

FCC REPORT

(BLE)

Applicant: Beijing Changba Technology Co. Ltd.

Address of Applicant: Room 260, 3C, 5th floor, No.9 Wangjing Street, Chaoyang District, Beijing

Equipment Under Test (EUT)

Product Name: CALF Speaker Microphone

Model No.: M1

Trade mark: CALF

FCC ID: 2AWERM1

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Date of sample receipt: 02 Aug., 2021

Date of Test: 03 Aug., to 25 Aug., 2021

Date of report issued: 25 Aug., 2021

Test Result: PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the JYT product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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2 Version

Version No.	Date	Description
00	25 Aug., 2021	Original

Tested by:



Test Engineer

Date:

25 Aug., 2021

Reviewed by:



Project Engineer

Date:

25 Aug., 2021

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4 Test Summary

Test Items	Section in CFR 47	Test Data	Result
Antenna requirement	15.203 & 15.247 (b)	See Section 6.1	Pass
AC Power Line Conducted Emission	15.207	See Section 6.2	Pass
Conducted Peak Output Power	15.247 (b)(3)	Appendix A - BLE	Pass
6dB Emission Bandwidth 99% Occupied Bandwidth	15.247 (a)(2)	Appendix A - BLE	Pass
Power Spectral Density	15.247 (e)	Appendix A - BLE	Pass
Conducted Band Edge	15.247 (d)	Appendix A - BLE	Pass
Radiated Band Edge		See Section 6.6.2	Pass
Conducted Spurious Emission	15.205 & 15.209	Appendix A - BLE	Pass
Radiated Spurious Emission		See Section 6.7.2	Pass
Remark: 1. Pass: The EUT complies with the essential requirements in the standard. 2. N/A: Not Applicable. 3. The cable insertion loss used by “RF Output Power” and other conduction measurement items is 0.5dB (provided by the customer).			
Test Method:	ANSI C63.10-2013 KDB 558074 D01 15.247 Meas Guidance v05r02		

5 General Information

5.1 Client Information

Applicant:	Beijing Changba Technology Co. Ltd.
Address:	Room 260, 3C, 5th floor, No.9 Wangjing Street, Chaoyang District, Beijing
Manufacturer:	Beijing Changba Technology Co. Ltd.
Address:	Room 260, 3C, 5th floor, No.9 Wangjing Street, Chaoyang District, Beijing
Factory:	Ningbo Yinzhou Shengke Electronics Co., Ltd
Address:	NO.111, Yunmo East Road, Yunlong Town, Yinzhou, Ningbo, 315137 Zhejiang, P.R. China

5.2 General Description of E.U.T.

Product Name:	CALF Speaker Microphone
Model No.:	M1
Operation Frequency:	2402-2480 MHz
Channel numbers:	40
Channel separation:	2 MHz
Modulation technology:	GFSK
Data speed :	1Mbps
Antenna Type:	Internal Antenna
Antenna gain:	-2 dBi
Power supply:	Rechargeable Li-ion Battery DC3.7V, 2000mAh
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

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

Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test. Channel No. 0, 20 & 39 were selected as Lowest, Middle and Highest channel.

5.3 Test environment and mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test mode:	
Transmitting mode	Keep the EUT in continuous transmitting with modulation
Radiated Emission: The sample was placed 0.8m (below 1GHz)/1.5m (above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. Duty cycle setting during the transmission is 100% with maximum power setting for all modulations.	

5.4 Description of Support Units

The EUT has been tested as an independent unit.

5.5 Measurement Uncertainty

Parameters	Expanded Uncertainty
Conducted Emission (9kHz ~ 30MHz)	±1.60 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	±3.12 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.32 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.16 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±3.20 dB (k=2)

5.6 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC - Designation No.: CN1211**

JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551.

● **ISED – CAB identifier.: CN0021**

The 3m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

● **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

5.7 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd.

Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China.

Tel: +86-755-23118282, Fax: +86-755-23116366

Email: info-JYTee@lets.com, Website: <http://www.ccis-cb.com>

5.8 Test Instruments list

Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	ETS	9m*6m*6m	966	01-19-2021	01-18-2024
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-03-2021	03-02-2022
Biconical Antenna	SCHWARZBECK	VUBA9117	359	06-18-2021	06-17-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-03-2021	03-02-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-18-2021	06-17-2022
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-18-2020	11-17-2021
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-03-2021	03-02-2022
Pre-amplifier	CD	PAP-1G18	11804	03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-18-2020	11-17-2021
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-03-2021	03-02-2022
Spectrum Analyzer	Agilent	N9020A	MY50510123	11-18-2020	11-17-2021
Signal Generator	Rohde & Schwarz	SMX	835454/016	03-03-2021	03-02-2022
Signal Generator	R&S	SMR20	1008100050	03-03-2021	03-02-2022
RF Switch Unit	MWRFTTEST	MW200	N/A	N/A	N/A
Test Software	MWRFTTEST	MTS8200	Version: 2.0.0.0		
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-03-2021	03-02-2022
Cable	MICRO-COAX	MFR64639	K10742-5	03-03-2021	03-02-2022
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-03-2021	03-02-2022
DC Power Supply	XinNuoEr	WYK-10020K	1409050110020	09-25-2020	09-24-2021
Temperature Humidity Chamber	HengPu	HPGDS-500	20140828008	11-01-2020	10-31-2021
Simulated Station	Rohde & Schwarz	CMW500	140493	07-22-2020	07-21-2021
				07-22-2021	07-21-2022
10m SAC	ETS	RFSD-100-F/A	Q2005	03-31-2021	04-01-2024
BiConiLog Antenna	SCHWARZBECK	VULB 9168	1249	03-31-2021	04-01-2022
BiConiLog Antenna	SCHWARZBECK	VULB 9168	1250	03-31-2021	04-01-2022
EMI Test Receiver	R&S	ESR 3	102800	04-06-2021	04-07-2022
EMI Test Receiver	R&S	ESR 3	102802	04-06-2021	04-07-2022
Pre-amplifier	Bost	LNA 0920N	2016	04-06-2021	04-07-2022
Pre-amplifier	Bost	LNA 0920N	2019	04-06-2021	04-07-2022
Test Software	R&S	EMC32	Version: 10.50.40		

