FCC Part 15.231

TEST REPORT

For

Superior Electronics Corporation

No.10, Lane 31, Chongde St., Sinyi District, Taipei City 110, Taiwan (R.O.C.)

FCC ID: K4ER100TBQ

Report Type:	**Product Type:**
Original Report	Wireless Help Button

Report Producer : Kaylee Chiang

Report Number : RXZ181204009-00

Report Date : 2018-12-21

Reviewed By: Jerry Chang

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
1.0	RXZ181204009	RXZ181204009-00	2018.12.21	Original Report	Kaylee

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	Superior Electronics Corporation
	No.10, Lane 31, Chongde St., Sinyi District, Taipei City 110, Taiwan (R.O.C.)
Manufacturer	Superior Electronics Corporation
	No.10, Lane 31, Chongde St., Sinyi District, Taipei City 110, Taiwan (R.O.C.)
Brand(Trade) Name	ENFORCER
Product (Equipment)	Wireless Help Button
Main Model Name	RM-R100-TBQ
Series Model Name	SD-862M-GWSQ
Model Discrepancy	The major electrical and mechanical constructions of series models are identical to the basic model, except different appearance color. The model, RM-R100-TBQ is the testing sample, and the final test data are shown on this test report.
Frequency Range	433.92MHz
Number of Channels	1 Channel
Antenna Specification	PCB Antenna / -2 dBi
Power Operation (Voltage Range)	☐ AC 120V/60Hz ☐ Adapter ☐ By AC Power Cord ☐ PoE
	☒ DC Type ☒ Battery 9Vdc ☐ DC Power Supply ☐ External from USB Cable ☐ External DC Adapter
	☐ Host System
Received Date	Dec 04, 2018
Date of Test	Dec 16, 2018 ~ Dec 17, 2018

**All measurement and test data in this report was gathered from production sample serial number: 181204009 (Assigned by BACL, Taiwan).*

1.2 Objective

This report is prepared on behalf of *Superior Electronics Corporation* All the test measurements were performed according to the measurement procedure described in ANSI C63.10 - 2013.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.209, 15.35(c) and 15.231 rules.

1.3 Related Submittal(s)/Grant(s)

N/A.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

1.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Taiwan) to collect test data is located on

☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

☐68-3, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (Taiwan) Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3180) and the FCC designation No.TW3180 under the Mutual Recognition Agreement (MRA) in FCC Test. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 974454. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

2 System Test Configuration

2.1 Description of Test Configuration

Channel list:

Channel	Frequency (MHz)
1	433.92

2.2 Equipment Modifications

No modification was made to the EUT.

2.3 EUT Exercise Software

No test software was used.

2.4 Support Equipment List and Details

Description	Manufacturer	Model Number	BSMI	FCC ID	S/N
N/A	N/A	N/A	N/A	N/A	N/A

2.5 External Cable List and Details

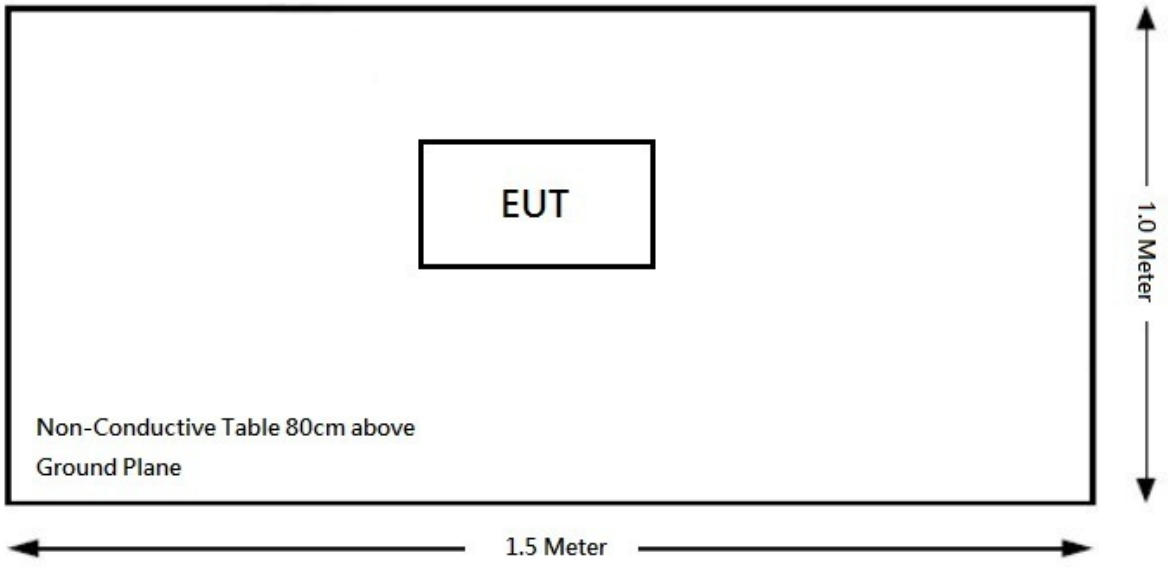
Cable Description	Length (m)	From	To
N/A	N/A	N/A	N/A

