FCC Test Report

Report No.: AGC06724190602FE03

FCC ID	:	2APAKBE1210
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Visit CO alarm transmitter
BRAND NAME	:	Bellman & Symfon
MODEL NAME	:	BE1210
APPLICANT	:	Bellman & Symfon AB
DATE OF ISSUE	:	Jul. 04, 2019
STANDARD(S) **TEST PROCEDURE(S)**	:	FCC Part 15 Subpart C Section 15.231
REPORT VERSION	:	V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jul. 04, 2019	Valid	Initial release

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1. VERIFICATION OF CONFORMITY

Applicant	Bellman & Symfon AB
Address	Södra Långebergsgatan 30 436 32, Askim Sweden
Manufacturer	Bellman & Symfon AB
Address	Södra Långebergsgatan 30 436 32, Askim Sweden
Factory	Ei comanpy
Address	Ei Electronics Campus, U 40-47 Shannon Industrial Estate Shannon, V14 H020 Co. Clare Ireland
Product Designation	Visit CO alarm transmitter
Brand Name	Bellman & Symfon
Test Model	BE1210
Date of test	Jun. 27, 2019 to Jul. 04, 2019
Deviation	None
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BR/RF

We hereby certify that:
The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.231. The test results of this report relate only to the tested sample identified in this report.

Tested By Draven Li

Draven Li(Li Ming Liang) Jul. 04, 2019

Reviewed By Max Zhang

Max Zhang(Zhang Yi) Jul. 04, 2019

Approved By Forrest Lei

Forrest Lei(Lei Yonggang)
Authorized Officer Jul. 04, 2019

2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

A major technical description of EUT is described as following

Operation Frequency	433.92MHz
Field Strength(3m)	78.14dBuV/m(Peak)@3m
Modulation	OOK
Number of channels	1
Hardware Version	001A
Software Version	001
Antenna Designation	PCB+Wire antenna
Antenna Gain	2.2dBi
Power Supply	DC 3V by battery (Duracell Alkaline battery 1.5V x2)

3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

- Uncertainty of Conducted Emission, Uc = ±3.2 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±3.9 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB
- Uncertainty of Occupied Channel Bandwidth: Uc = ±2 %

4. DESCRIPTION OF TEST MODES

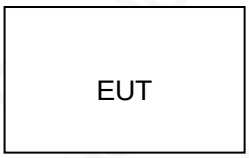
NO.	TEST MODE DESCRIPTION
1	Transmitting mode(Automatic operated)
2	Transmitting mode(Manual operated)

Note:
1. All the test modes can be supply by new battery, and only the data of the worst case recorded in the test report.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Configure 1:



5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Mfr/Brand	Model/Type No.	Remark
1	Visit CO alarm transmitter	Bellman & Symfon	BE1210	EUT

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirement	Compliant
§15.231(a)(2)	Activated automatically	Compliant
ANSI C63.10 Clause 7.5	Average Factor	N/A
§15.231(b) & §15.209	Field Strength of Fundamental and Spurious Emission	Compliant
§15.231(c)	Bandwidth	Compliant

6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

7. TEST EQUIPMENT LIST

TEST EQUIPMENT OF RADIATED EMISSION TEST

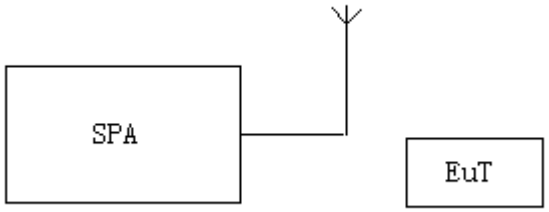
Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Jun. 12, 2019	Jun. 11, 2020
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 20, 2018	Dec. 19, 2019
Attenuator	ZHINAN	E-002	N/A	Aug. 28, 2018	Aug. 27, 2019
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	Jun. 14, 2018	Jun. 13, 2020
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May. 26, 2018	May. 25, 2020
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Oct. 25, 2018	Oct. 24, 2019
ANTENNA	SCHWARZBECK	VULB9168	D69250	Sep. 28, 2017	Sep. 27, 2019

8. PROVISION FOR MOMENTARY OPERATION

8.1 MEASUREMENT PROCEDURE

1. Set the parameters of SPA as below:
   Centre frequency = Operation Frequency
   RBW=1MHz, VBW=3MHz
   Span: 0Hz
   Sweep time: 10S
2. Set the EUT to transmit activated automatically. Use the “View” function of SPA to find the transmission time of being released.
3. Record the data and Reported.

8.2 TEST SETUP

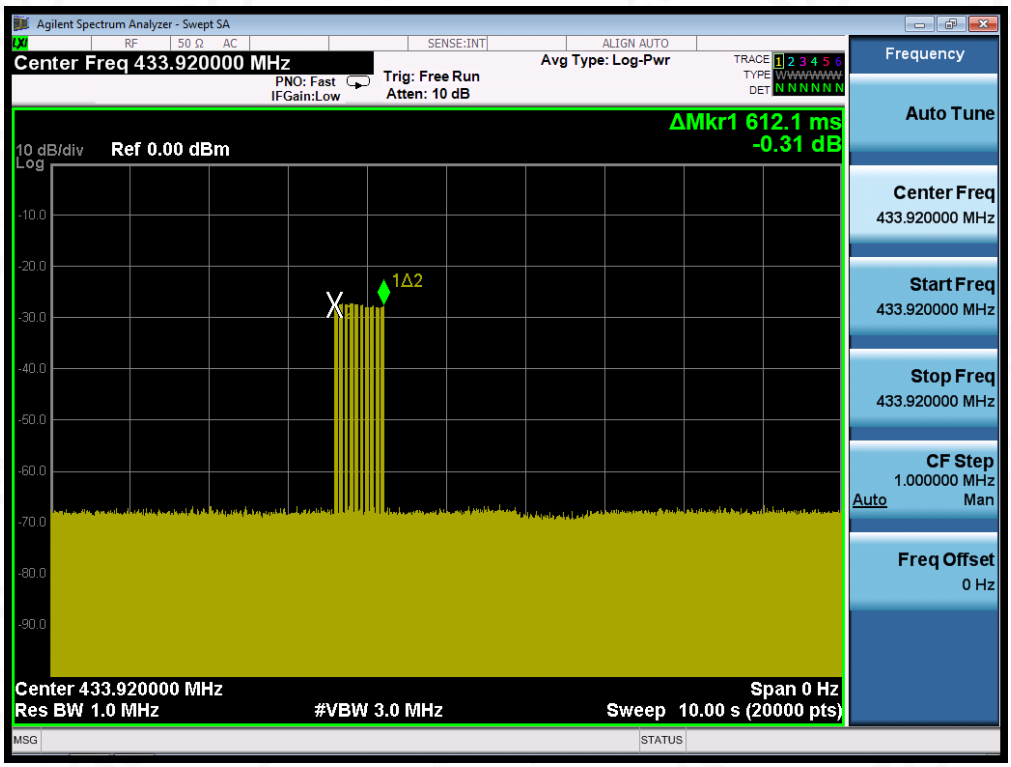


8.3 TEST RESULT

Mode1(Automatic operated):

