63	122	294	QP	VERTICAL
4	239.99	-17.72	26.79	46.00	-19.21	117	182	QP	VERTICAL
5	336.04	-15.82	27.87	46.00	-18.13	153	122	QP	VERTICAL
6	625.08	-10.52	26.80	46.00	-19.20	184	88	QP	VERTICAL

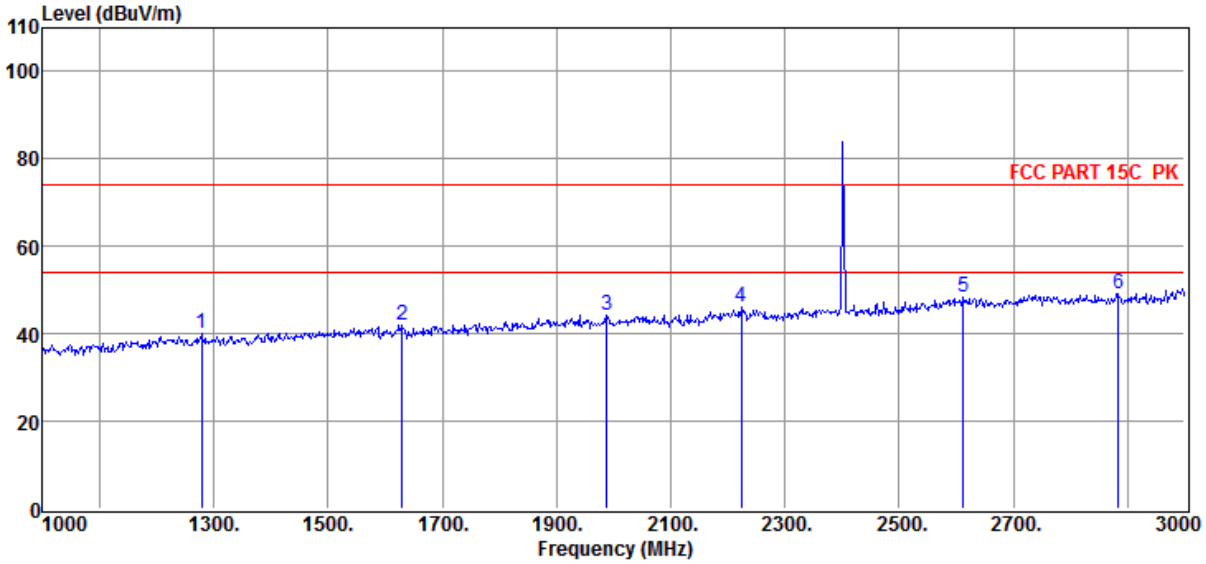
Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission test (1 GHz – 3GHz)

Radiated Emission Test Result

Test Site	: 10m Chamber		
Test Date	: 04-28-2022	**Tested By**	: Sunny
EUT	: Mark Button, N3	**Model Number**	: 810-00003-01
Power Supply	: USB	**Test Mode**	: Tx mode
Memo	: BLE 1M 2402MHz		

Data: 9



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	1278.00	-4.70	40.01	74.00	-33.99	172	352	Peak	HORIZONTAL
2	1630.00	-2.32	41.88	74.00	-32.12	166	125	Peak	HORIZONTAL
3	1988.00	0.25	44.37	74.00	-29.63	156	346	Peak	HORIZONTAL
4	2224.00	2.37	46.00	74.00	-28.00	152	63	Peak	HORIZONTAL
5	2612.00	5.76	48.37	74.00	-25.63	170	20	Peak	HORIZONTAL
6	2884.00	6.90	49.26	74.00	-24.74	185	91	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

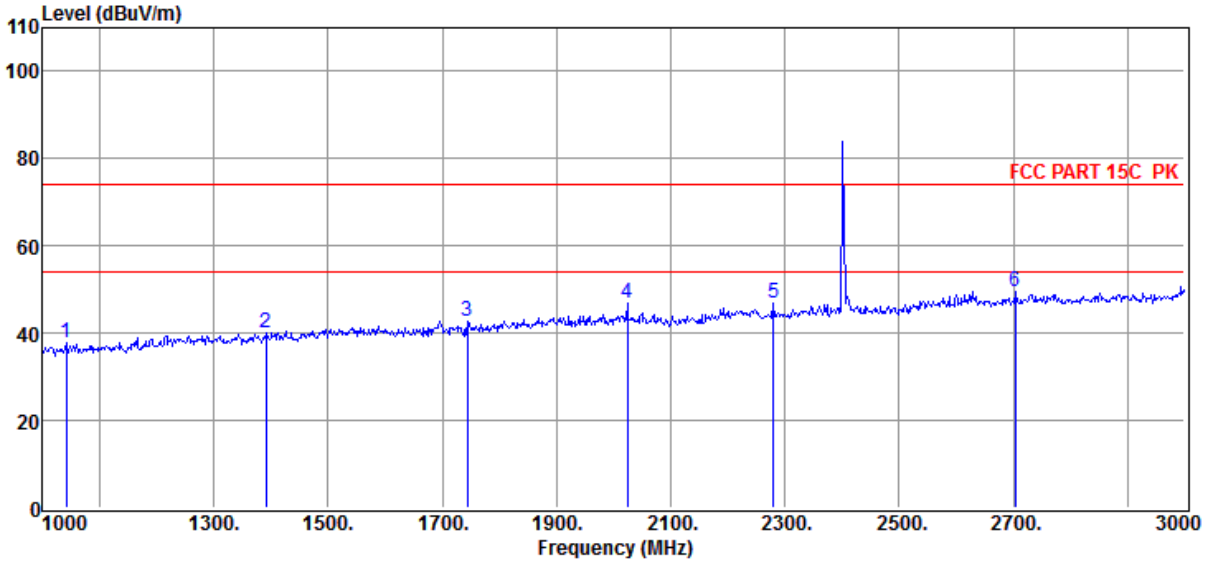
Test Date : 04-28-2022 **Tested By** : Sunny