2.6 Block Diagram of Test Setup

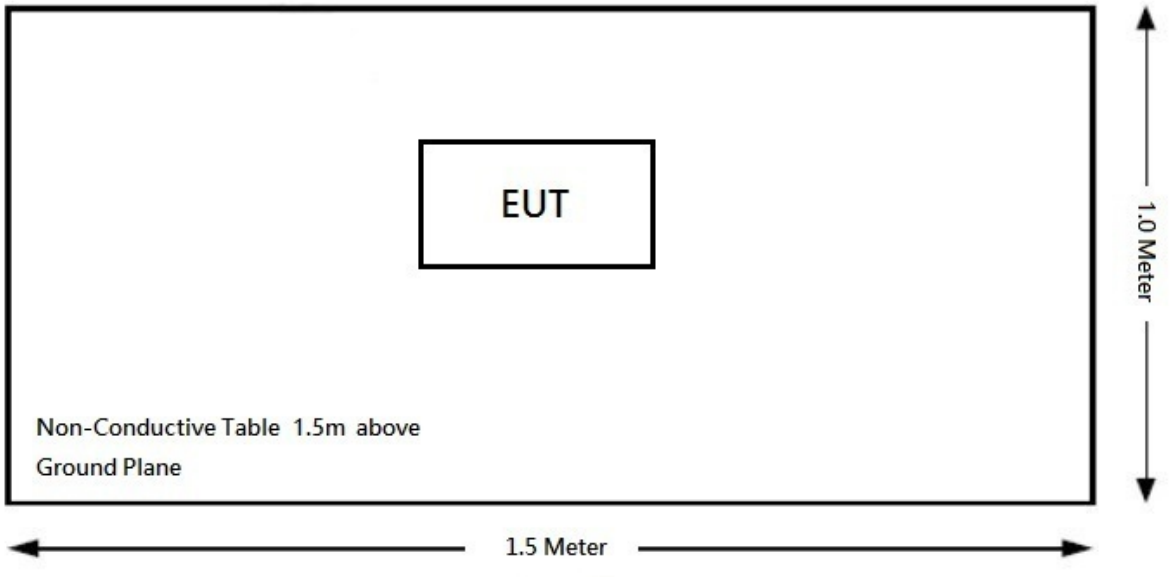
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation:

Below 1GHz:



Above 1GHz:



3 Summary of Test Results

FCC Rules	Description of Test	Results
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conducted Emissions	Not applicable
§15.205, §15.209, §15.231(b)	Radiated Emissions	Compliance
§15.231(a)(2)	Deactivation	Compliance
§15.231(c)	Deactivation	Compliance

Not applicable: Device only supports battery.

4 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Room (966-A)					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2017/12/20	2018/12/19
Horn Antenna	EMCO	3115	9311-4158	2018/04/20	2019/04/19
Horn Antenna	ETS-Lindgren	3116	62638	2018/08/29	2019/08/28
Preamplifier	Sonoma	310N	130602	2018/07/04	2019/07/03
Preamplifier	EM Electronics Corp.	EM01G18G	060657	2018/12/07	2019/12/06
Microware Preamplifier	EM Electronics Corporation	EM18G40G	060656	2018/01/15	2019/01/14
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2018/10/23	2019/10/22
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2018/02/12	2019/02/13
Micro flex Cable	UTIFLEX	FSCM 64639 / (2M)	93D0127	2018/07/31	2019/07/30
Micro flex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2018/11/16	2019/11/15
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2018/03/05	2019/03/04
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2018/01/17	2019/01/16
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	60772	N.C.R	N.C.R
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements*

5 FCC §15.203 – Antenna Requirements

5.1 Applicable Standard

An intentional radiator shall be designed to ensure that no antenna other than that furnished by theresponsible 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 shall be considered sufficient to comply with the provisions of this section.

5.2 Antenna Connected Construction

The EUT has a PCB antenna which was permanently attached and the antenna gain is 0dBi; fulfill the requirement of this section. Please refer to EUT photos.

Result: Compliant.