Test Mode: EUT @ 433.92MHz for RF Transmitter

The time of stopping transmission	Limit (s)
0.6121	5.00

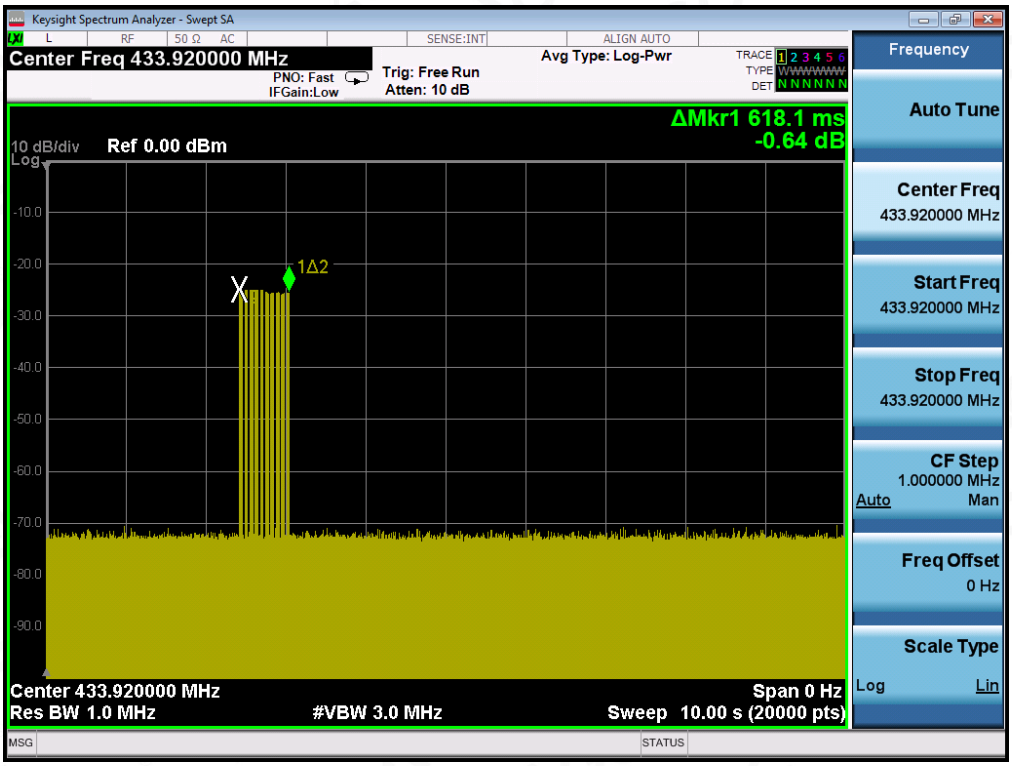


RESULT: PASS

Mode2(Manual operated):

Test Mode: EUT @ 433.92MHz for RF Transmitter

The time of stopping transmission	Limit (s)
0.6181	5.00



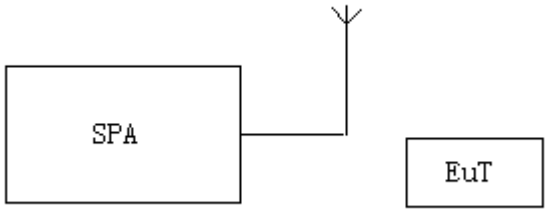
RESULT: PASS

9. DUTY CYCLE CORRECTION FACTOR

9.1 MEASUREMENT PROCEDURE

1. Set the parameters of SPA as below:
   Centre frequency = Operation Frequency
   RBW=1MHz; VBW=3MHz
   Span: 0Hz
   Sweep time: more than two pulse trains or more than each type of pulse occupancy time
2. Set the EUT to transmit by manually operated. Use the “Delta mark” function of SPA to find the period time between two pulse trains and each type of pulse occupancy time.
3. Record the plots and Reported.

9.2 TEST SETUP



9.3 TEST RESULT

Note: The level of the peak emission are less than the average limit, so the average factor need not to be tested.

10. RADIATED EMISSION

10.1. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

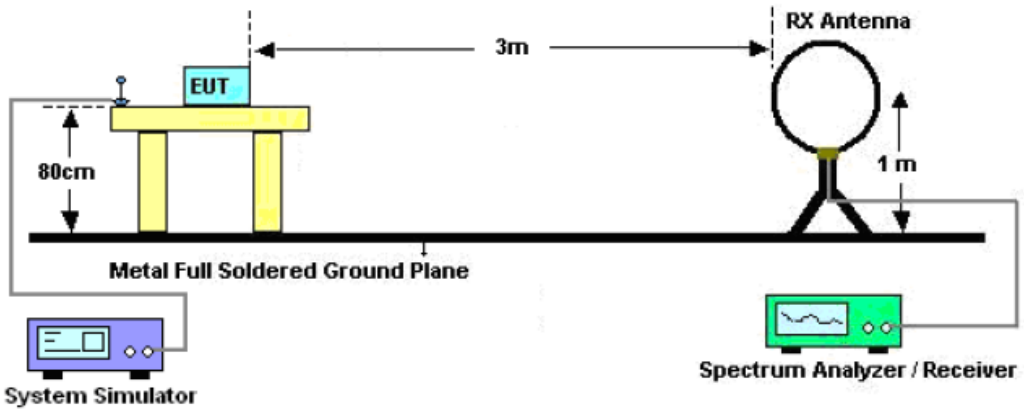
The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RBW 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RBW 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RBW 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz 1MHz/1MHz for Peak, 1MHz/10Hz for Average

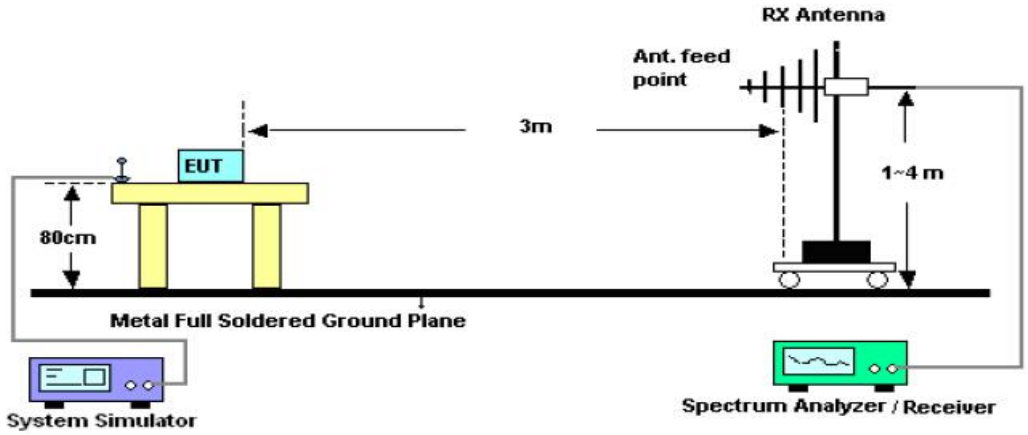
Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RBW 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RBW 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RBW 120KHz for QP

10.2. TEST SETUP

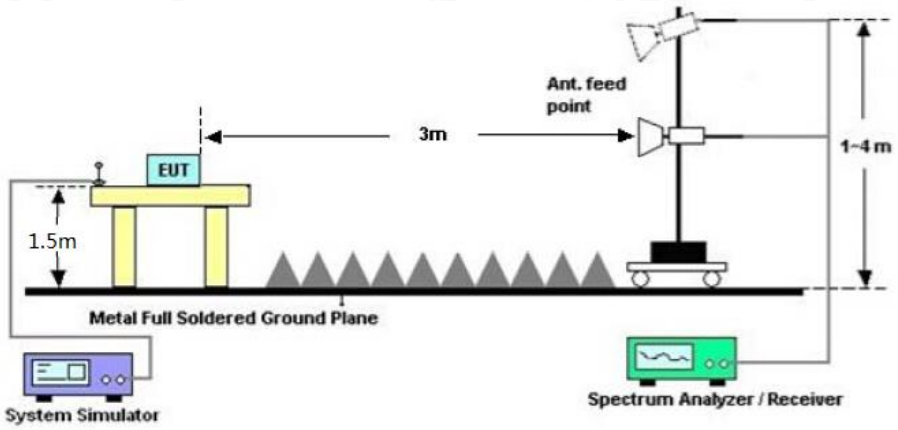
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