EUT : Mark Button, N3 **Model Number** : 810-00003-01

Power Supply : USB **Test Mode** : Tx mode

Memo : BLE 1M 2402MHz

Data: 10



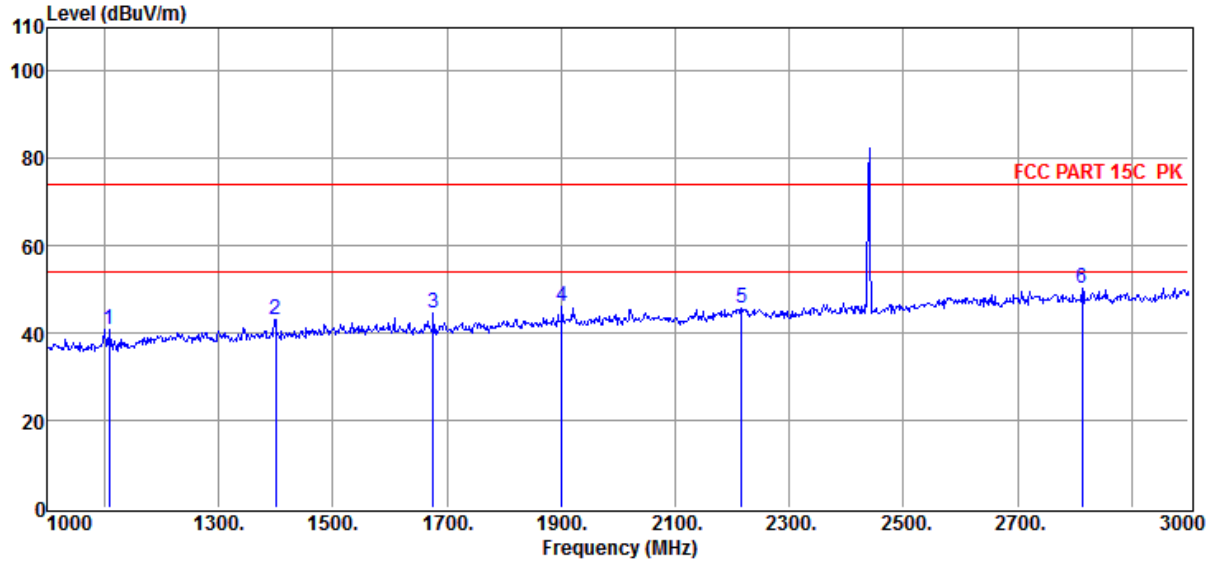
Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	1042.00	-7.01	37.95	74.00	-36.05	167	205	Peak	VERTICAL
2	1392.00	-4.14	40.05	74.00	-33.95	178	227	Peak	VERTICAL
3	1744.00	-1.51	42.66	74.00	-31.34	177	253	Peak	VERTICAL
4	2024.00	0.68	46.80	74.00	-27.20	154	119	Peak	VERTICAL
5	2280.00	2.09	46.78	74.00	-27.22	171	296	Peak	VERTICAL
6	2704.00	5.97	49.60	74.00	-24.40	187	226	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site	: 10m Chamber		
Test Date	: 04-28-2022	**Tested By**	: Sunny
EUT	: Mark Button, N3	**Model Number**	: 810-00003-01
Power Supply	: USB	**Test Mode**	: Tx mode
Memo	: BLE 1M 2440MHz		

Data: 13



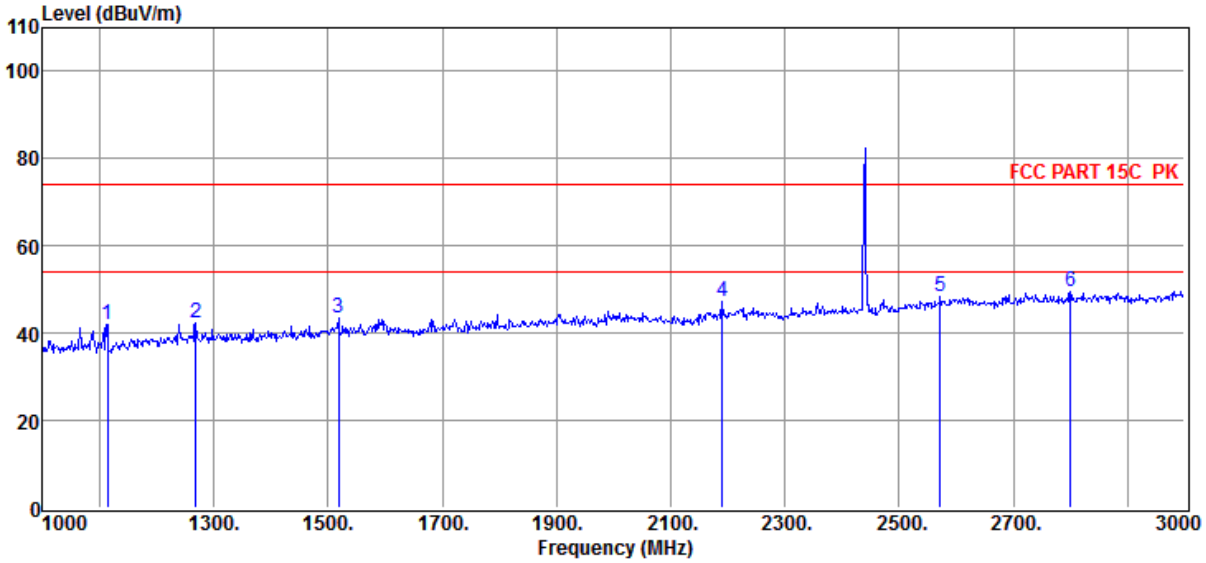
Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	1108.00	-6.68	40.96	74.00	-33.04	158	32	Peak	HORIZONTAL
2	1400.00	-4.10	43.12	74.00	-30.88	174	82	Peak	HORIZONTAL
3	1676.00	-2.16	44.56	74.00	-29.44	162	263	Peak	HORIZONTAL
4	1902.00	-0.06	46.12	74.00	-27.88	170	144	Peak	HORIZONTAL
5	2216.00	2.37	45.74	74.00	-28.26	174	285	Peak	HORIZONTAL
6	2814.00	6.47	50.11	74.00	-23.89	187	210	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site	: 10m Chamber		
Test Date	: 04-28-2022	**Tested By**	: Sunny
EUT	: Mark Button, N3	**Model Number**	: 810-00003-01
Power Supply	: USB	**Test Mode**	: Tx mode
Memo	: BLE 1M 2440MHz		

