




FCC Radio Test Report

FCC ID: 2AU4DDCA

Report No. : TBR-C-202306-0105-3
Applicant : X-Sense Innovations Co., Ltd.
Equipment Under Test (EUT)
EUT Name : Smart Smoke and Carbon Monoxide Alarm Listener with Voice Alerts
Model No. : SAL100
Serial Model No. : ----
Brand Name : X-SENSE
Sample ID : RW-C-202306-0105-2-1#& RW-C-202306-0105-2-2#
Receipt Date : 2023-07-12
Test Date : 2023-07-12 to 2023-07-20
Issue Date : 2023-07-21
Standards : FCC Part 15, Subpart C 15.249
Test Method : ANSI C63.10:2013
Conclusions : **PASS**

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

The EUT technically complies with the FCC requirements

Test/Witness Engineer : 
Seven.wu

Engineer Supervisor : 
Ivan Su

Engineer Manager : 
Ray Lai



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. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

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Revision History

Report No.	Version	Description	Issued Date
TBR-C-202306-0105-3	Rev.01	Initial issue of report	2023-07-21



1. General Information about EUT

1.1 Client Information

Applicant	:	X-Sense Innovations Co., Ltd.
Address	:	B4 503D,Tower B, Kexing Science Park, No15 Keyuan Road, Technology Park Community, Yuehai Avenue, Nanshan District, Shenzhen, China
Manufacturer	:	X-Sense Innovations Co., Ltd.
Address	:	B4 503D,Tower B, Kexing Science Park, No15 Keyuan Road, Technology Park Community, Yuehai Avenue, Nanshan District, Shenzhen, China

1.2 General Description of EUT (Equipment Under Test)

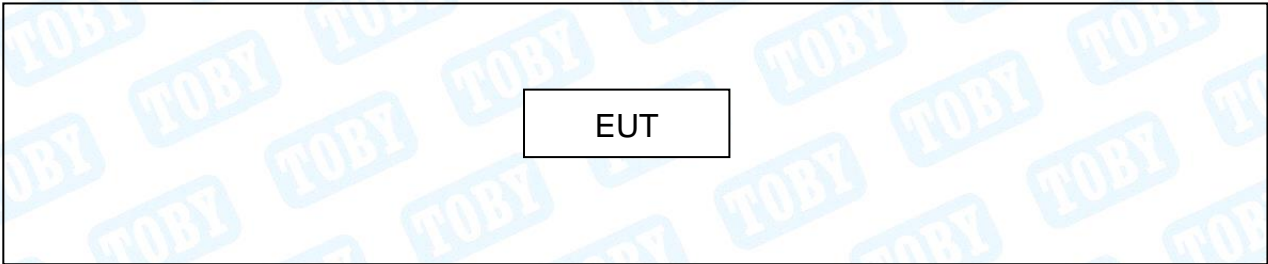
EUT Name	:	Smart Smoke and Carbon Monoxide Alarm Listener with Voice Alerts	
Model(s)	:	SAL100	
Model Difference	:	----	
Product Description	:	Operation Frequency: 912.375MHz	
		Number of Channel:	1 Channel
		Out Power:	77.67dBuV/m@3m Peak
		Antenna Gain:	1dBi spring antenna
		Modulation Type:	FSK
Power Rating	:	LR03AM4 1.5V AAA battery*2, 1200mAh	
Software Version	:	SAL100_V1.0.2	
Hardware Version	:	SAL100_V1.2	
Connecting I/O Port(S)	:	Please refer to the User's Manual	

Note:

- (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



1.3 Block Diagram Showing the Configuration of System Tested



1.4 Description of Support Units

Equipment Information				
Name	Model	FCC ID/SDOC	Manufacturer	Used “√”
----	----	----	----	----
Cable Information				
Number	Shielded Type	Ferrite Core	Length	Note
----	----	----	----	----



1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

For Radiated Test	
Final Test Mode	Description
Mode 1	TX Mode

Note:

For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate.

- (1) According to ANSI C63.10 standards, the measurements are performed at the highest, middle, lowest available channels.
- (2) During the testing procedure, the continuously transmitting with the maximum power mode was programmed by the customer.
- (3) The EUT is considered a Mobile unit; it was pre-tested on the positioned of each 3 axis, X-plane, Y-plane and Z-plane. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.