6 FCC §15.209, §15.205 , §15.231(b) – Radiated Emissions

6.1 Applicable Standard

FCC §15.205, §15.209, §15.231 (b)

According to FCC §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66 – 40.70	2250	225
70 – 130	1250	125
130 – 174	1250 to 3750 **	125 to 375 **
174 – 260	3750	375
160 – 470	3750 to 12500 **	375 to 1250 **
Above 470	12500	1250

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

6.2 Measurement Uncertainty

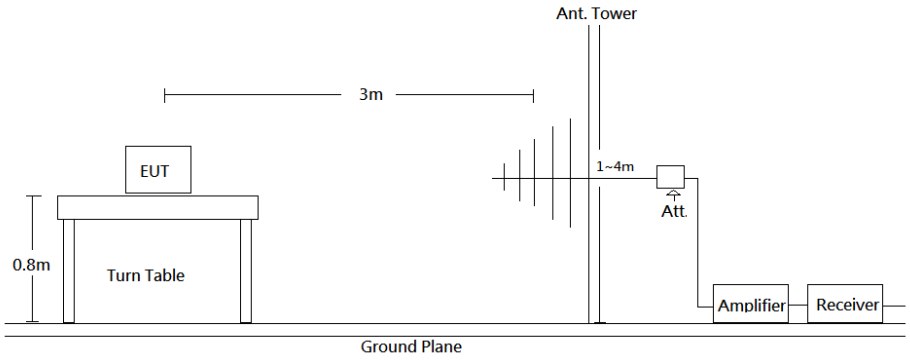
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Taiwan) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report.

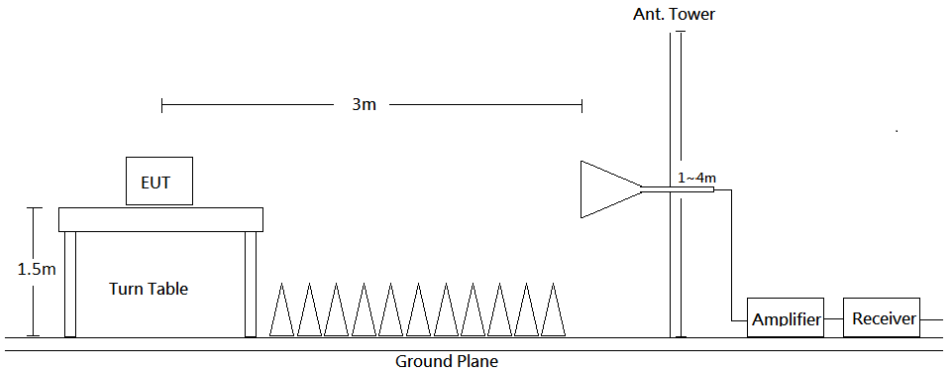
Frequency	Measurement uncertainty
30 MHz~200 MHz	3.75 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	4.21 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	4.83 dB (k=2, 95% level of confidence)
6 GHz~18 GHz	5.18 dB (k=2, 95% level of confidence)
18 GHz~26 GHz	4.55 dB (k=2, 95% level of confidence)
26 GHz~40 GHz	4.67 dB (k=2, 95% level of confidence)

6.3 EUT Setup

Below 1 GHz:



Above 1 GHz:



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.231 Limits.

6.4 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 4 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Detector
30-1000 MHz	100 kHz	300 kHz	PK
Above 1 GHz	1 MHz	3 MHz	PK

6.5 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

6.6 Corrected Factor & Margin Calculation

The Correct Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Result – Limit

6.7 Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.209 Limit.

6.8 Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2018-12-16 ~ 2018-12-17.