Data: 14



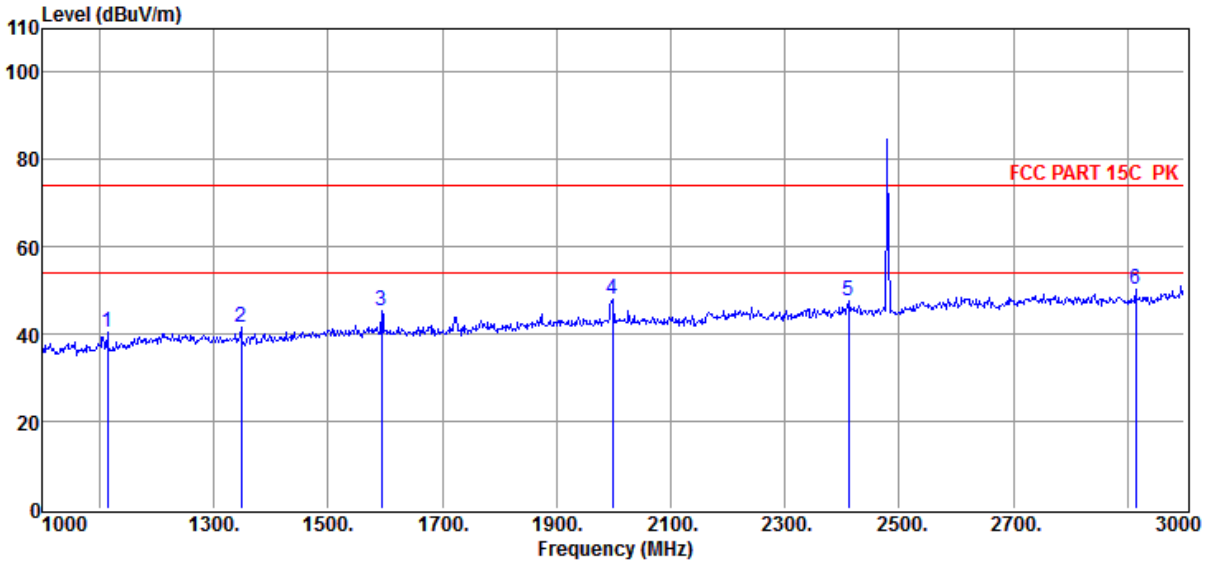
Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	1114.00	-6.63	41.87	74.00	-32.13	162	164	Peak	VERTICAL
2	1268.00	-4.71	42.24	74.00	-31.76	161	318	Peak	VERTICAL
3	1518.00	-2.77	43.40	74.00	-30.60	163	323	Peak	VERTICAL
4	2190.00	2.13	47.26	74.00	-26.74	187	97	Peak	VERTICAL
5	2572.00	5.28	48.39	74.00	-25.61	168	283	Peak	VERTICAL
6	2800.00	6.38	49.55	74.00	-24.45	166	163	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site	: 10m Chamber		
Test Date	: 04-28-2022	**Tested By**	: Sunny
EUT	: Mark Button, N3	**Model Number**	: 810-00003-01
Power Supply	: USB	**Test Mode**	: Tx mode
Memo	: BLE 1M 2480MHz		

Data: 19



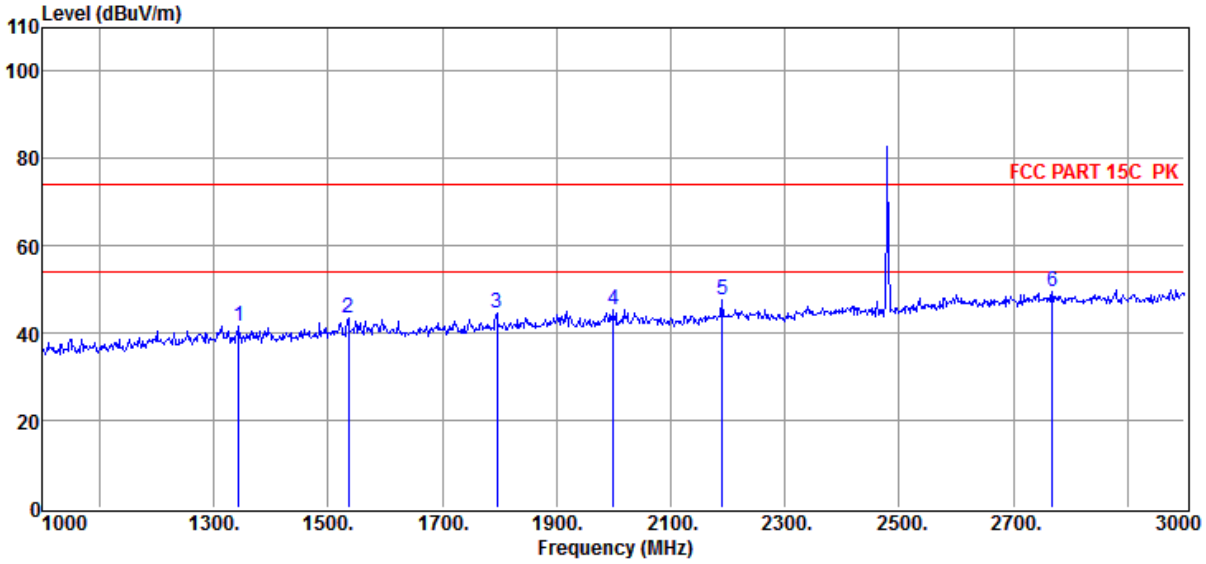
Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	1114.00	-6.63	40.26	74.00	-33.74	189	184	Peak	HORIZONTAL
2	1348.00	-4.38	41.45	74.00	-32.55	190	219	Peak	HORIZONTAL
3	1594.00	-2.30	45.51	74.00	-28.49	175	15	Peak	HORIZONTAL
4	1998.00	0.24	47.98	74.00	-26.02	183	263	Peak	HORIZONTAL
5	2412.00	3.32	47.53	74.00	-26.47	184	105	Peak	HORIZONTAL
6	2914.00	6.89	50.12	74.00	-23.88	172	153	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site	: 10m Chamber		
Test Date	: 04-28-2022	**Tested By**	: Sunny
EUT	: Mark Button, N3	**Model Number**	: 810-00003-01
Power Supply	: USB	**Test Mode**	: Tx mode
Memo	: BLE 1M 2480MHz		

Data: 20



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	1344.00	-4.40	41.68	74.00	-32.32	163	247	Peak	VERTICAL
2	1536.00	-2.59	43.33	74.00	-30.67	181	260	Peak	VERTICAL
3	1796.00	-1.15	44.52	74.00	-29.48	187	271	Peak	VERTICAL
4	2000.00	0.23	45.53	74.00	-28.47	185	193	Peak	VERTICAL
5	2190.00	2.13	47.78	74.00	-26.22	162	64	Peak	VERTICAL
6	2768.00	6.55	49.44	74.00	-24.56	152	198	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission test (3 GHz – 18GHz)