Conducted Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESCI	101189	03-03-2021	03-02-2022
Pulse Limiter	SCHWARZBECK	OSRAM 2306	9731	03-03-2021	03-02-2022
LISN	CHASE	MN2050D	1447	03-03-2021	03-02-2022
LISN	Rohde & Schwarz	ESH3-Z5	8438621/010	06-18-2021	06-17-2022
Cable	HP	10503A	N/A	03-03-2021	03-02-2022
EMI Test Software	AUDIX	E3	Version: 6.110919b		

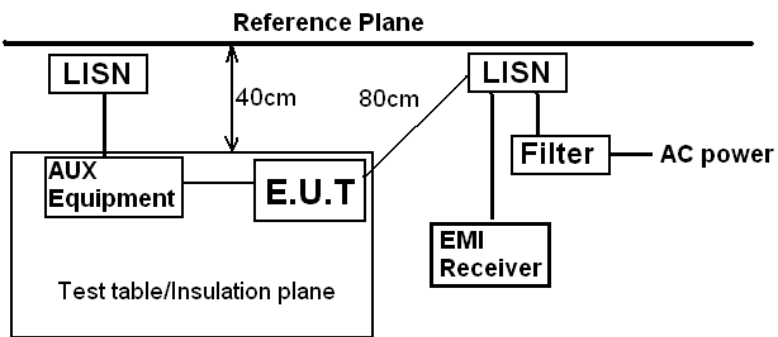
Conducted method:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
Spectrum Analyzer	Keysight	N9010B	MY60240202	11-27-2020	11-26-2021
Vector Signal Generator	Keysight	N5182B	MY59101009	11-27-2020	11-26-2021
Analog Signal Generator	Keysight	N5173B	MY59100765	11-27-2020	11-26-2021
Power Detector Box	MWRF-test	MW100-PSB	MW201020JYT	11-27-2020	11-26-2021
Simulated Station	Rohde & Schwarz	CMW270	102335	11-27-2020	11-26-2021
RF Control Box	MWRF-test	MW100-RFCB	MW200927JYT	N/A	N/A
PDU	MWRF-test	XY-G10	N/A	N/A	N/A
Test Software	MWRF-tes	MTS 8310	Version: 2.0.0.0		
DC Power Supply	Keysight	E3642A	MY60296194	11-27-2020	11-26-2021

6 Test results and Measurement Data

6.1 Antenna requirement:

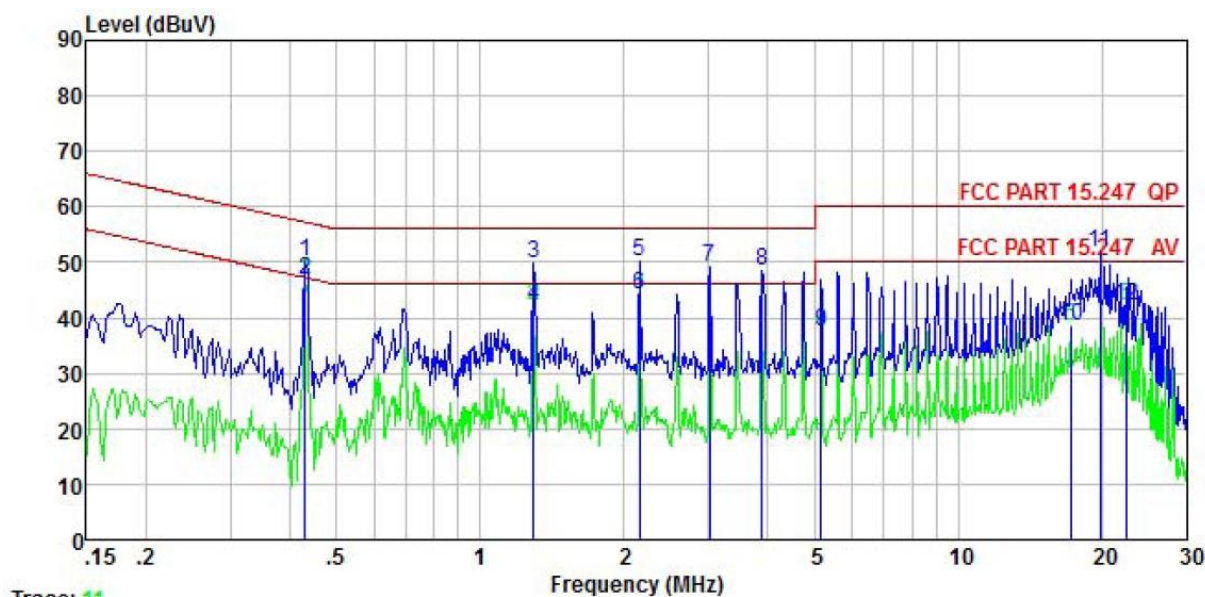
Standard requirement:	FCC Part 15 C Section 15.203 /247(b)
<p>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(b) (4) requirement: (4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p>	
E.U.T Antenna:	
<p>The BLE antenna is an Internal antenna which cannot replace by end-user, the best-case gain of the antenna is -2 dBi.</p>	