1.6 Description of Test Software Setting

During testing channel & Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of RF mode.

Test Software Version	Adjust and control the corresponding transmission frequency through the EUT entity key.
Frequency	912.375MHz
FKS	DEF



1.7 Measurement Uncertainty

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

Test Item	Parameters	Expanded Uncertainty (U_{Lab})
Conducted Emission	Level Accuracy: 9kHz~150kHz	± 3.42 dB
	150kHz to 30MHz	± 3.42 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	± 4.60 dB
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	± 4.40 dB
Radiated Emission	Level Accuracy: Above 1000MHz	± 4.20 dB



1.8 Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1/F., Building 6, Rundongsheng Industrial Zone, Longzhu, Xixiang, Bao'an District, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

A2LA Certificate No.: 4750.01

The laboratory has been accredited by American Association for Laboratory Accreditation(A2LA) to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the technical competence in the field of Electrical Testing. And the A2LA Certificate No.: 4750.01.FCC Accredited Test Site Number: 854351. Designation Number: CN1223.

IC Registration No.: (11950A)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A. CAB identifier: CN0056.



2. Test Summary

FCC Part 15 Subpart C(15.249)				
Standard Section	Test Item	Test Sample(s)	Judgment	Remark
FCC				
15.203	Antenna Requirement	RW-C-202306-0105-2-2#	PASS	N/A
15.205	Restricted Bands	RW-C-202306-0105-2-1#	PASS	N/A
15.207	AC Power Conducted Emission	RW-C-202306-0105-2-1#	N/A	N/A
15.249 & 15.209	Radiated Spurious Emission	RW-C-202306-0105-2-2#	PASS	N/A
15.215(C)	20dB Bandwidth	RW-C-202306-0105-2-2#	PASS	N/A
Note: N/A is an abbreviation for Not Applicable.				

3. Test Software

Test Item	Test Software	Manufacturer	Version No.
Conducted Emission	EZ-EMC	EZ	CDI-03A2
Radiation Emission	EZ-EMC	EZ	FA-03A2RE
RF Conducted Measurement	MTS-8310	MWRFTtest	V2.0.0.0
RF Test System	JS1120-3	Tonscend	V3.2.22



4. Test Equipment

Radiation Emission Test					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep.01.2022	Aug. 31, 2023
Spectrum Analyzer	Rohde & Schwarz	FSV40-N	102197	Jun. 20, 2023	Jun. 19, 2024
EMI Test Receiver	Rohde & Schwarz	ESU-8	100472/008	Feb. 23, 2023	Feb. 22, 2024
Bilog Antenna	SCHWARZBECK	VULB 9168	1225	Dec. 05, 2021	Dec. 04, 2023
Horn Antenna	SCHWARZBECK	BBHA 9120 D	2463	Feb. 26, 2022	Feb.25, 2024
Horn Antenna	SCHWARZBECK	BBHA 9170	1118	Jun. 26, 2022	Jun.25, 2024
Loop Antenna	SCHWARZBECK	FMZB 1519 B	1519B-059	Jun. 26, 2022	Jun.25, 2024
HF Amplifier	Tonscend	TAP9E6343	AP21C806117	Sep.01.2022	Aug. 31, 2023
HF Amplifier	Tonscend	TAP051845	AP21C806141	Sep.01.2022	Aug. 31, 2023
HF Amplifier	Tonscend	TAP0184050	AP21C806129	Sep.01.2022	Aug. 31, 2023
Highpass Filter	CD	HPM-6.4/18G	---	N/A	N/A
Highpass Filter	CD	HPM-2.8/18G	---	N/A	N/A
Highpass Filter	XINBO	XBLBQ-HTA67(8-25G)	22052702-1	N/A	N/A
Antenna Conducted Emission					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jun. 20, 2023	Jun. 19, 2024
Spectrum Analyzer	Rohde & Schwarz	FSV40-N	102197	Jun. 20, 2023	Jun. 19, 2024
MXA Signal Analyzer	KEYSIGHT	N9020B	MY60110172	Sep.01.2022	Aug. 31, 2023
MXA Signal Analyzer	Agilent	N9020A	MY47380425	Sep.01.2022	Aug. 31, 2023
Vector Signal Generator	Agilent	N5182A	MY50141294	Sep.01.2022	Aug. 31, 2023
Analog Signal Generator	Agilent	N5181A	MY48180463	Sep.01.2022	Aug. 31, 2023
Vector Signal Generator	KEYSIGHT	N5182B	MY59101429	Sep.01.2022	Aug. 31, 2023
Analog Signal Generator	KEYSIGHT	N5173B	MY61252685	Sep.01.2022	Aug. 31, 2023
RF Control Unit	Tonsced	JS0806-1	21C8060380	N/A	N/A
RF Control Unit	Tonsced	JS0806-2	21F8060439	Sep.01.2022	Aug. 31, 2023
Band Reject Filter Group	Tonsced	JS0806-F	21D8060414	Jun. 20, 2023	Jun. 19, 2024
Power Control Box	Tonsced	JS0806-4ADC	21C8060387	N/A	N/A
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	144382	Sep.01.2022	Aug. 31, 2023
Universal Radio Communication Tester	Rohde&Schwarz	CMW500	168796	Feb. 23, 2023	Feb.22, 2024
Temperature and Humidity Chamber	ZhengHang	ZH-QTH-1500	ZH2107264	Jun. 20, 2023	Jun. 19, 2024