Radiated Emission Test Result

Test Site : 10m Chamber

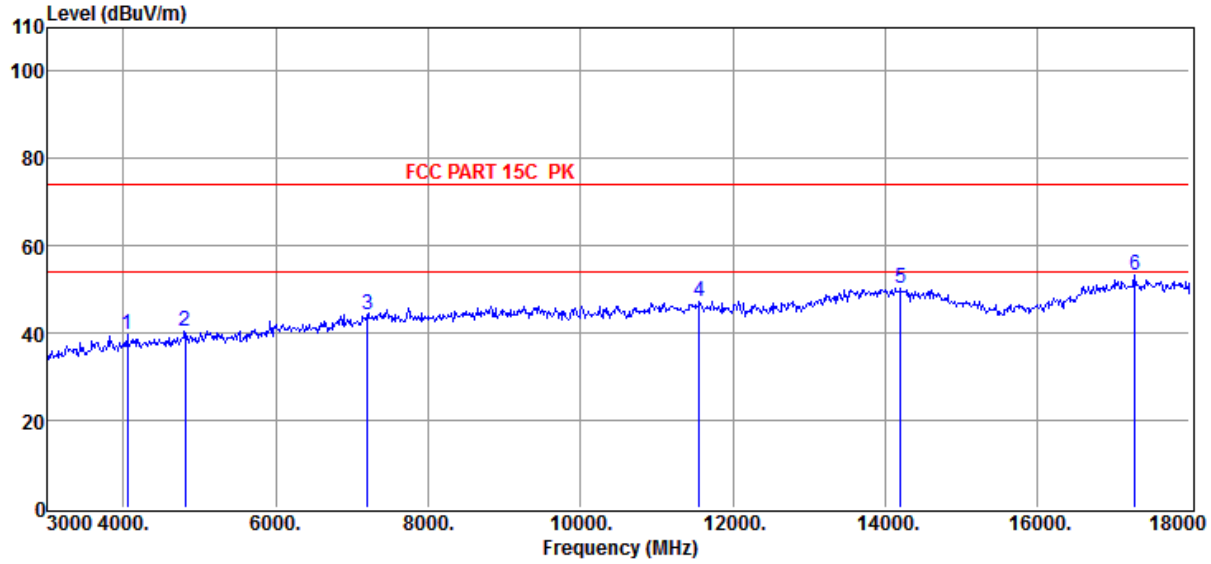
Test Date : 04-28-2022 **Tested By** : Sunny

EUT : Mark Button, N3 **Model Number** : 810-00003-01

Power Supply : USB **Test Mode** : Tx mode

Memo : BLE 1M 2402MHz

Data: 11



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	4050.00	-0.63	39.72	74.00	-34.28	151	21	Peak	HORIZONTAL
2	4804.00	0.78	40.36	74.00	-33.64	166	149	Peak	HORIZONTAL
3	7206.00	5.72	44.15	74.00	-29.85	184	262	Peak	HORIZONTAL
4	11565.00	10.07	47.28	74.00	-26.72	186	232	Peak	HORIZONTAL
5	14205.00	14.01	50.36	74.00	-23.64	163	40	Peak	HORIZONTAL
6	17280.00	15.77	53.11	74.00	-20.89	178	83	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

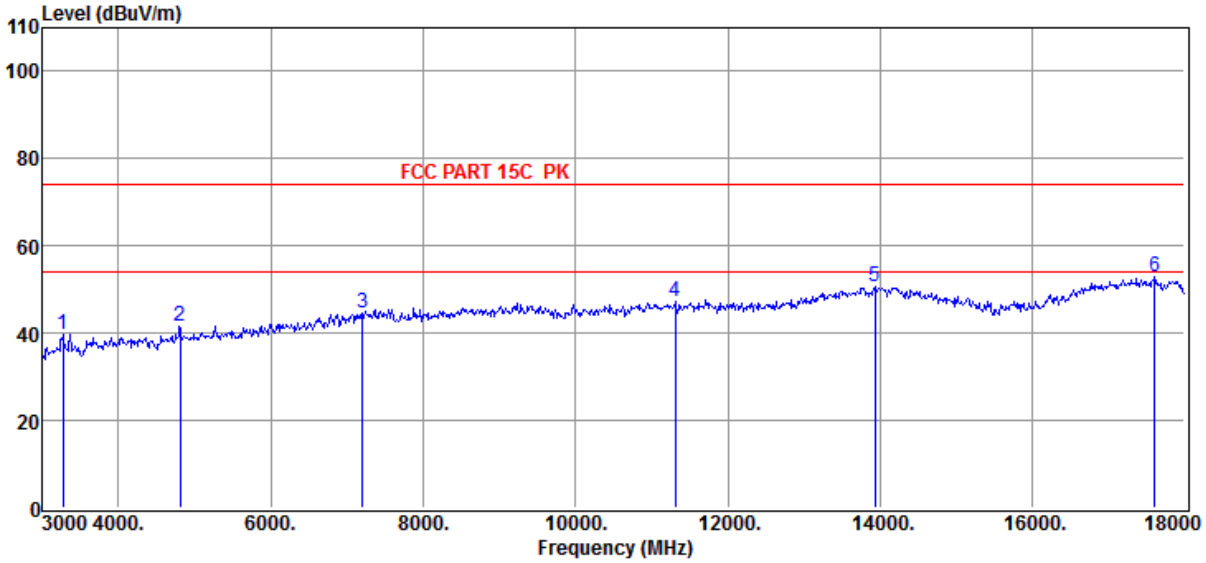
Test Date : 04-28-2022 **Tested By** : Sunny

EUT : Mark Button, N3 **Model Number** : 810-00003-01

Power Supply : USB **Test Mode** : Tx mode

Memo : BLE 1M 2402MHz

Data: 12



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	3270.00	-2.61	39.86	74.00	-34.14	188	4	Peak	VERTICAL
2	4804.00	0.78	41.73	74.00	-32.27	176	176	Peak	VERTICAL
3	7206.00	5.72	44.55	74.00	-29.45	160	117	Peak	VERTICAL
4	11310.00	10.09	47.38	74.00	-26.62	172	290	Peak	VERTICAL
5	13935.00	12.73	50.51	74.00	-23.49	161	149	Peak	VERTICAL
6	17610.00	15.36	53.04	74.00	-20.96	166	112	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