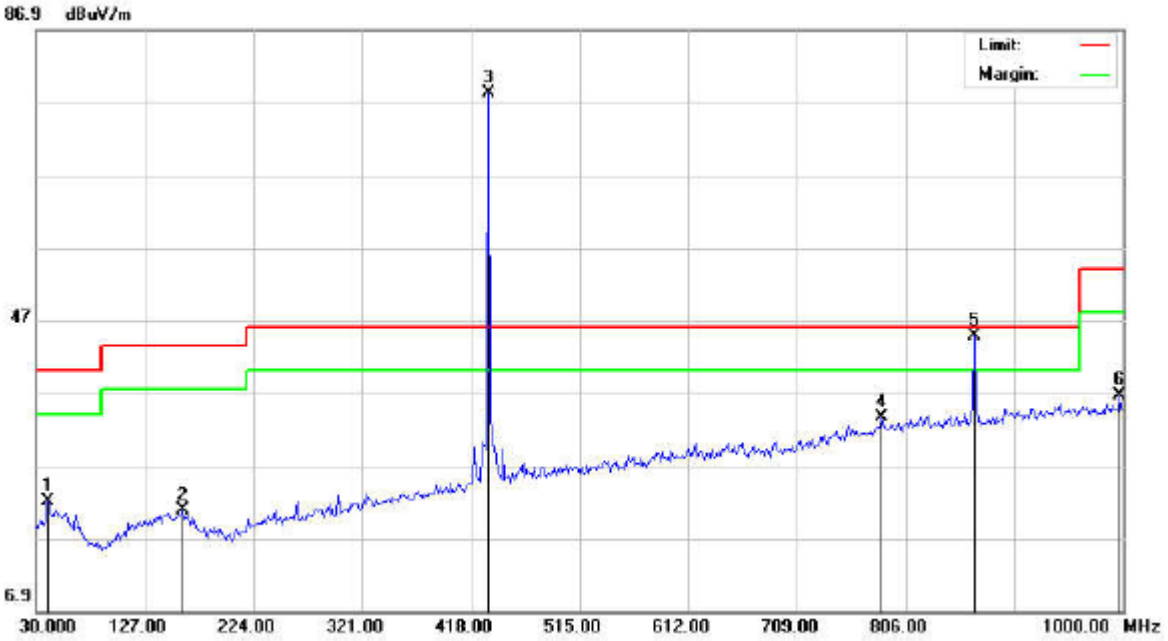
10.3. TEST RESULT

Test Mode: EUT @ 433.92MHz for RF Transmitter

RADIATED EMISSION BELOW 30MHz

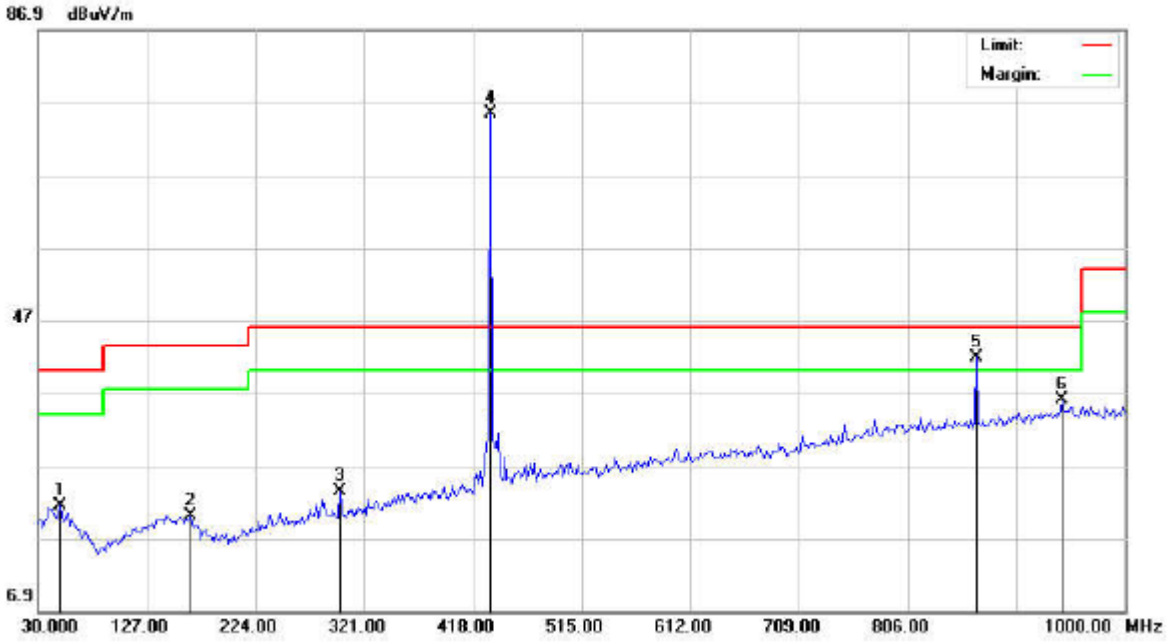
No emission found between lowest internal used/generated frequencies to 30MHz.

RADIATED EMISSION BELOW 1GHZ-Horizontal



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB		cm	degree	
1		41.3166	1.88	20.04	21.92	40.00	-18.08	peak			
2		160.9499	1.79	19.09	20.88	43.50	-22.62	peak			
3	*	433.9200	54.47	23.67	78.14	80.80	-2.66	peak			
4		784.9832	3.58	30.07	33.65	46.00	-12.35	peak			
5	!	867.8400	13.58	31.28	44.86	60.80	-15.94	peak			
6		996.7667	4.03	32.53	36.56	54.00	-17.44	peak			

RADIATED EMISSION BELOW 1GHZ-Vertical



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB		cm	degree	
1		49.4000	1.72	19.75	21.47	40.00	-18.53	peak			
2		165.8000	1.50	18.59	20.09	43.50	-23.41	peak			
3		299.9833	3.84	19.47	23.31	46.00	-22.69	peak			
4	*	433.9200	51.66	23.67	75.33	80.80	-5.47	peak			
5	!	867.8400	10.53	31.28	41.81	60.80	-18.99	peak			
6		943.4166	4.03	32.07	36.10	46.00	-9.90	peak			

RESULT: PASS

Note: 1. Factor=Antenna Factor + Cable loss - Amplifier gain, Margin=Measurement-Limit.

2. The “Factor” value can be calculated automatically by software of measurement system.

3. Emissions of frequency range from 1GHz to 5GHz have 20dB margin. No recording in the test report.

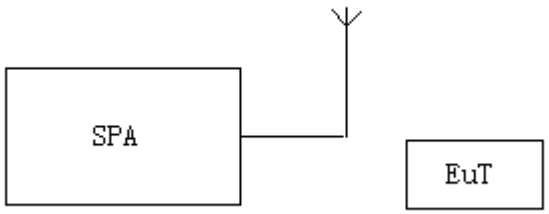
4. All test modes had been tested.The mode 2 was the worst case and record in the test report.