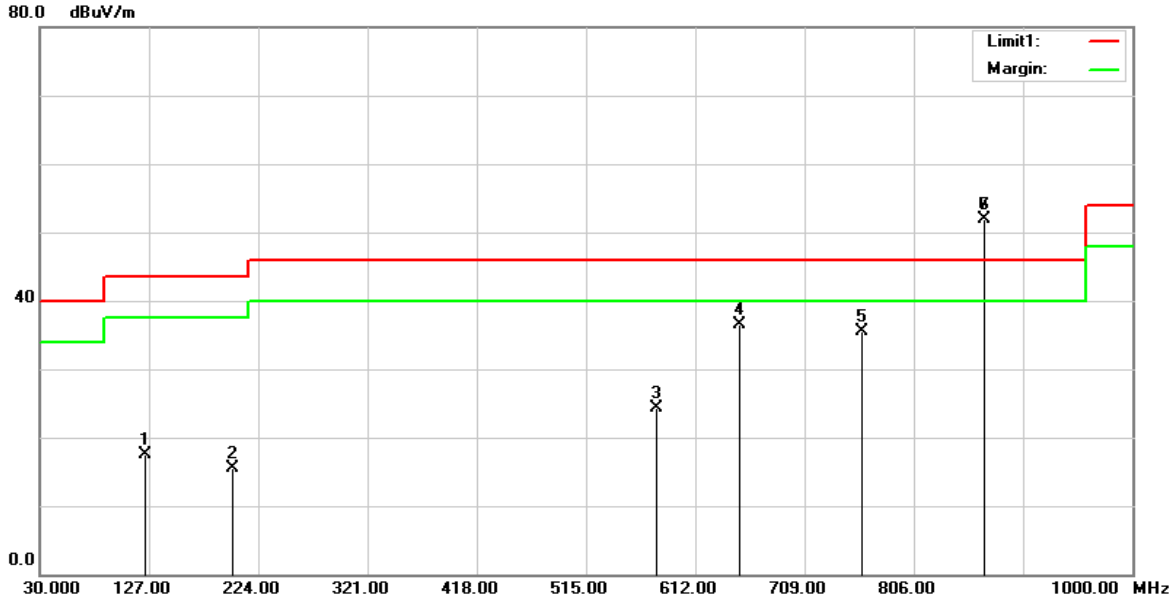
6.9 Test Results

Test Mode: Transmitting

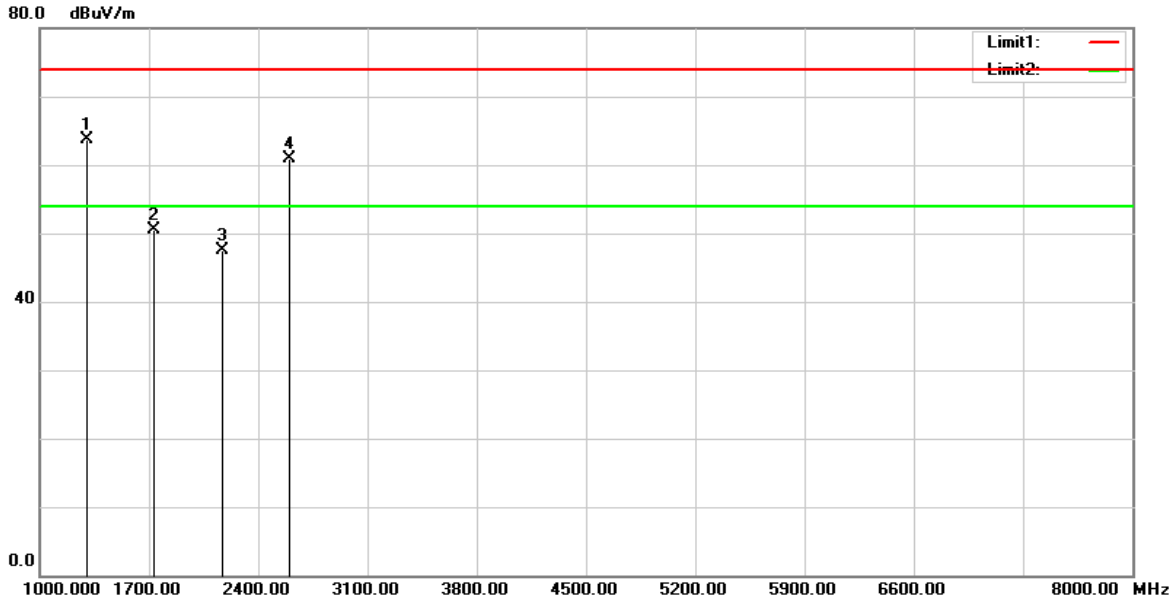
30MHz-1GHz (GFSK modulation) *(Pre-scan with three orthogonal axis, and worse case as Z axis.)*

Horizontal

30MHz-1GHz:

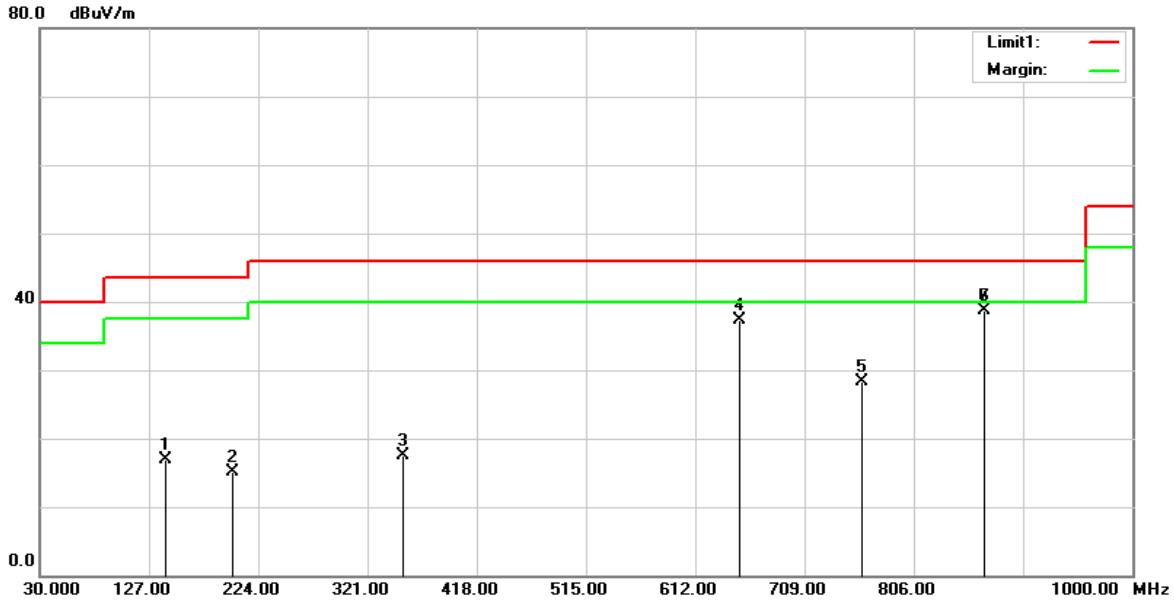


1GHz-4GHz:

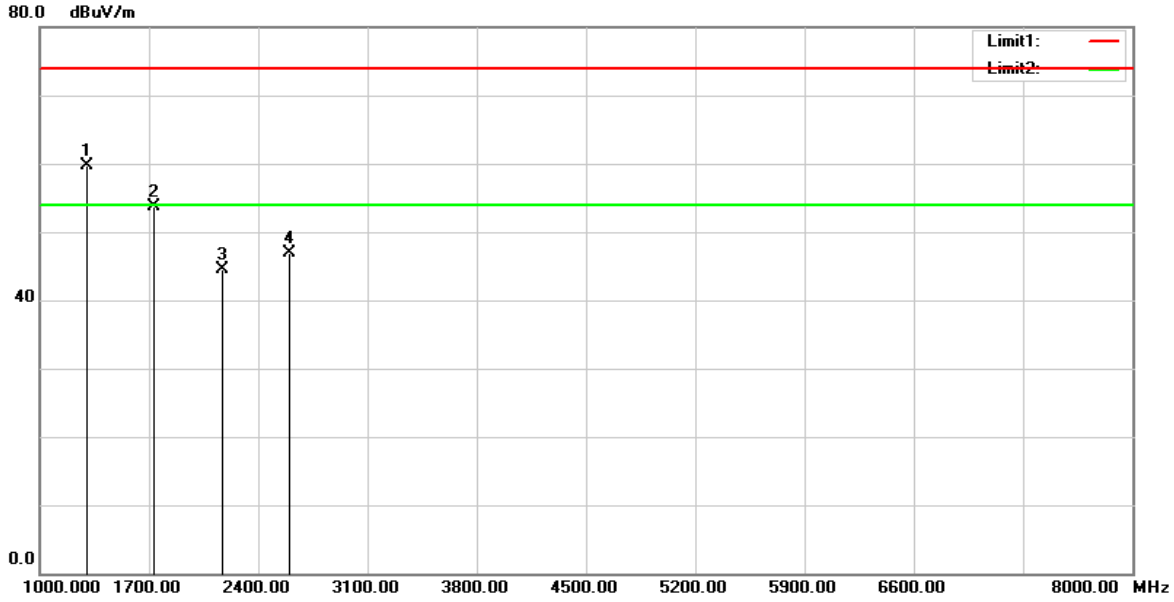


Vertical

30MHz-1GHz:



1GHz-4GHz:



Below 1GHz

Horizontal

Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
124.09	26.69	-9.21	17.48	43.5	-26.02	100	234	QP
200.72	24.41	-8.92	15.49	80.83	-65.34	100	115	QP
*433.92	85.83	-5.40	80.43	100.83	-20.4	242	11	Peak
*433.92	80.43	-8.04	72.39	80.83	-8.44	242	11	Ave
578.05	28.02	-3.7	24.32	80.83	-56.51	100	227	QP
650.8	39.31	-2.84	36.47	80.83	-44.36	100	172	QP
759.44	37.02	-1.51	35.51	80.83	-45.32	100	360	QP
867.84	51.64	0.34	51.98	80.83	-28.85	100	7	Peak
867.84	51.98	-8.04	43.94	60.83	-16.89	100	7	Ave

Vertical

Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
141.55	26.44	-9.51	16.93	80.83	-63.9	100	311	QP
201.69	24.21	-9.15	15.06	80.83	-65.77	100	311	QP
353.01	24.28	-6.8	17.48	80.83	-63.35	100	96	QP
*433.92	79.95	-5.40	74.55	100.83	-26.28	233	264	Peak
*433.92	74.55	-8.04	66.51	80.83	-14.32	233	264	Ave
650.8	40.11	-2.84	37.27	80.83	-43.56	100	262	QP
759.44	29.82	-1.51	28.31	80.83	-52.52	100	306	QP
867.84	38.36	0.34	38.7	80.83	-42.13	100	223	Peak
867.84	38.7	-8.04	30.66	60.83	-30.17	100	223	Ave

Note 1:

Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)

Margin (dB) = Result (dBμV /m) – Limit (dBμV/m)

Note 2:

Calculate Average value based on Duty Cycle correction factor:

Tp = 52.403ms

Ton = Burst1*N1 + Burst2*N2 = 0.671*21 + 0.333*20 = 14.091 + 6.66 = 20.751ms

Duty Cycle Corrected Factor = 20*log(Ton/Tp) = 20*log(20.751ms/52.403ms) = -8.04dB

Average value = Peak value + Duty Cycle Corrected Factor

Above 1GHz

Horizontal

Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1301.760	71.92	-8.18	63.74	80.83	-17.09	219	61	peak
1301.760	63.74	-8.04	55.70	60.83	-5.13	219	61	AVG
1735.680	56.72	-6.20	50.52	80.83	-30.31	146	82	peak
1735.680	50.52	-8.04	42.48	60.83	-18.35	146	82	AVG
2169.600	51.99	-4.44	47.55	80.83	-33.28	112	199	peak
2169.600	47.55	-8.04	39.51	60.83	-21.32	112	199	AVG
2603.520	64.26	-3.29	60.97	80.83	-19.86	139	16	peak
2603.520	60.97	-8.04	52.93	60.83	-7.90	139	16	AVG

Vertical

Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1301.760	67.94	-8.18	59.76	80.83	-21.07	214	140	peak
1301.760	59.76	-8.04	51.72	60.83	-9.11	214	140	AVG
1735.680	59.81	-6.20	53.61	80.83	-27.12	215	346	peak
1735.680	53.61	-8.04	45.57	60.83	-15.26	215	346	AVG
2169.600	48.89	-4.44	44.45	80.83	-36.38	100	90	peak
2169.600	44.45	-8.04	36.41	60.83	-24.42	100	90	AVG
2603.520	50.26	-3.29	46.97	80.83	-33.86	100	20	peak
2603.520	46.97	-8.04	38.93	60.83	-21.90	100	20	AVG

Note 1:

Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)

Margin (dB) = Result (dBμV /m) – Limit (dBμV/m)

Note 2:

Calculate Average value based on Duty Cycle correction factor:

Tp = 52.403ms

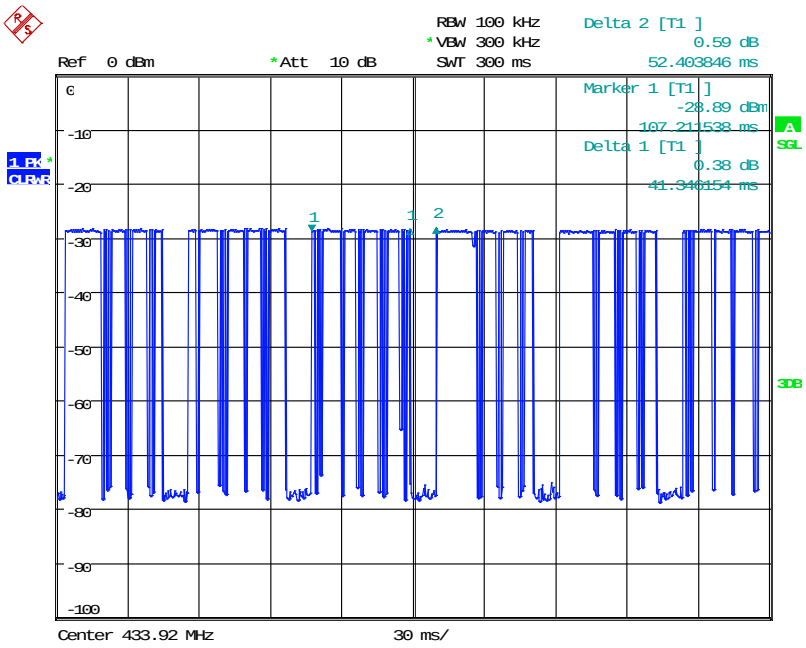
Ton = Burst1*N1 + Burst2*N2 = 0.671*21 + 0.333*20 = 14.091 + 6.66 = 20.751ms

Duty Cycle Corrected Factor = 20*log(Ton/Tp) = 20*log(20.751ms/52.403ms) = -8.04dB