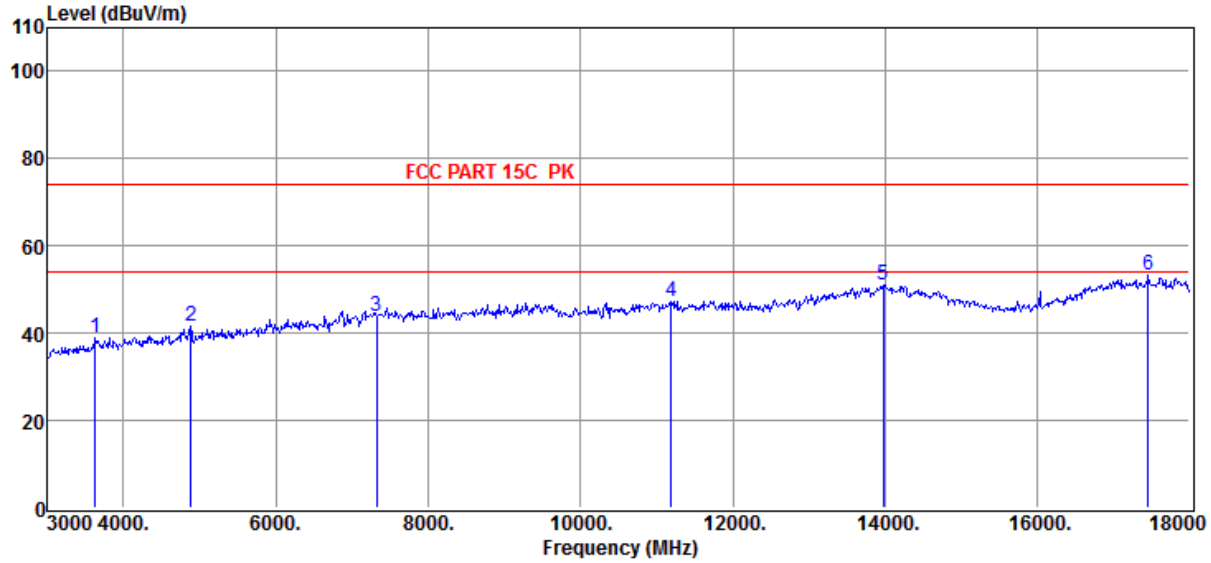
Test Date : 04-28-2022 **Tested By** : Sunny

EUT : Mark Button, N3 **Model Number** : 810-00003-01

Power Supply : USB **Test Mode** : Tx mode

Memo : BLE 1M 2440MHz

Data: 15



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	3630.00	-1.17	38.90	74.00	-35.10	179	52	Peak	HORIZONTAL
2	4880.00	0.92	41.74	74.00	-32.26	159	102	Peak	HORIZONTAL
3	7320.00	6.39	43.95	74.00	-30.05	168	277	Peak	HORIZONTAL
4	11190.00	10.36	47.35	74.00	-26.65	177	330	Peak	HORIZONTAL
5	13980.00	12.92	51.11	74.00	-22.89	175	69	Peak	HORIZONTAL
6	17460.00	15.59	53.32	74.00	-20.68	183	350	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

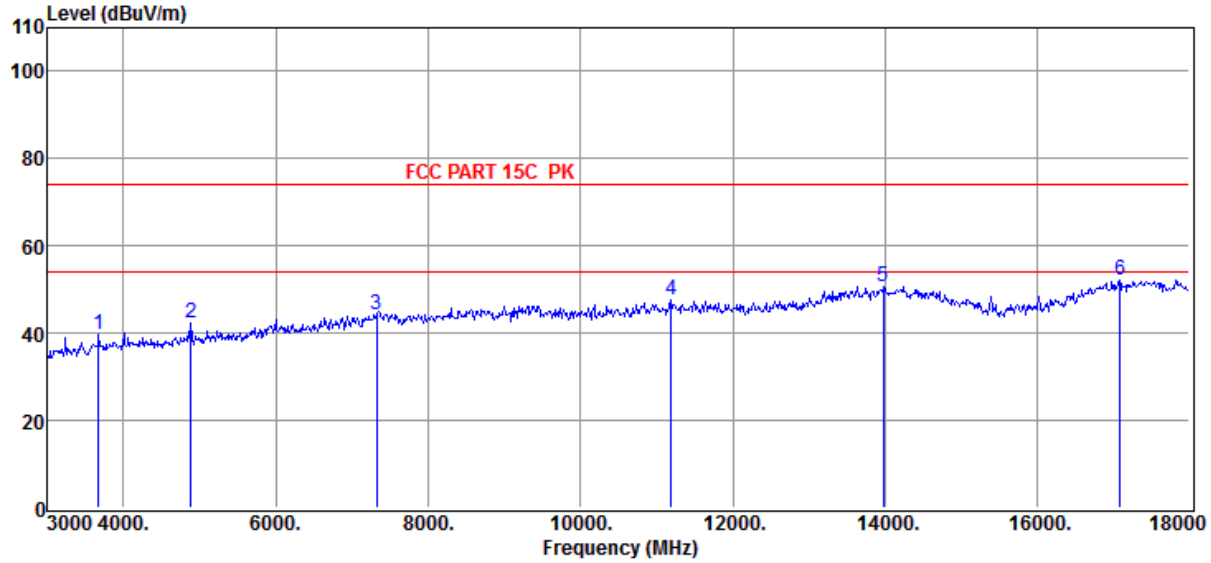
Test Date : 04-28-2022 **Tested By** : Sunny

EUT : Mark Button, N3 **Model Number** : 810-00003-01

Power Supply : USB **Test Mode** : Tx mode

Memo : BLE 1M 2440MHz

Data: 16



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	3675.00	-1.19	39.82	74.00	-34.18	158	181	Peak	VERTICAL
2	4880.00	0.92	42.19	74.00	-31.81	185	40	Peak	VERTICAL
3	7320.00	6.39	44.07	74.00	-29.93	158	49	Peak	VERTICAL
4	11190.00	10.36	47.53	74.00	-26.47	186	144	Peak	VERTICAL
5	13980.00	12.92	50.81	74.00	-23.19	160	224	Peak	VERTICAL
6	17085.00	15.67	52.16	74.00	-21.84	162	346	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