11. BANDWIDTH

11.1. MEASUREMENT PROCEDURE

1. Set the parameters of SPA as below:
   Centre frequency = Operation Frequency
   RBW=10kHz
   VBW=30KHz
   Span: 500kHz
   Sweep time: Auto
2. Set the EUT to continue transmitting mode. Allow the trace to stabilize. Use the “N dB down” function of SPA to define the bandwidth.
3. Record the plots and Reported.

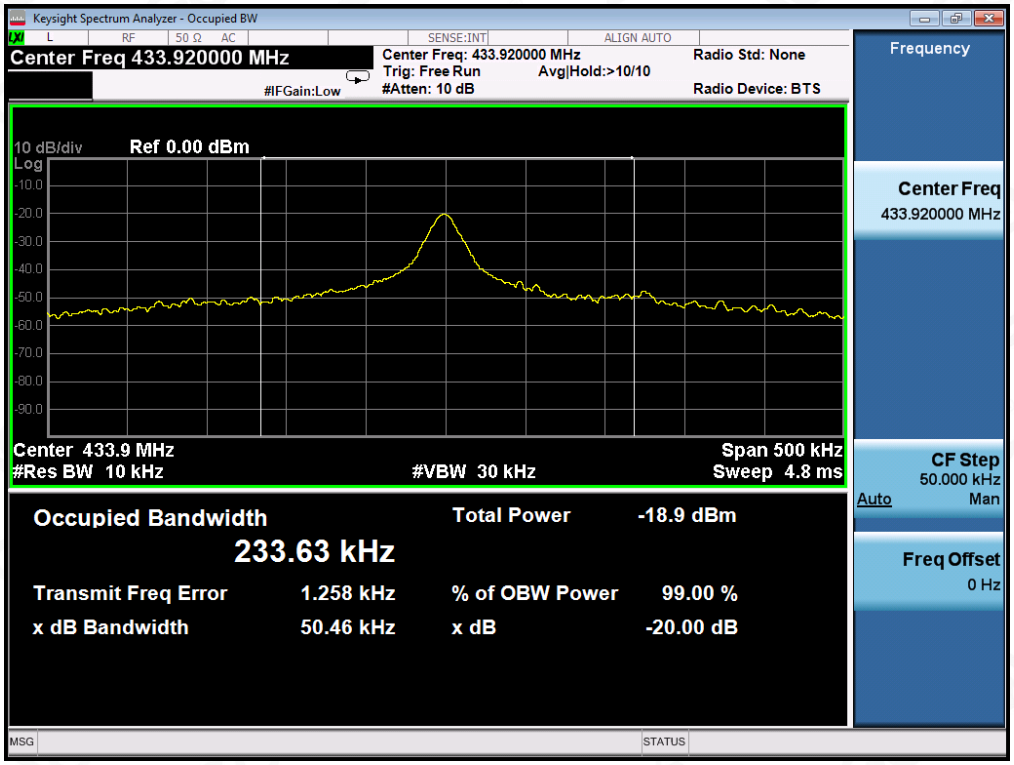
11.2. TEST SETUP



11.3. TEST RESULT

Test Mode: EUT @ 433.92MHz for RF Transmitter

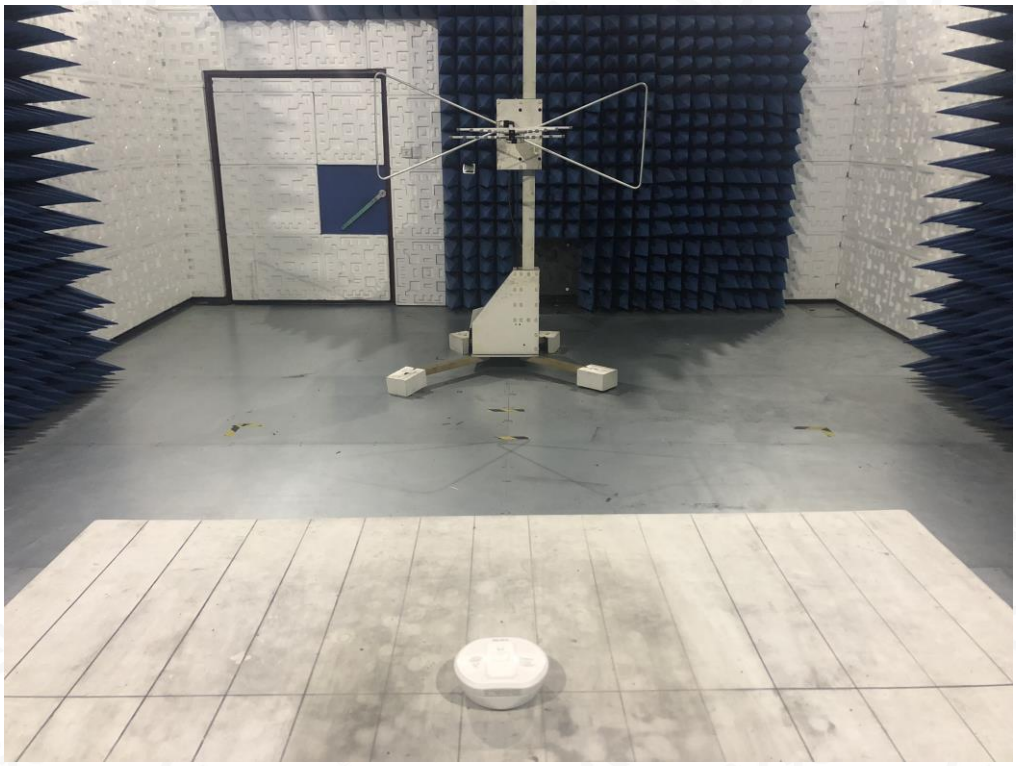
-20dB bandwidth	LIMIT	RESULT
50.46kHz	1085.0KHz	Pass
Note: Limit= Operation Frequency ×0.25%		



Note:All test modes had been tested.The mode 2 was the worst case and record in the test report.