6.2 Conducted Emission

Test Requirement:	FCC Part 15 C Section 15.207		
Test Frequency Range:	150 kHz to 30 MHz		
Class / Severity:	Class B		
Receiver setup:	RBW=9kHz, VBW=30kHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test procedure:	<ol style="list-style-type: none"> The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.), which provides a 50ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10(latest version) on conducted measurement. 		
Test setup:	 <p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>		
Test Instruments:	Refer to section 5.9 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Passed		

Measurement Data:

Product name:	CALF Speaker Microphone	Product model:	M1
Test by:	Mike	Test mode:	BLE Tx mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Line
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5℃ Humi: 55%

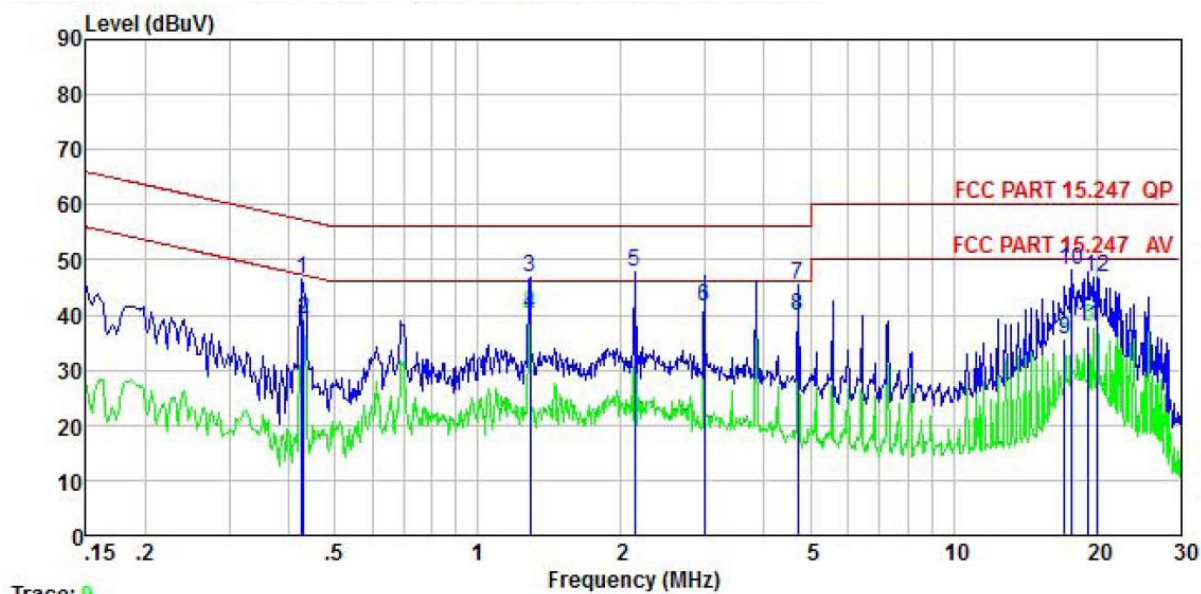


	Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.431	39.74	10.30	0.16	0.03	50.23	57.24	-7.01	QP
2	0.431	36.41	10.30	0.16	0.03	46.90	47.24	-0.34	Average
3	1.296	39.11	10.50	0.17	0.11	49.89	56.00	-6.11	QP
4	1.296	31.50	10.50	0.17	0.11	42.28	46.00	-3.72	Average
5	2.155	39.62	10.55	-0.30	0.18	50.05	56.00	-5.95	QP
6	2.155	33.59	10.55	-0.30	0.18	44.02	46.00	-1.98	Average
7	3.025	38.78	10.58	-0.21	0.07	49.22	56.00	-6.78	QP
8	3.881	37.83	10.62	-0.06	0.08	48.47	56.00	-7.53	QP
9	5.166	26.43	10.67	0.20	0.09	37.39	50.00	-12.61	Average
10	17.199	24.88	11.11	2.37	0.15	38.51	50.00	-11.49	Average
11	19.845	39.64	11.19	0.97	0.15	51.95	60.00	-8.05	QP
12	22.416	29.91	11.22	0.93	0.16	42.22	50.00	-7.78	Average

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Aux Factor + Cable Loss.

Product name:	CALF Speaker Microphone	Product model:	M1
Test by:	Mike	Test mode:	BLE Tx mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Neutral
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5°C Humi: 55%



	Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.426	36.40	10.14	-0.03	0.03	46.54	57.33	-10.79	QP
2	0.431	29.06	10.15	-0.03	0.03	39.21	47.24	-8.03	Average
3	1.289	36.01	10.65	0.11	0.11	46.88	56.00	-9.12	QP
4	1.289	29.26	10.65	0.11	0.11	40.13	46.00	-5.87	Average
5	2.133	36.47	10.82	0.19	0.19	47.67	56.00	-8.33	QP
6	2.993	30.07	10.90	0.31	0.07	41.35	46.00	-4.65	Average
7	4.696	33.67	11.00	0.62	0.09	45.38	56.00	-10.62	QP
8	4.696	27.98	11.00	0.62	0.09	39.69	46.00	-6.31	Average
9	17.109	22.14	11.50	1.80	0.15	35.59	50.00	-14.41	Average
10	17.755	34.97	11.53	1.47	0.15	48.12	60.00	-11.88	QP
11	19.224	25.61	11.60	0.64	0.15	38.00	50.00	-12.00	Average
12	20.056	34.72	11.63	0.23	0.19	46.77	60.00	-13.23	QP