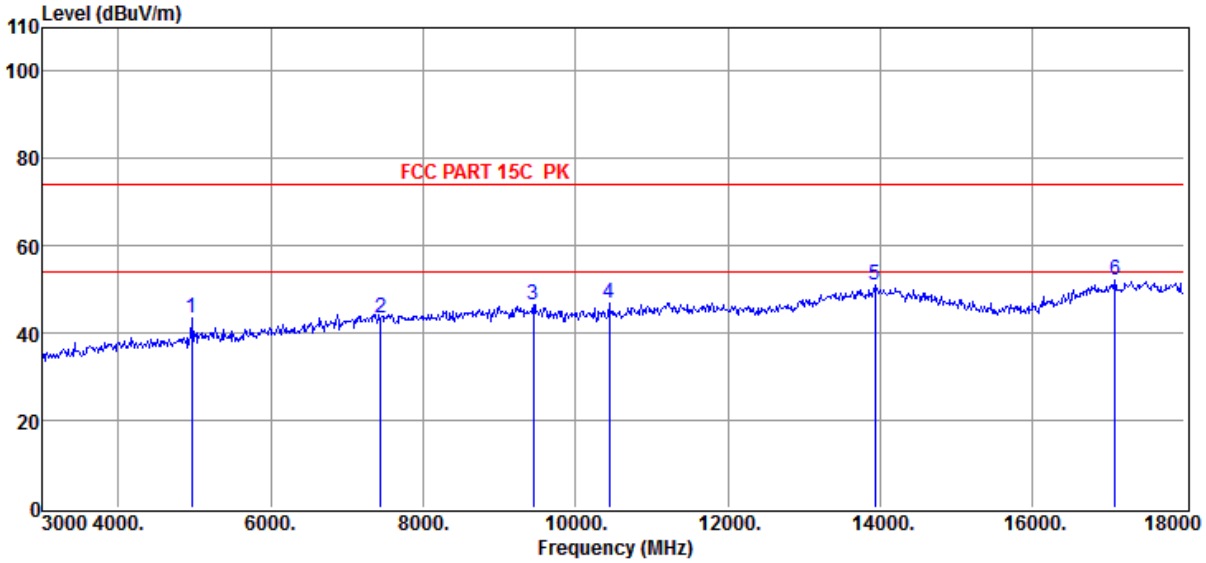
Test Date : 04-28-2022 **Tested By** : Sunny

EUT : Mark Button, N3 **Model Number** : 810-00003-01

Power Supply : USB **Test Mode** : Tx mode

Memo : BLE 1M 2480MHz

Data: 21



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	4960.00	1.19	43.56	74.00	-30.44	181	246	Peak	HORIZONTAL
2	7440.00	6.43	43.30	74.00	-30.70	161	304	Peak	HORIZONTAL
3	9450.00	7.98	46.53	74.00	-27.47	182	14	Peak	HORIZONTAL
4	10440.00	8.88	47.04	74.00	-26.96	161	36	Peak	HORIZONTAL
5	13935.00	12.73	50.98	74.00	-23.02	171	232	Peak	HORIZONTAL
6	17085.00	15.67	52.05	74.00	-21.95	177	180	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

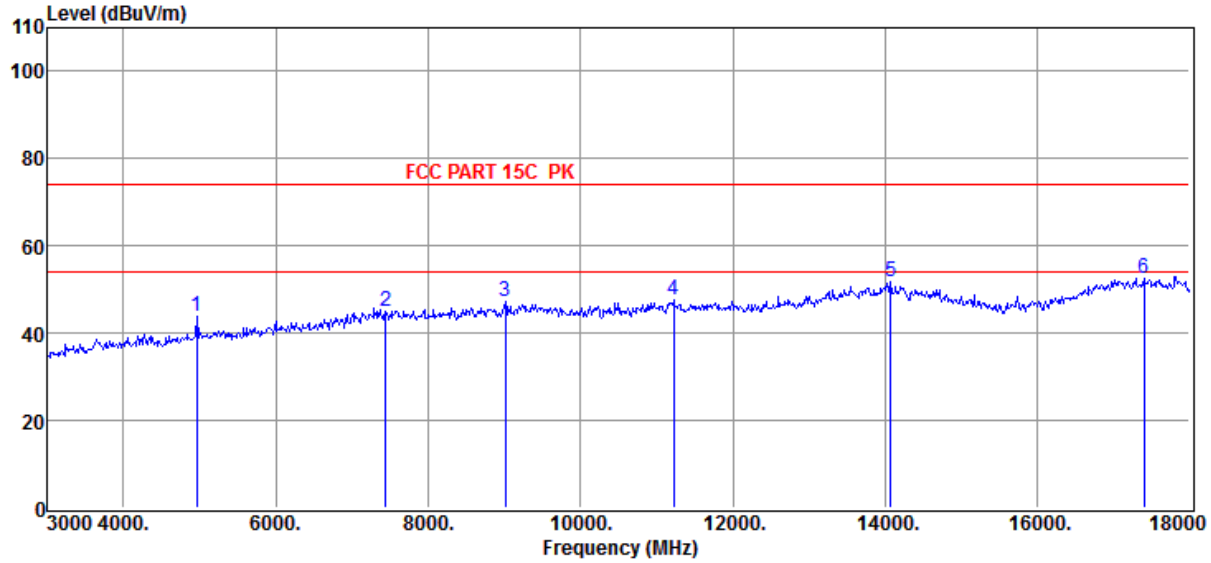
Test Date : 04-28-2022 **Tested By** : Sunny