5. Conducted Emission Test

4.1 Test Standard and Limit

4.1.1 Test Standard

FCC Part 15.207

4.1.2 Test Limit

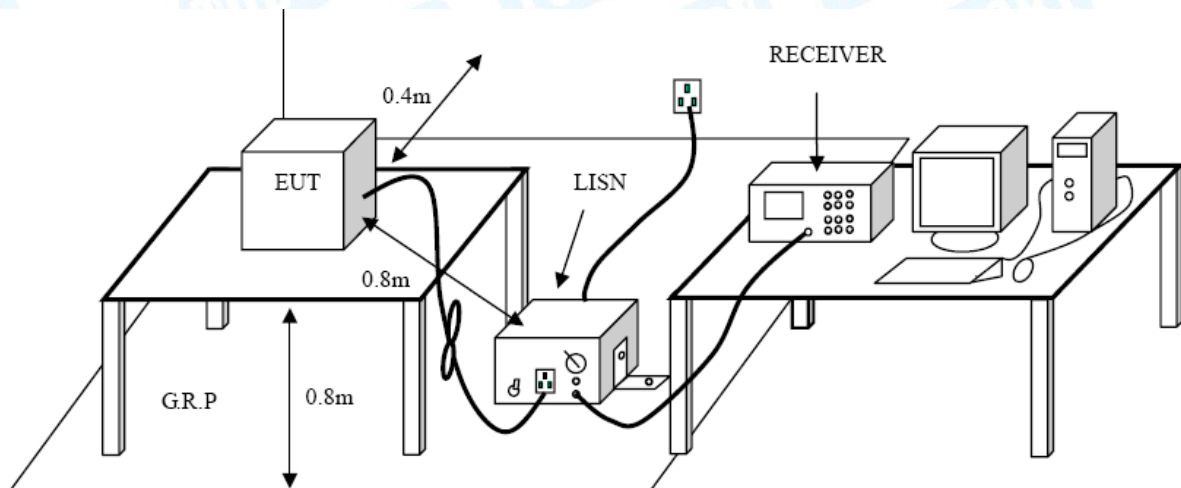
Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dB μ V)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Notes:

- (1) *Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2 Test Setup



4.3 Test Procedure

The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back



and forth in the center forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

LISN is at least 80 cm from nearest part of EUT chassis.

The bandwidth of EMI test receiver is set at 9kHz, and the test frequency band is from 0.15MHz to 30MHz.

4.4 EUT Operating Mode

Please refer to the description of test mode.

4.5 Test Data

Not Applicable.



6. Radiated Emission Test

5.1 Test Standard and Limit

5.1.1 Test Standard

FCC Part 15.209

5.1.2 Test Limit

Radiated Emission Limit (9kHz~1000MHz)

Frequency (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Radiated Emission Limit (Above 1000MHz)

Frequency (MHz)	Distance Meters (at 3m)	
	Peak	Average
Above 1000	74	54

Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission Level(dBuV/m)=20log Emission Level(Uv/m)

Limits of radiated emission measurement (15.249)