Notes:

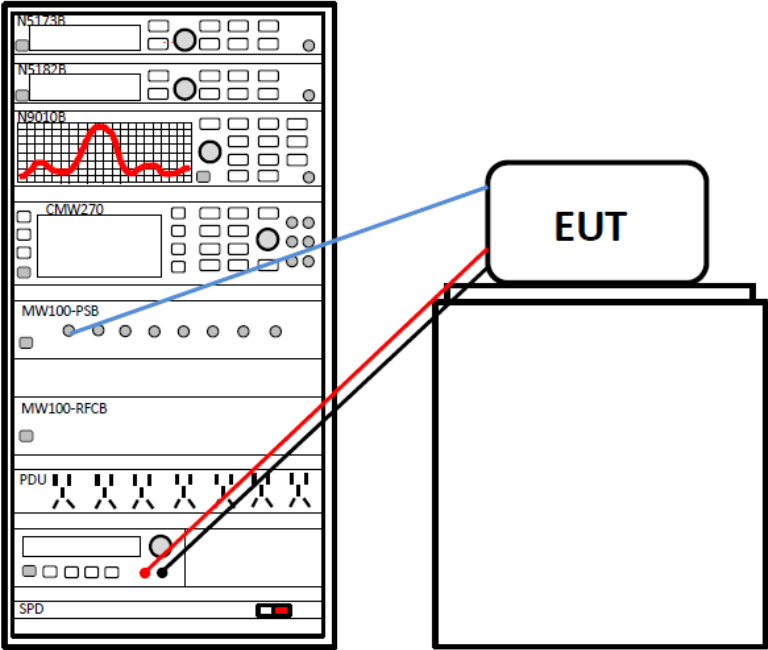
1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Aux Factor + Cable Loss.

6.3 Conducted Output Power

Test Requirement:	FCC Part 15 C Section 15.247 (b)(3)
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

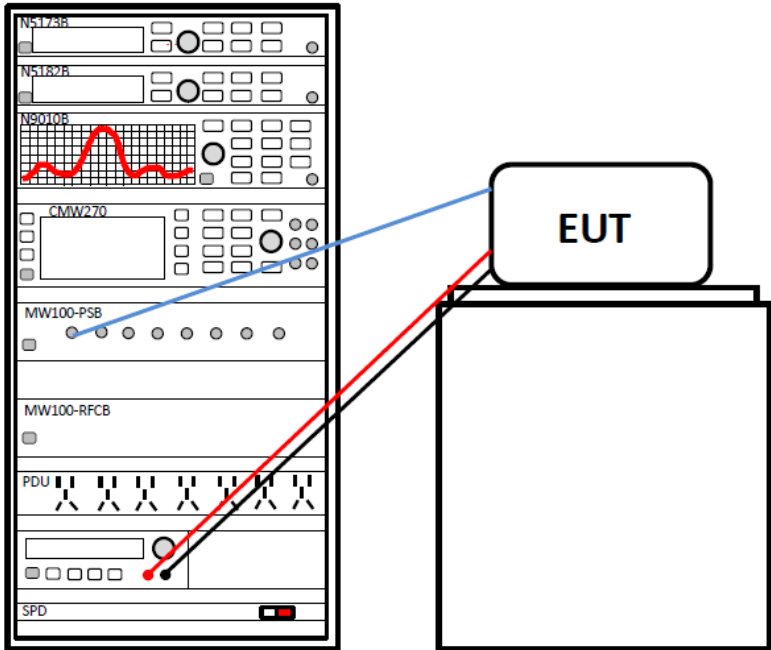
Measurement Data: Refer to Appendix A - BLE

6.4 Occupy Bandwidth

Test Requirement:	FCC Part 15 C Section 15.247 (a)(2)
Limit:	>500kHz
Test setup:	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data: Refer to Appendix A - BLE

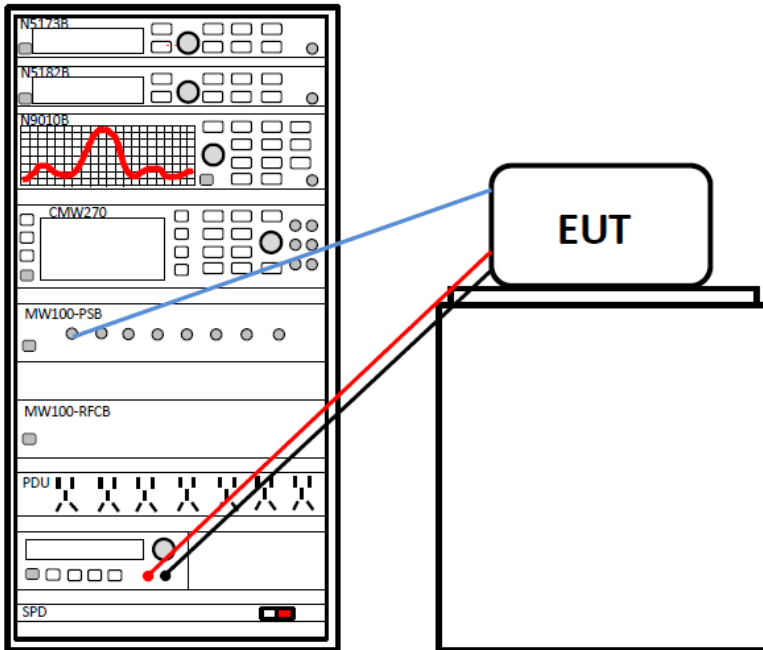
6.5 Power Spectral Density

Test Requirement:	FCC Part 15 C Section 15.247 (e)
Limit:	8 dBm/3kHz
Test setup:	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data: Refer to Appendix A - BLE