EUT : Mark Button, N3 **Model Number** : 810-00003-01

Power Supply : USB **Test Mode** : Tx mode

Memo : BLE 1M 2480MHz

Data: 22

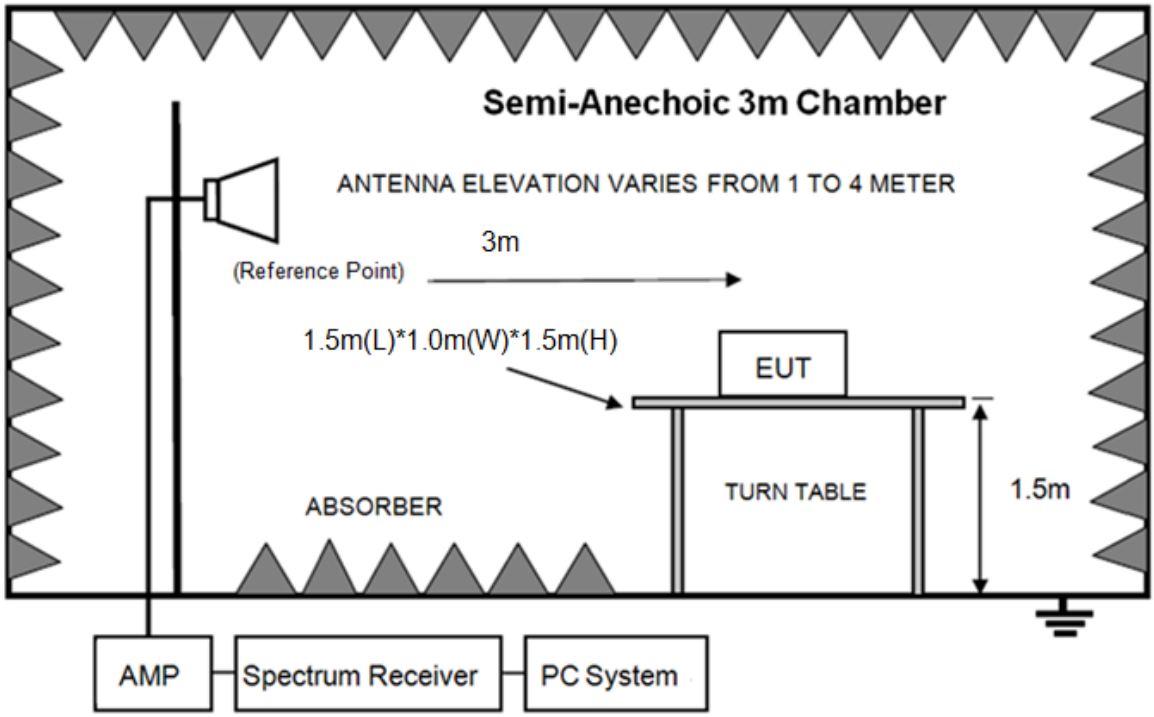


Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	4960.00	1.19	43.71	74.00	-30.29	169	193	Peak	VERTICAL
2	7440.00	6.43	44.82	74.00	-29.18	186	314	Peak	VERTICAL
3	9015.00	7.16	47.37	74.00	-26.63	176	297	Peak	VERTICAL
4	11220.00	10.34	47.55	74.00	-26.45	190	91	Peak	VERTICAL
5	14070.00	13.05	51.75	74.00	-22.25	164	301	Peak	VERTICAL
6	17400.00	15.59	52.48	74.00	-21.52	177	95	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

6. Band Edge Compliance (Radiated Method)

6.1. Block diagram of test setup



6.2. Limit

All restriction band should comply with 15.209, other emission should be at least 20 dB below the fundamental.

6.3. Test Procedure

Same with clause 5.3 except change investigated frequency range.

Remark: All restriction band have been tested, and only the worst case is shown in report.

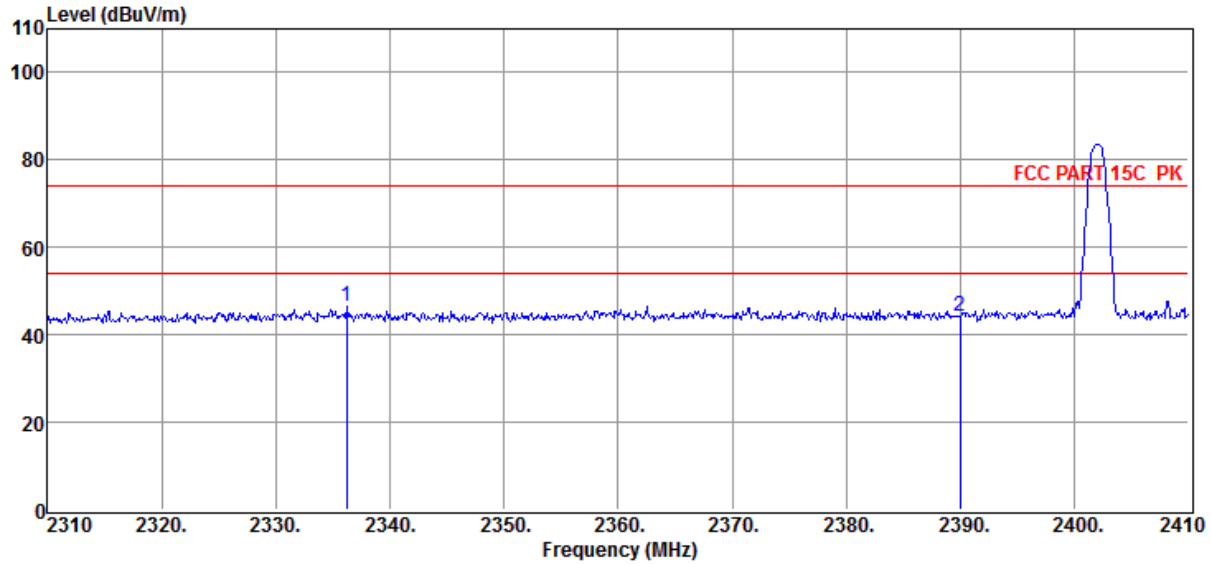
6.4. Test result

Pass. (See below detailed test result)

Radiated Emission Test Result

Test Site	: 10m Chamber		
Test Date	: 04-28-2022	**Tested By**	: Sunny
EUT	: Mark Button, N3	**Model Number**	: 810-00003-01
Power Supply	: USB	**Test Mode**	: Tx mode
Memo	: BLE 1M 2402MHz		

Data: 7



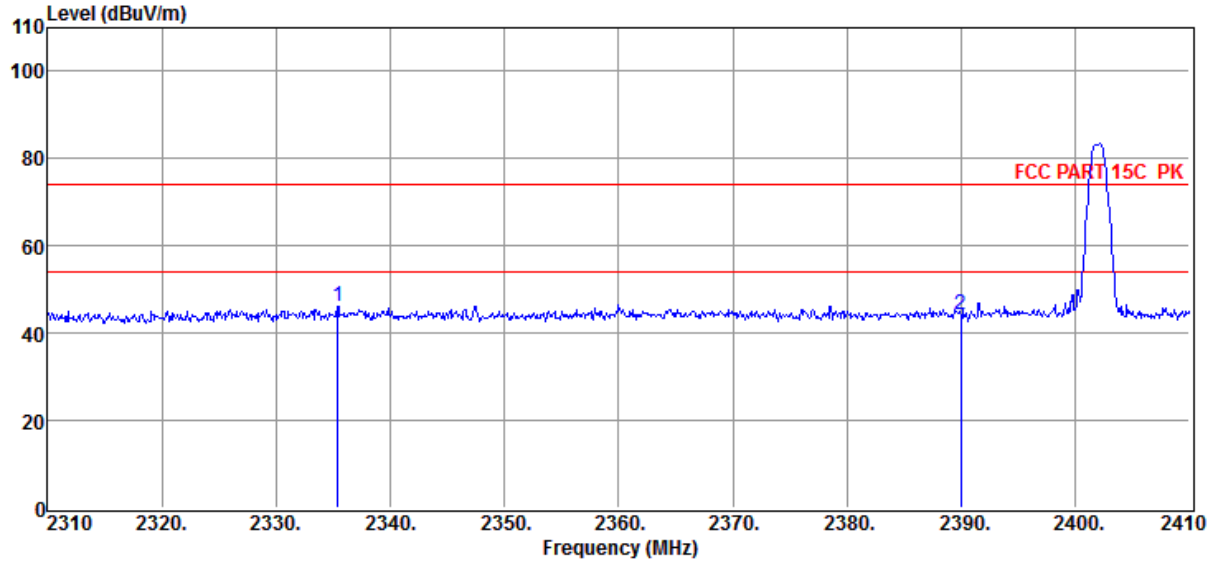
Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	2336.20	2.84	46.49	74.00	-27.51	183	311	Peak	HORIZONTAL
2	2390.00	3.30	44.06	74.00	-29.94	186	300	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site	: 10m Chamber		
Test Date	: 04-28-2022	**Tested By**	: Sunny
EUT	: Mark Button, N3	**Model Number**	: 810-00003-01
Power Supply	: USB	**Test Mode**	: Tx mode
Memo	: BLE 1M 2402MHz		