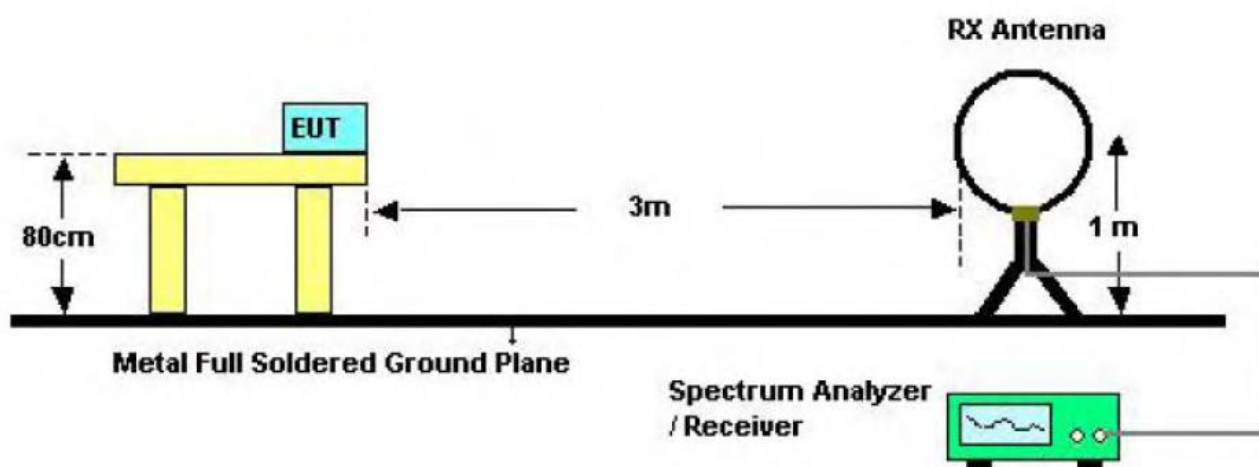
FCC Part 15 (15.249), Subpart C	
Limit	Frequency Range (MHz)
Field strength of fundamental 50000 μ V/m (94 dB μ V/m) @ 3 m	902~928
Field strength of fundamental 500 μ V/m (54 dB μ V/m) @ 3 m	Below 902 and Above 928



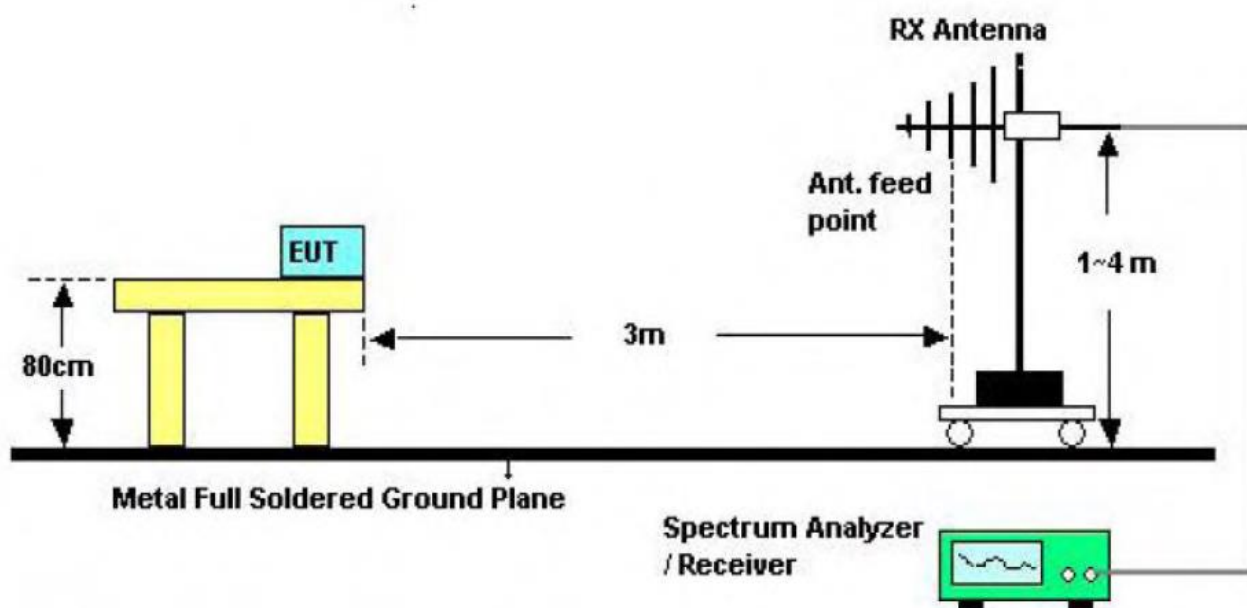
Restricted bands requirement for equipment operating in 902MHz to 928 MHz (15.249)