Average value = Peak value + Duty Cycle Corrected Factor

Duty Cycle

Tp=52.403ms



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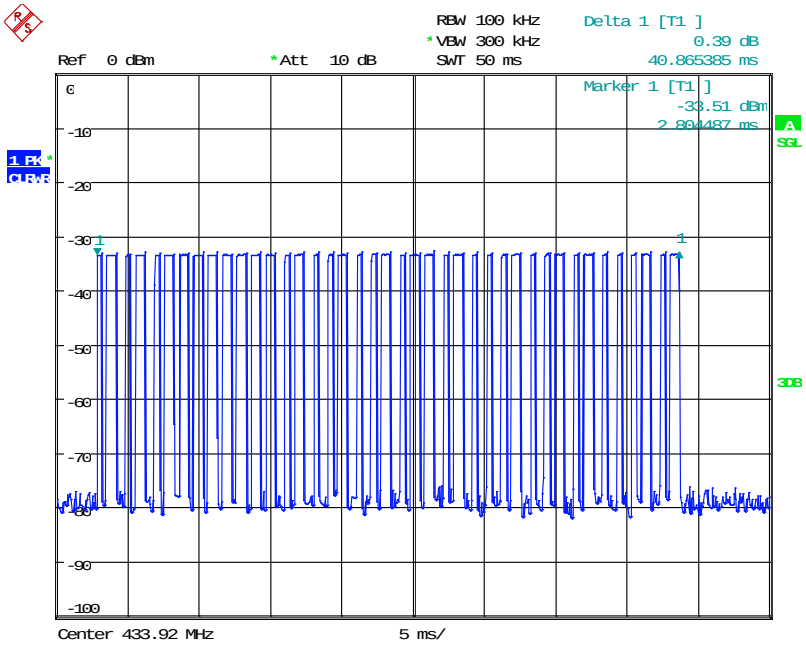
Zoom in

N1=21, N2=20



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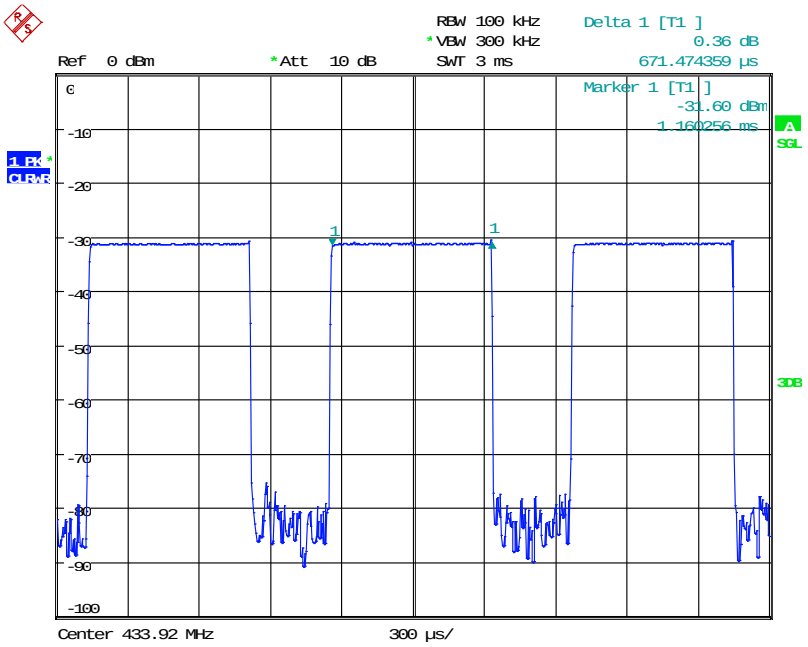
Duty Cycle Burst 1



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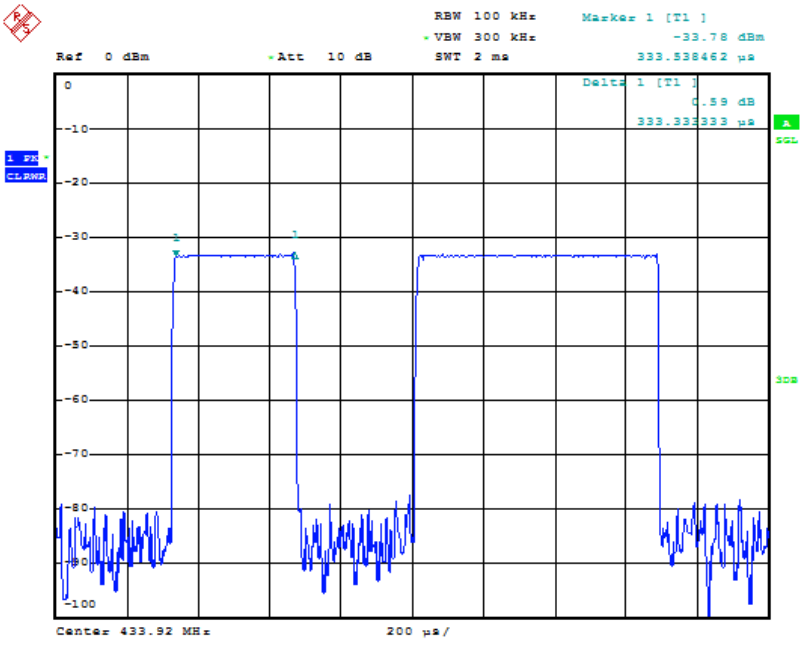
Duty Cycle Burst 2



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7 FCC §15.231(a)(1) – Deactivation Testing

7.1 Applicable Standard

Per FCC §15.231(a) (1), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released

7.2 Test Procedure

1. With the EUT's antenna attached, the waveform was received by the test antenna which was connected to the spectrum analyzer.
2. Set center frequency of spectrum analyzer=operating frequency.
3. Set the spectrum analyzer as RBW=100k VBW=300k Span=0Hz.
4. Repeat above procedures until all frequency measured was complete.