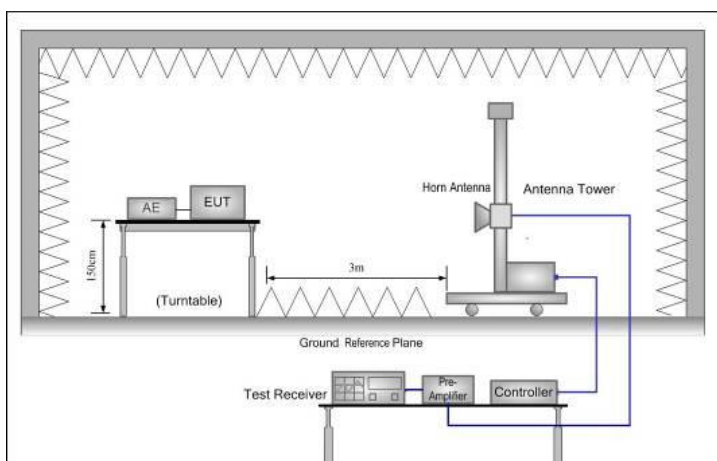
6.6 Band Edge

6.6.1 Conducted Emission Method

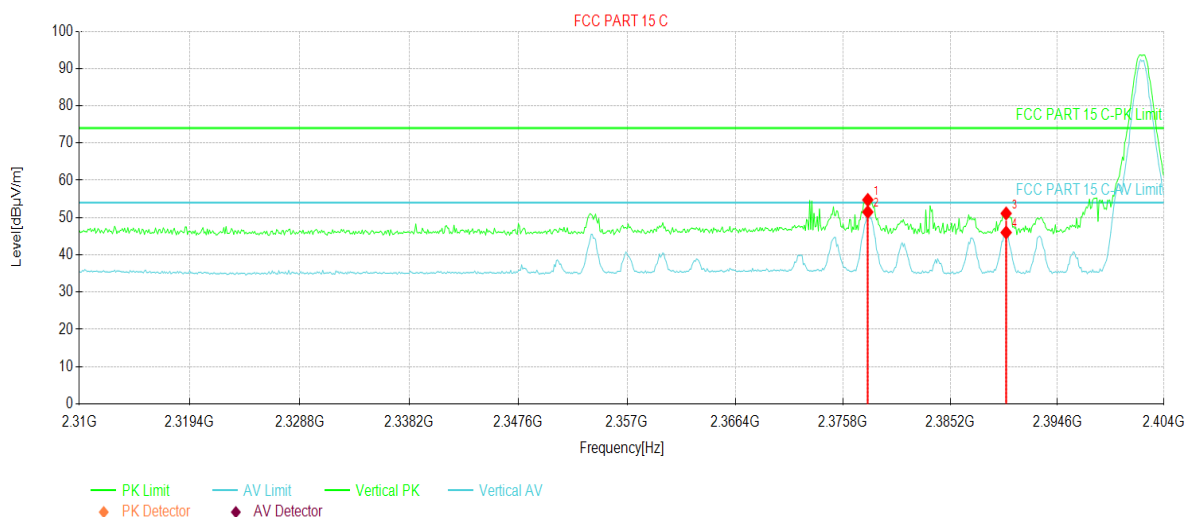
Test Requirement:	FCC Part 15 C Section 15.247 (d)
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data: Refer to Appendix A - BLE

6.6.2 Radiated Emission Method

Test Requirement:	FCC Part 15 C Section 15.205 and 15.209				
Test Frequency Range:	2310 MHz to 2390 MHz and 2483.5MHz to 2500 MHz				
Test Distance:	3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	Above 1GHz	Peak RMS	1MHz 1MHz	3MHz 3MHz	Peak Value Average Value
Limit:	Frequency	Limit (dBuV/m @3m)		Remark	
	Above 1GHz	54.00 74.00		Average Value Peak Value	
Test Procedure:	<div>1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</div> <div>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</div> <div>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</div> <div>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</div> <div>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</div> <div>6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</div>				
Test setup:	<div></div>				
Test Instruments:	Refer to section 5.9 for details				
Test mode:	Refer to section 5.3 for details				
Test results:	Passed				

Product Name:	CALF Speaker Microphone	Product Model:	M1
Test By:	Mike	Test mode:	BLE Tx mode
Test Channel:	Lowest channel	Polarization:	Vertical
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Huni: 57%