Data: 8



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	2335.40	2.82	46.13	74.00	-27.87	162	185	Peak	VERTICAL
2	2390.00	3.30	44.31	74.00	-29.69	160	138	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

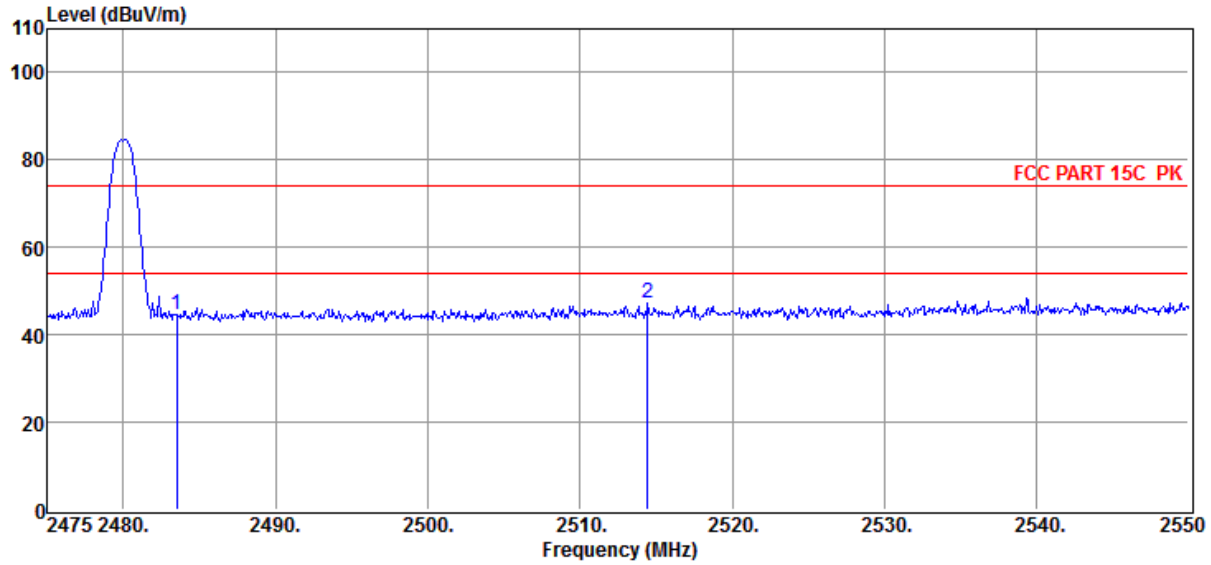
Test Date : 04-28-2022 **Tested By** : Sunny

EUT : Mark Button, N3 **Model Number** : 810-00003-01

Power Supply : USB **Test Mode** : Tx mode

Memo : BLE 1M 2480MHz

Data: 17



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	2483.50	3.52	44.66	74.00	-29.34	154	326	Peak	HORIZONTAL
2	2514.45	3.97	47.41	74.00	-26.59	158	85	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

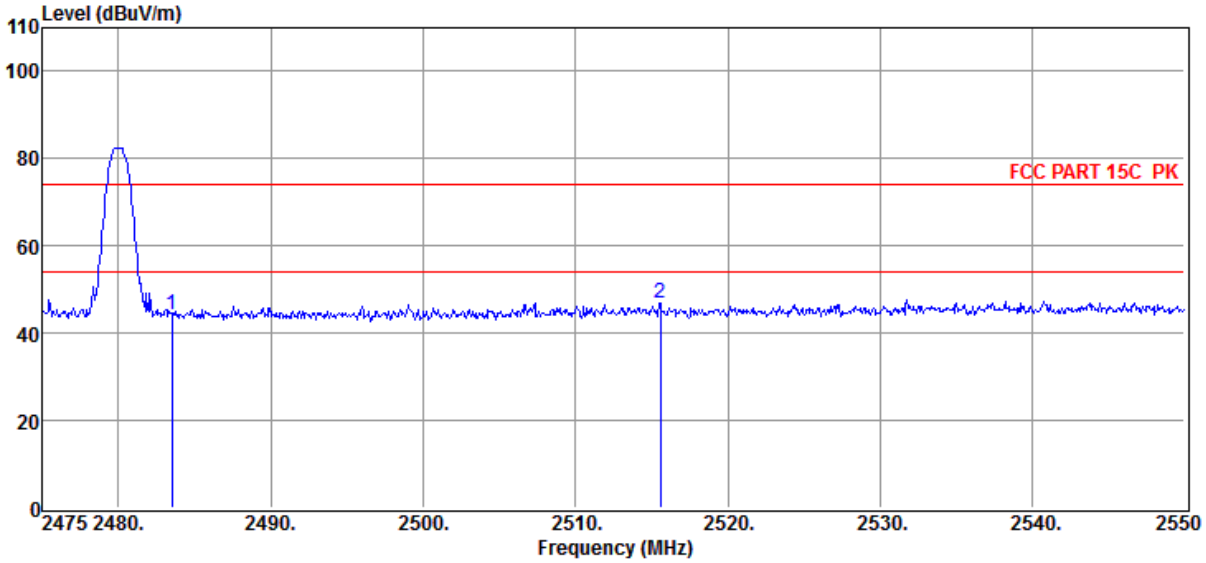
Test Date : 04-28-2022 **Tested By** : Sunny

EUT : Mark Button, N3 **Model Number** : 810-00003-01

Power Supply : USB **Test Mode** : Tx mode

Memo : BLE 1M 2480MHz

Data: 18



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	2483.50	3.52	44.14	74.00	-29.86	164	115	Peak	VERTICAL
2	2515.58	4.00	46.94	74.00	-27.06	175	152	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Margin = Result Level - Limit.

7. Antenna Requirements

7.1. Limit

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

7.2. Result

The antenna used for this product is Integrated antenna and no antenna other than that furnished by the responsible party shall be used with the device, maximum antenna gain is -1.0 dBi.

8. APPENDIXES

The below appendix was detail result tested by SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch(Date of Test: 2019/5/16 ~ 2019/5/28)
All appendixes were cited in this report.

Appendix	**Item**
Appendix	BLE