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

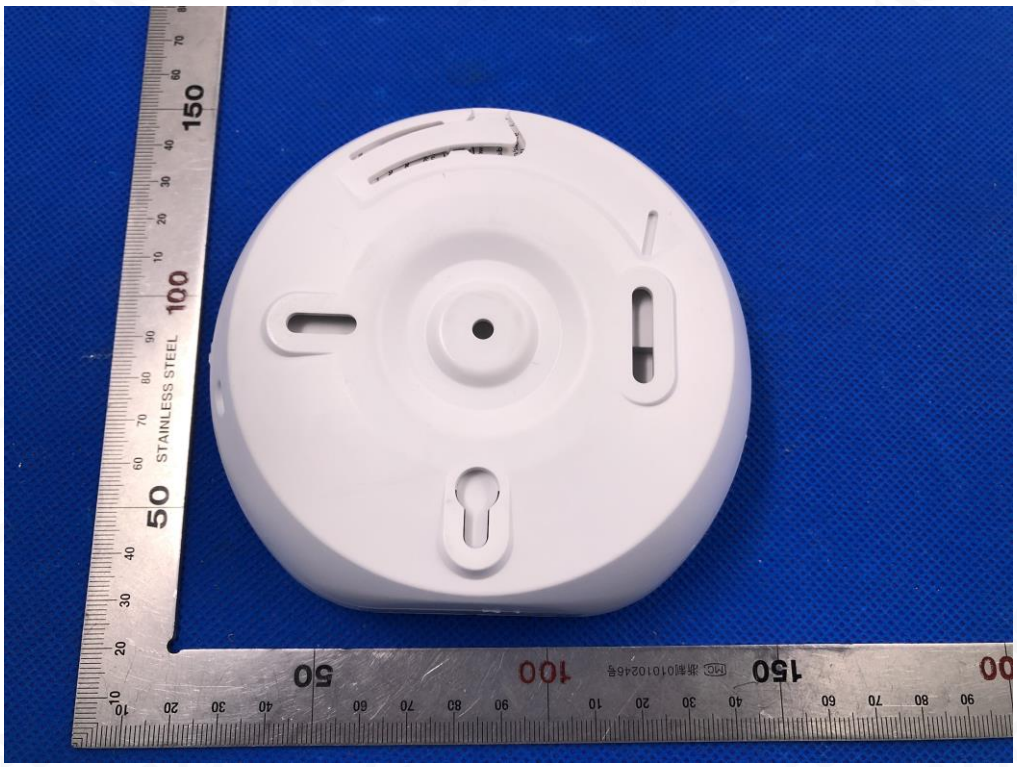
FCC RADIATED EMISSION TEST SETUP



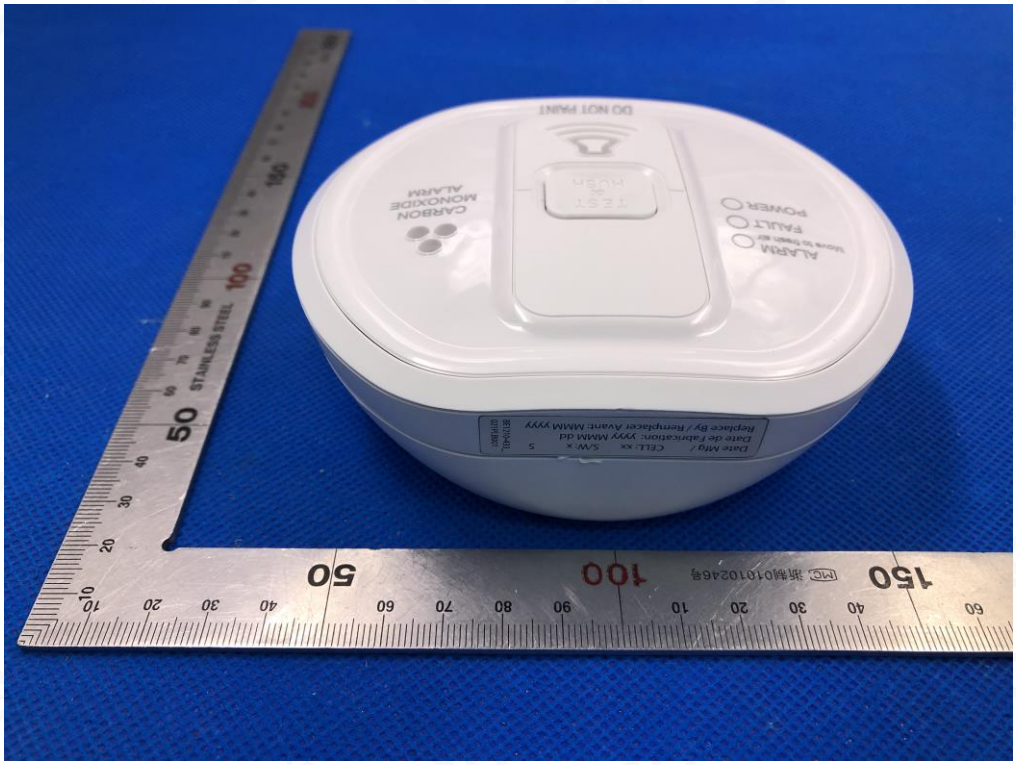
APPENDIX B: PHOTOGRAPHS OF EUT

TOP VIEW OF EUT