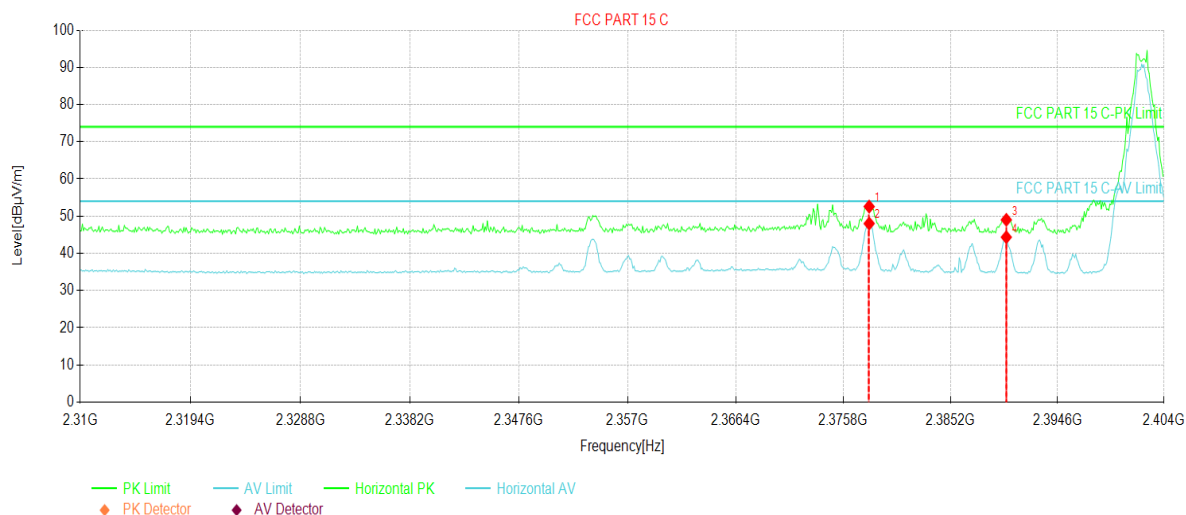


NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	2377.96	47.71	54.75	7.04	74.00	19.25	PK	Vertical
2	2377.96	44.45	51.49	7.04	54.00	2.51	AV	Vertical
3	2390.08	44.03	51.11	7.08	74.00	22.89	PK	Vertical
4	2390.08	38.91	45.99	7.08	54.00	8.01	AV	Vertical

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are lower than the limit 20dB and not show in test report.

Product Name:	CALF Speaker Microphone	Product Model:	M1
Test By:	Mike	Test mode:	BLE Tx mode
Test Channel:	Lowest channel	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Humi: 57%

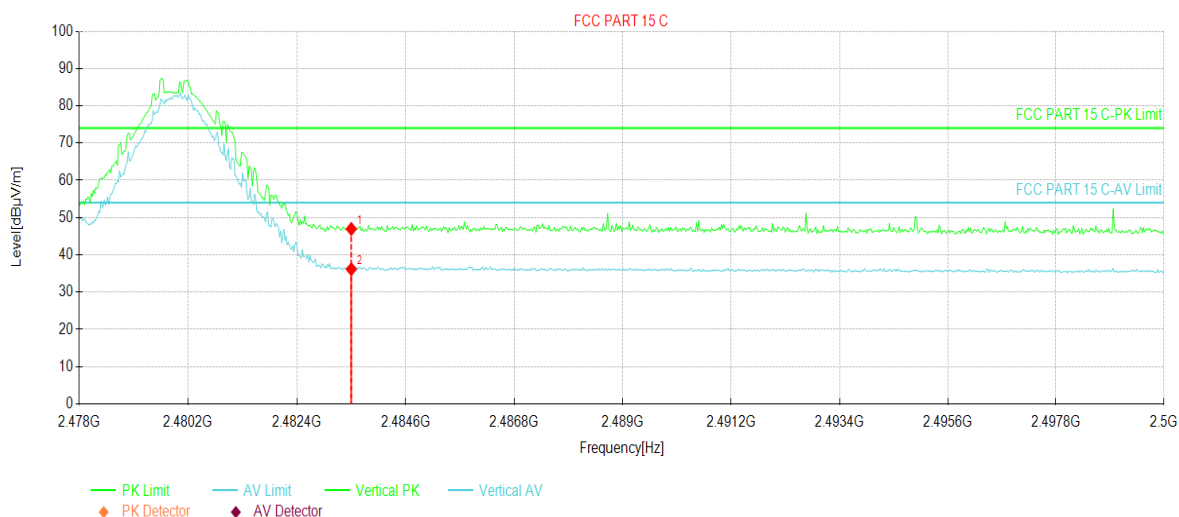


NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Factor [dB]	Limit [dBuV/m]	Margin [dB]	Trace	Polarity
1	2378.05	45.53	52.57	7.04	74.00	21.43	PK	Horizontal
2	2378.05	40.97	48.01	7.04	54.00	5.99	AV	Horizontal
3	2390.08	41.93	49.01	7.08	74.00	24.99	PK	Horizontal
4	2390.08	37.26	44.34	7.08	54.00	9.66	AV	Horizontal

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are lower than the limit 20dB and not show in test report.

Product Name:	CALF Speaker Microphone	Product Model:	M1
Test By:	Mike	Test mode:	BLE Tx mode
Test Channel:	Highest channel	Polarization:	Vertical
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Huni: 57%