7.3 Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

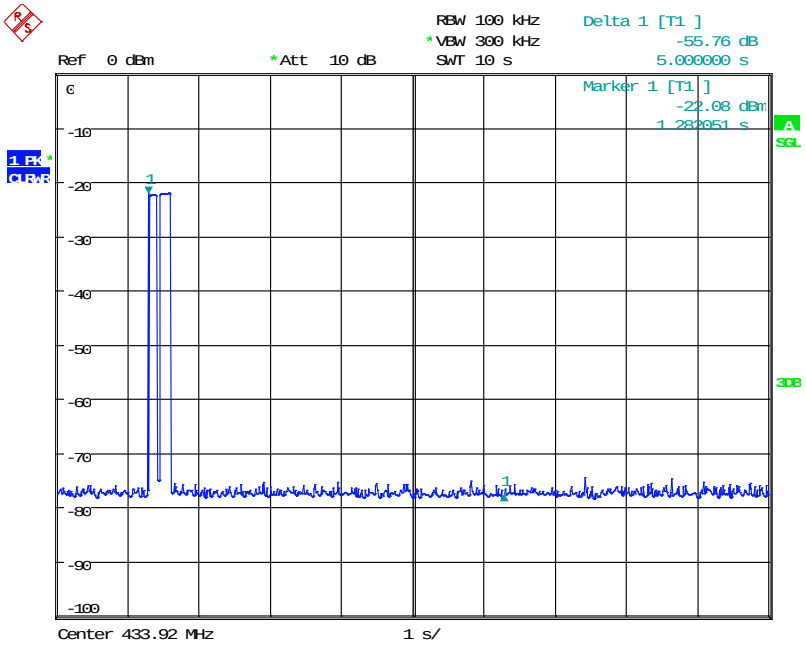
The testing was performed by Tom Hsu on 2018-12-16.

7.4 Test Results

Test mode: Transmitting

GFSK Modulation

5s



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8 FCC §15.231(c) – 20 dB Emission Bandwidth Testing

8.1 Applicable Standard

Per 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

8.2 Test Procedure

With the EUT's antenna attached, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

8.3 Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

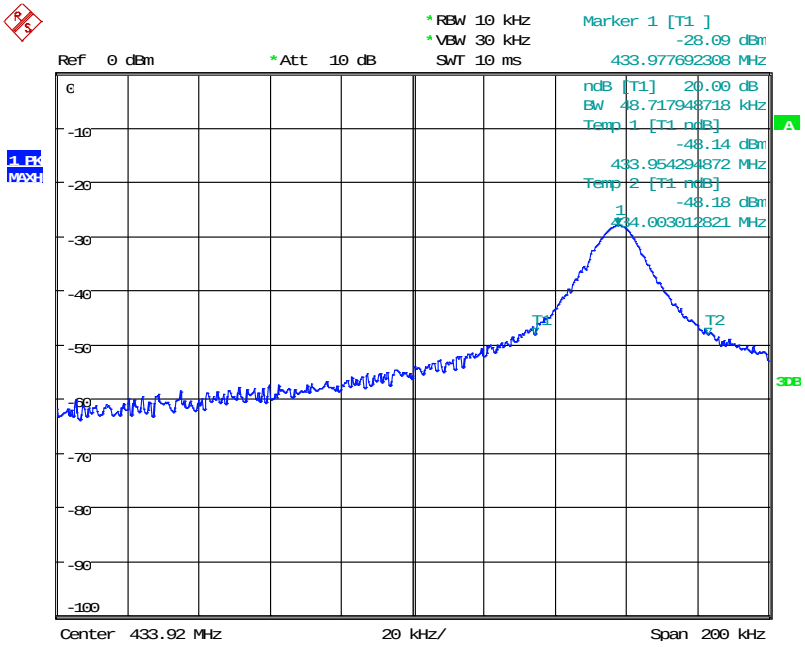
The testing was performed by Tom Hsu on 2018-12-16.

8.4 Test Results

Frequency (MHz)	20 dB Emission Bandwidth (kHz)	Limit (kHz)	Result
433.92	48.718	1085	Compliance

Note: Limit = 0.25% * Center Frequency = 0.25% * 433.92 MHz = 1085 kHz

20 dB Emission Bandwidth



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