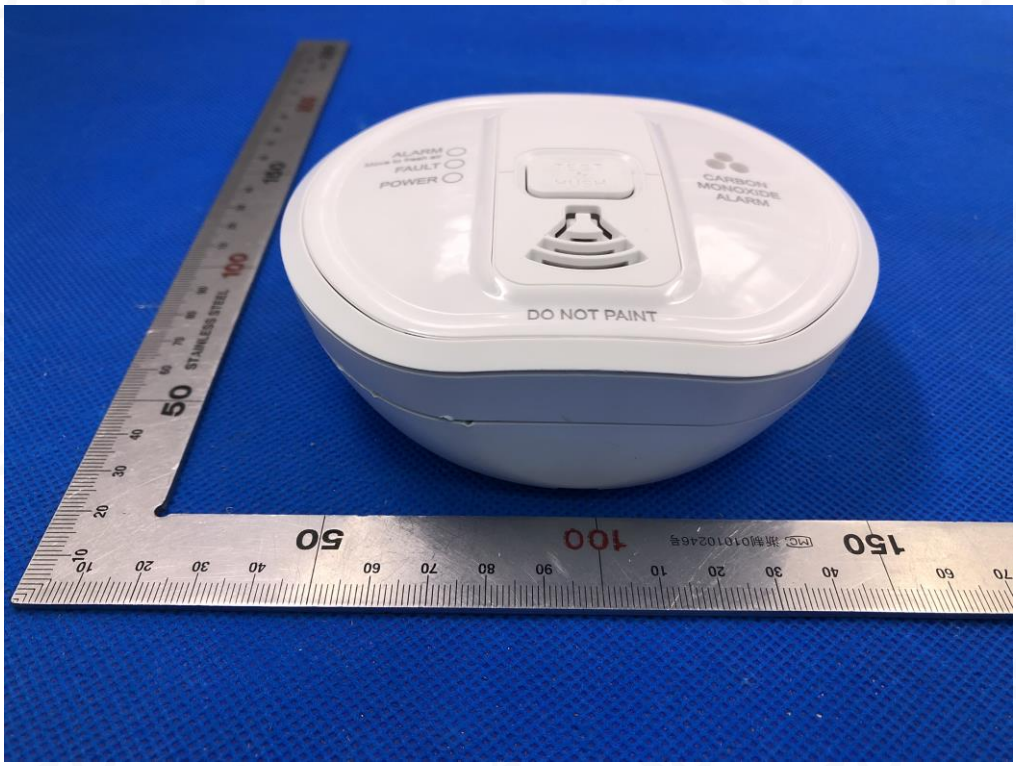
BOTTOM VIEW OF EUT



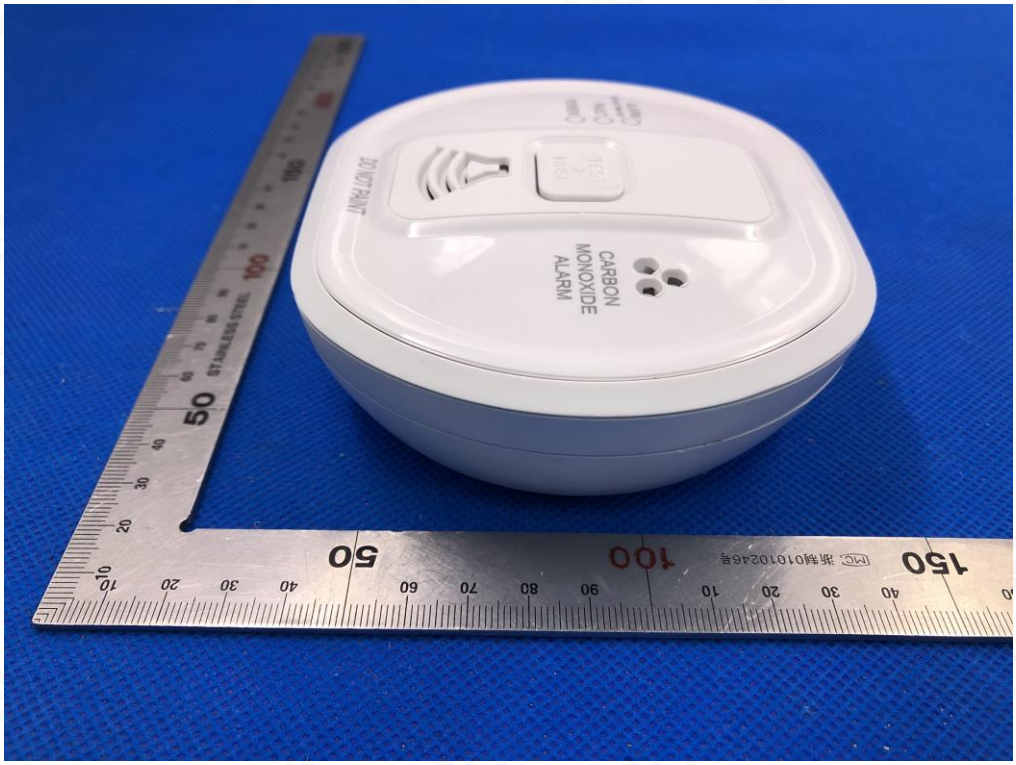
FRONT VIEW OF EUT



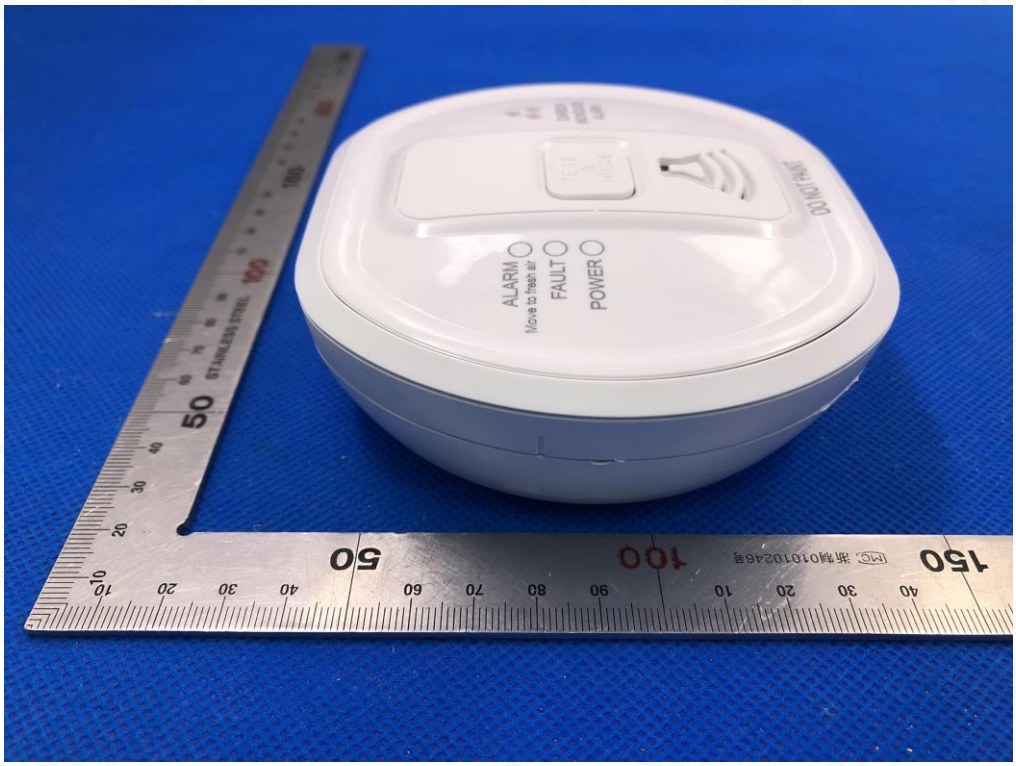
BACK VIEW OF EUT



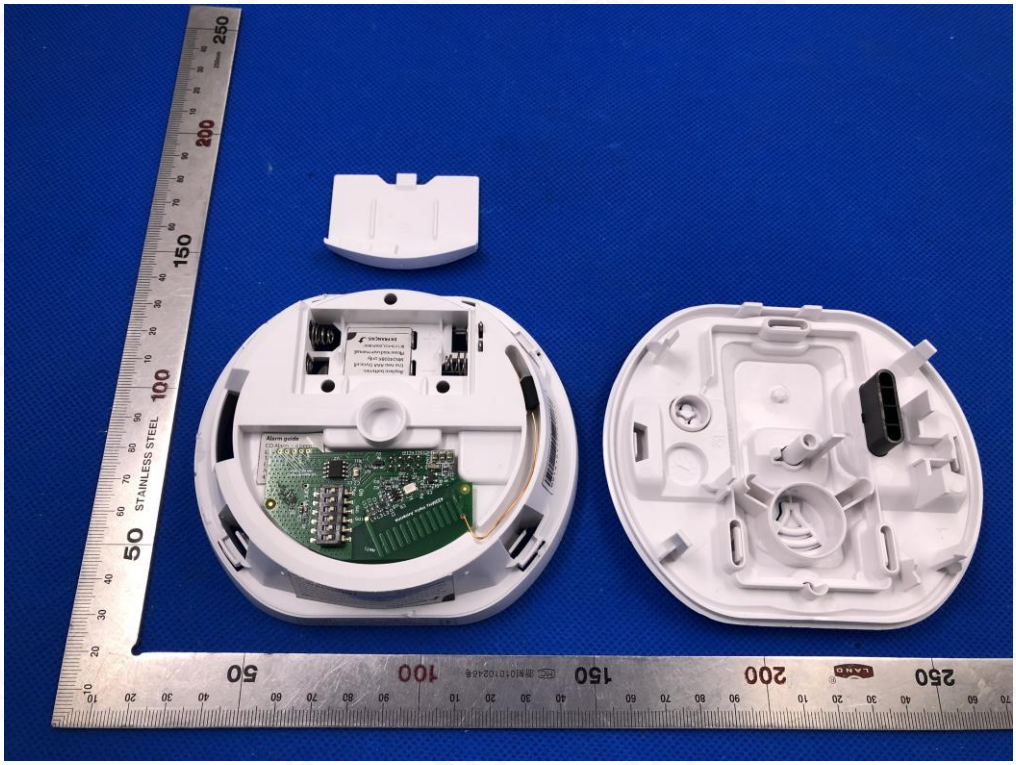
LEFT VIEW OF EUT