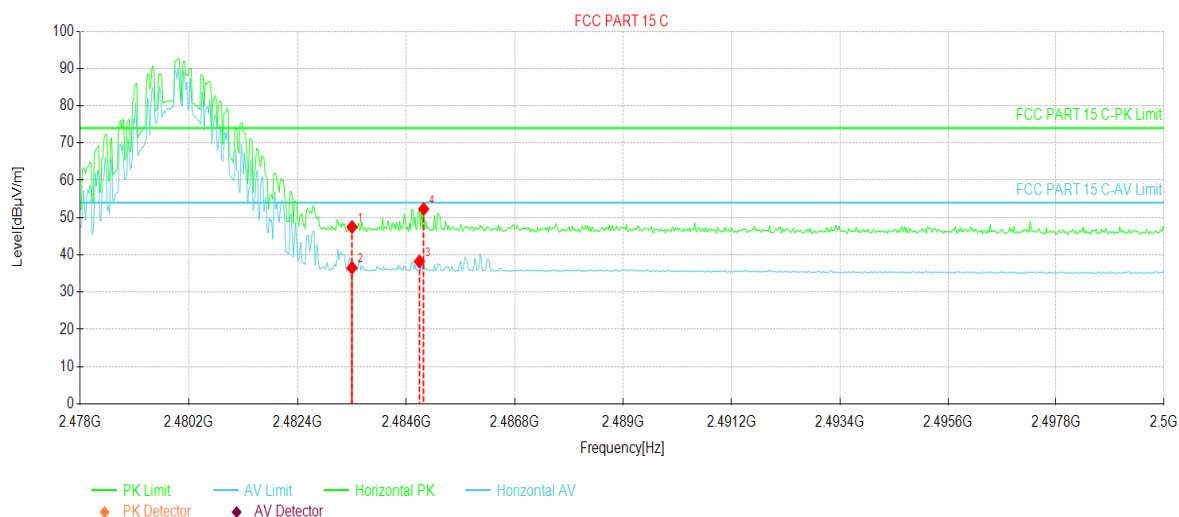


NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	2483.50	39.25	46.94	7.69	74.00	27.06	PK	Vertical
2	2483.50	28.46	36.15	7.69	54.00	17.85	AV	Vertical

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are lower than the limit 20dB and not show in test report.

Product Name:	CALF Speaker Microphone	Product Model:	M1
Test By:	Mike	Test mode:	BLE Tx mode
Test Channel:	Highest channel	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Huni: 57%



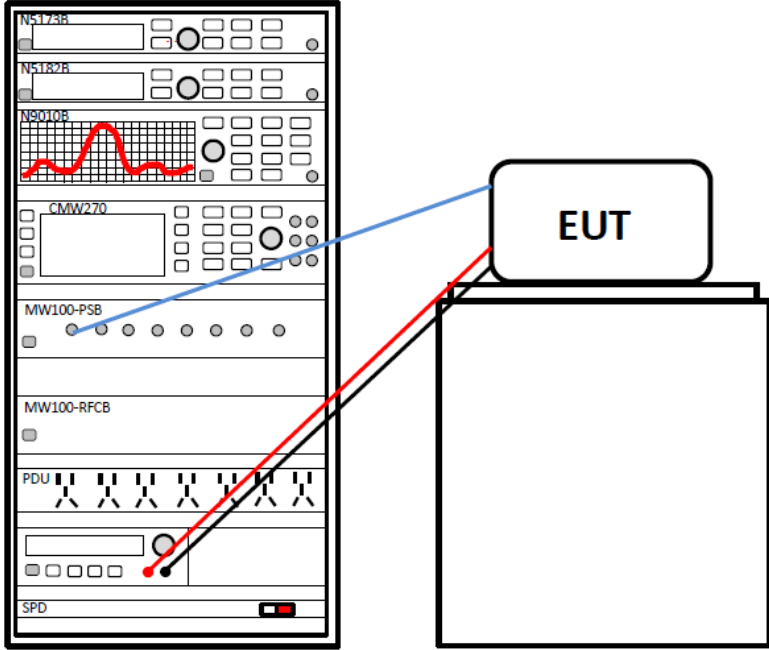
NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Factor [dB]	Limit [dBuV/m]	Margin [dB]	Trace	Polarity
1	2483.50	39.79	47.48	7.69	74.00	26.52	PK	Horizontal
2	2483.50	28.81	36.50	7.69	54.00	17.50	AV	Horizontal
3	2484.86	30.50	38.20	7.70	54.00	15.80	AV	Horizontal
4	2484.95	44.60	52.30	7.70	74.00	21.70	PK	Horizontal

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are lower than the limit 20dB and not show in test report.

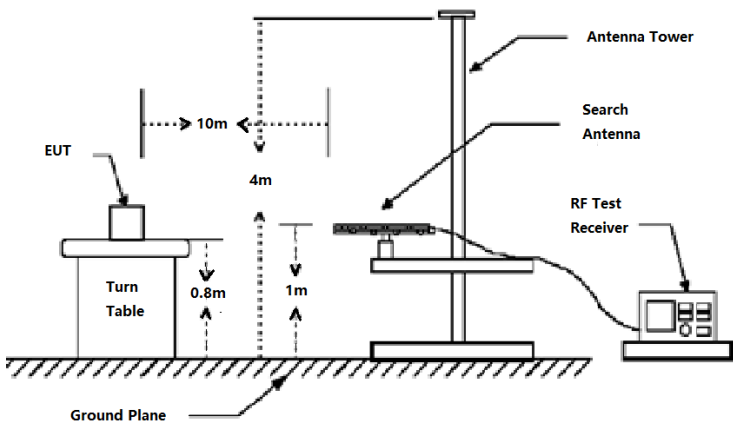
6.7 Spurious Emission

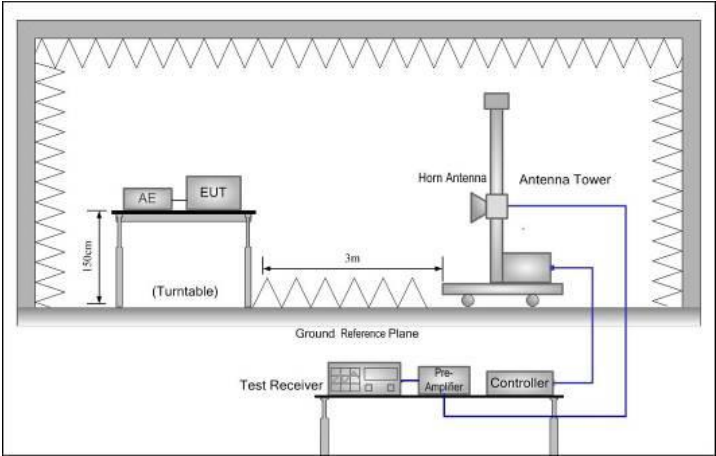
6.7.1 Conducted Emission Method

Test Requirement:	FCC Part 15 C Section 15.247 (d)
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test setup:	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data: Refer to Appendix A - BLE