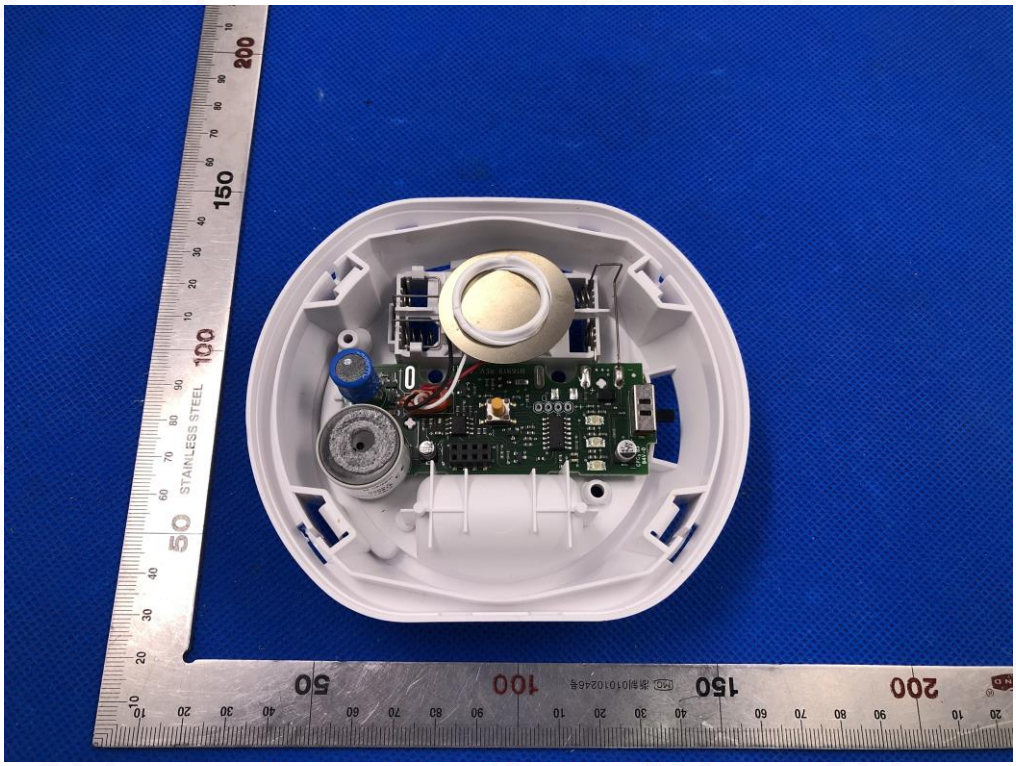
RIGHT VIEW OF EUT



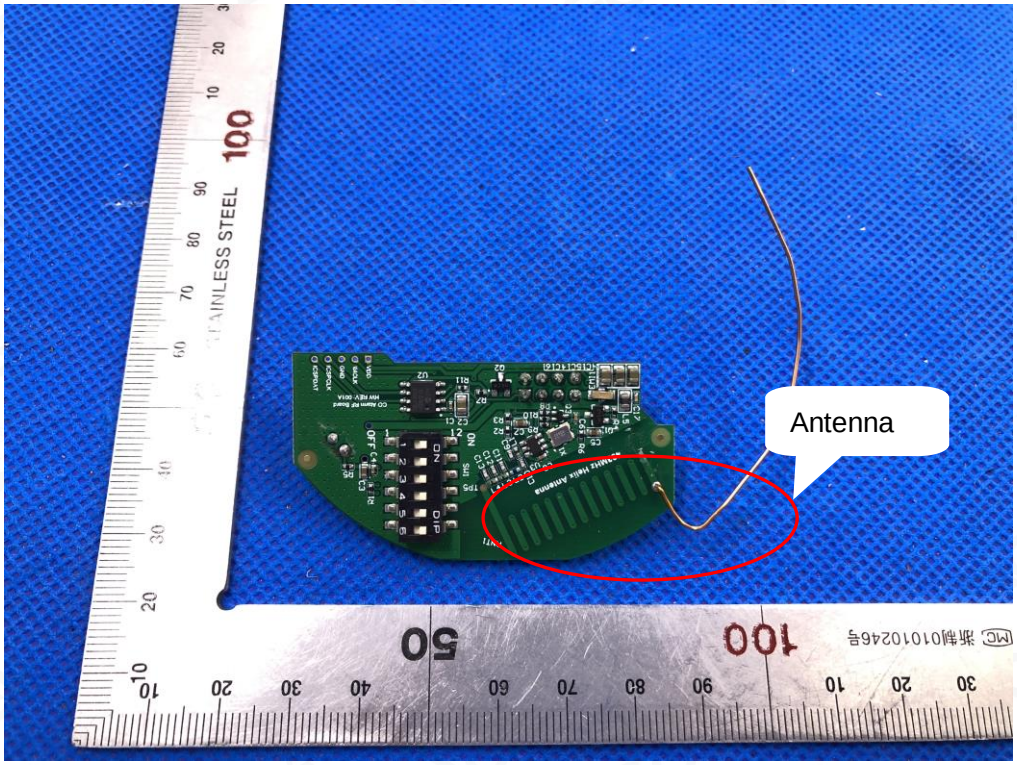
OPEN VIEW OF EUT-1



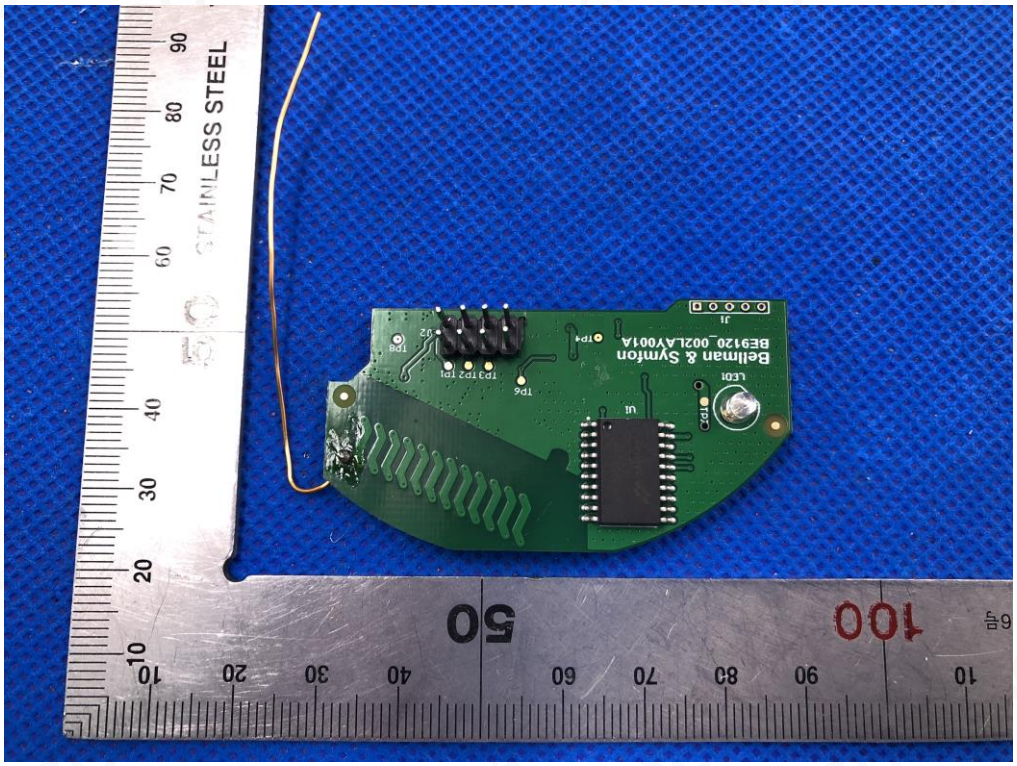
OPEN VIEW OF EUT-2



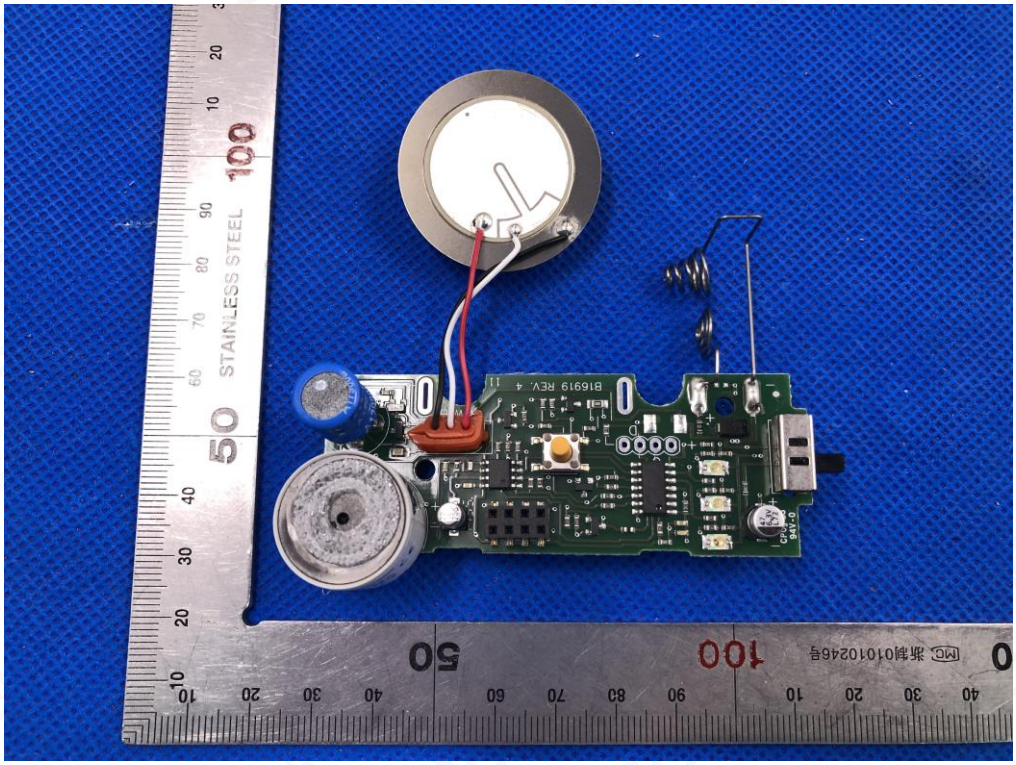
INTERNAL VIEW OF EUT-1



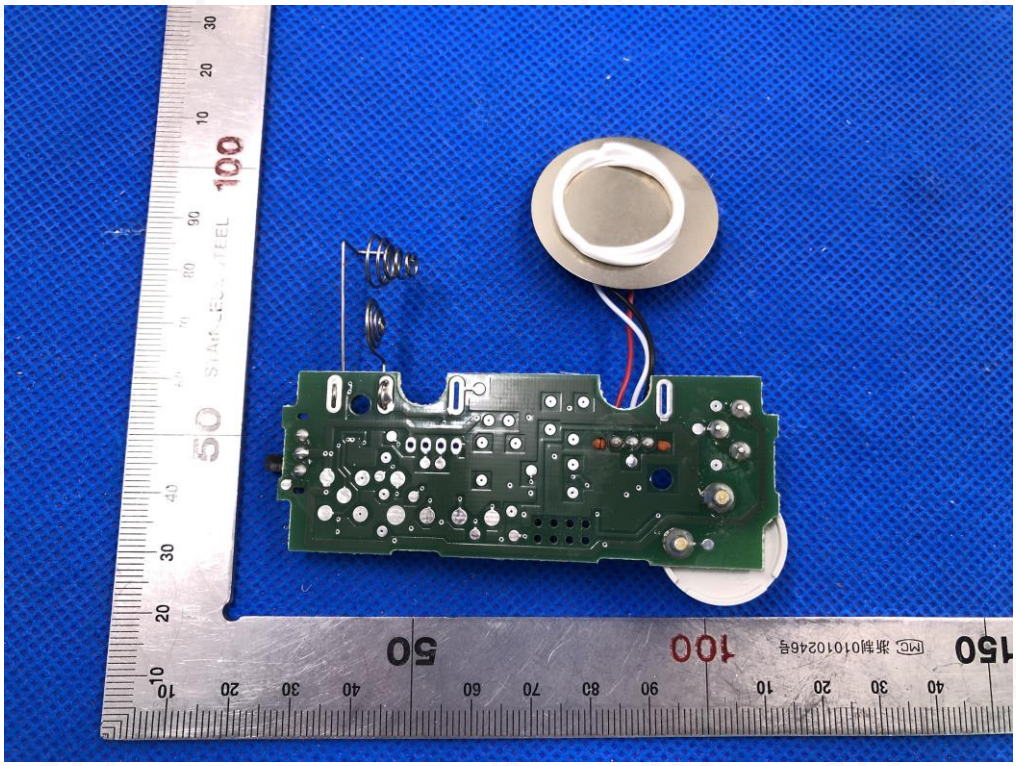
INTERNAL VIEW OF EUT-2



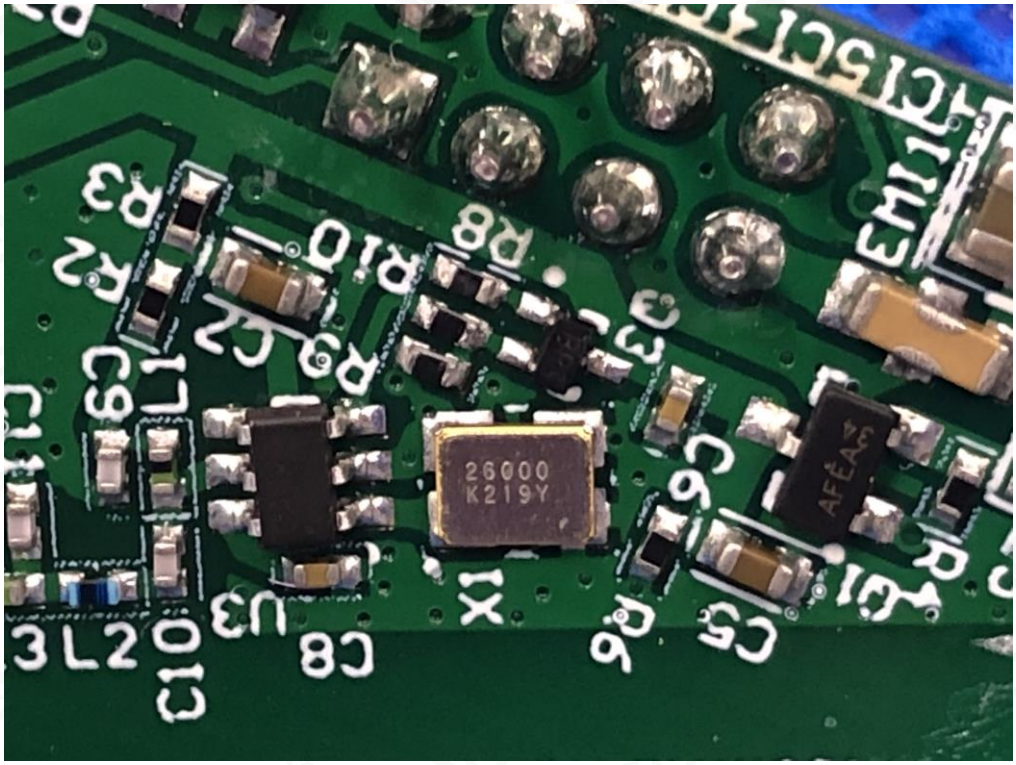
INTERNAL VIEW OF EUT-3



INTERNAL VIEW OF EUT-4



INTERNAL VIEW OF EUT-5



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