6.7.2 Radiated Emission Method

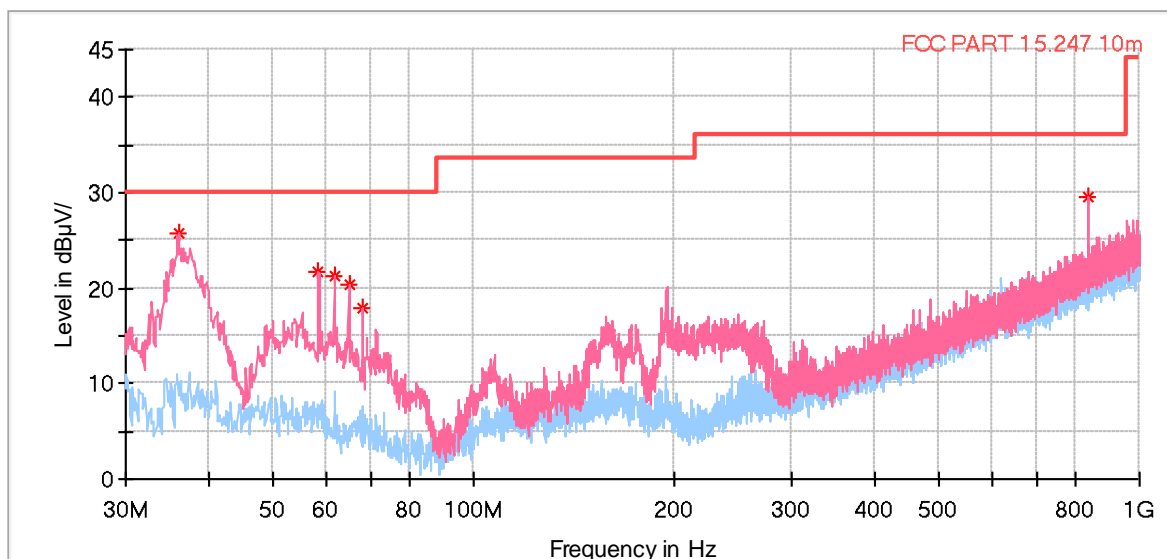
Test Requirement:	FCC Part 15 C Section 15.205 and 15.209				
Test Frequency Range:	9kHz to 25GHz				
Test Distance:	3m or 10m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak RMS	1MHz 1MHz	3MHz 3MHz	Peak Value Average Value
Limit:	Frequency		Limit (dBuV/m @10m)		Remark
	30MHz-88MHz		30.0		Quasi-peak Value
	88MHz-216MHz		33.5		Quasi-peak Value
	216MHz-960MHz		36.0		Quasi-peak Value
	960MHz-1GHz		44.0		Quasi-peak Value
	Frequency		Limit (dBuV/m @3m)		Remark
	Above 1GHz		54.0 74.0		Average Value Peak Value
Test Procedure:	<div>1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz)/1.5m(above 1GHz) above the ground at a 10 meter chamber (below 1GHz)or 3 meter chamber(above 1GHz). The table was rotated 360 degrees to determine the position of the highest radiation.</div> <div>2. The EUT was set 10 meters(below 1GHz) or 3 meters(above 1GHz) away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</div> <div>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</div> <div>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</div> <div>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</div> <div>6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</div>				
Test setup:	<div>Below 1GHz</div> <div></div>				

	<p>Above 1GHz</p> 
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed
Remark:	<ol style="list-style-type: none"> 1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case. 2. 9 kHz to 30MHz is lower than the limit 20dB, so only shows the data of above 30MHz in this report.

Measurement Data (worst case):
Below 1GHz:

Product Name:	CALF Speaker Microphone	Product Model:	M1
Test By:	Mike	Test mode:	BLE Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical & Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Humi: 57%

Full Spectrum



Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
58.421000	21.79	30.00	8.21	100.0	V	241.0	-16.2
61.719000	21.26	30.00	8.74	100.0	V	241.0	-16.7
64.920000	20.27	30.00	9.73	100.0	V	241.0	-17.3
68.218000	18.00	30.00	12.00	100.0	V	241.0	-17.9
836.652000	29.64	36.00	6.36	100.0	V	261.0	-1.8
36.111000	25.68	30.00	4.32	100.0	V	341.0	-16.5

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are lower than the limit 20dB and not show in test report.
- The Aux Factor is a notch filter switch box loss, this item is not used.

Above 1GHz

Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
4804.00	63.72	-9.60	54.12	74.00	19.88	Vertical
4804.00	65.42	-9.60	55.82	74.00	18.18	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
4804.00	59.78	-9.60	50.18	54.00	3.82	Vertical
4804.00	61.48	-9.60	51.88	54.00	2.12	Horizontal
Test channel: Middle channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
4884.00	64.52	-9.04	55.48	74.00	18.52	Vertical
4884.00	64.82	-9.04	55.78	74.00	18.22	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
4884.00	61.03	-9.04	51.99	54.00	2.01	Vertical
4884.00	61.25	-9.04	52.21	54.00	1.79	Horizontal
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
4960.00	64.48	-8.45	56.03	74.00	17.97	Vertical
4960.00	64.72	-8.45	56.27	74.00	17.73	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
4960.00	60.04	-8.45	51.59	54.00	2.41	Vertical
4960.00	61.57	-8.45	53.12	54.00	0.88	Horizontal
Remark: 1. Final Level =Receiver Read level + Factor. 2. The emission levels of other frequencies are lower than the limit 20dB and not show in test report.						