Restricted Frequency Band (MHz)	(dBuV/m)(at 3 M)
902~928	Attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in 15.209, whichever is the lesser attenuation

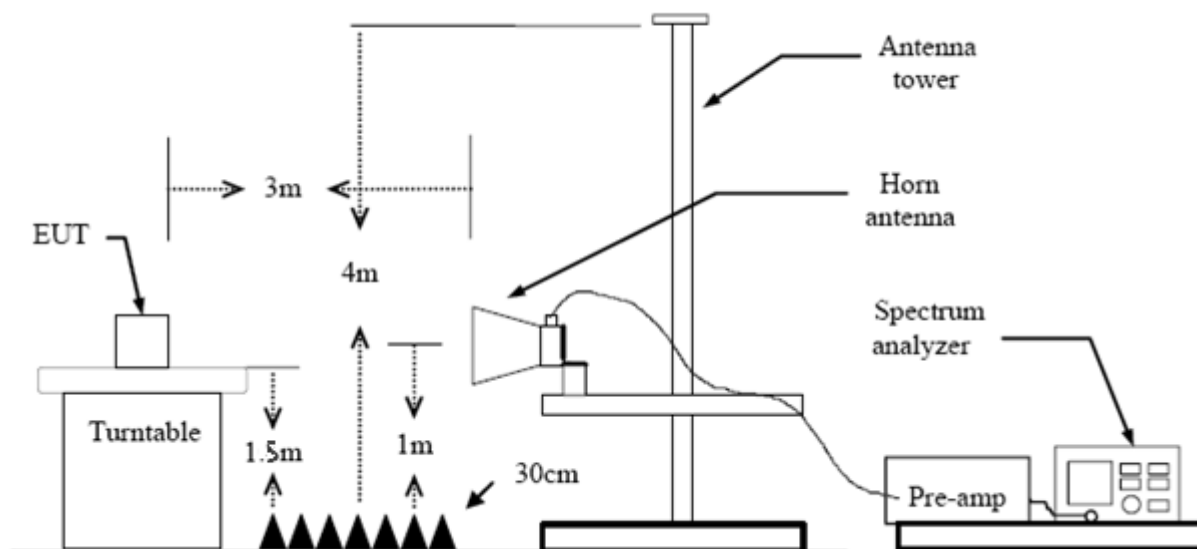
5.2 Test Setup



Below 30MHz Test Setup



Bellow 1000MHz Test Setup



Above 1GHz Test Setup

5.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency Below 1GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- (3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (4) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.



(8) For the actual test configuration, please see the test setup photo.

5.4 EUT Operating Condition

The EUT was set to Continual Transmitting in maximum power, and new batteries are used during testing.

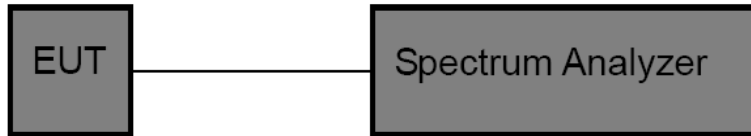
5.5 Test Data

Please refer to the Attachment A.



7. Bandwidth Test

6.1 Test Setup



6.2 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:
Bandwidth: RBW=100 kHz, VBW=300kHz.
- (3) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst –case (i.e the widest) bandwidth.

6.3 EUT Operating Condition

The EUT was set to continuously transmitting for the Bandwidth Test.

6.4 Test Data

Please refer to the Attachment B.



8. Antenna Requirement

7.1 Standard Requirement

7.1.1 Standard

FCC Part 15.203

7.1.2 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 shall be considered sufficient to comply with the provisions of this Section. 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.

7.2 Antenna Connected Construction

The gains of the antenna used for transmitting is 1dBi, and the antenna de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

7.3 Result

The EUT antenna is spring antenna Antenna. It complies with the standard requirement.

Antenna Type	
<input checked="" type="checkbox"/>	Permanent attached antenna
<input type="checkbox"/>	Unique connector antenna
<input type="checkbox"/>	Professional installation antenna



Attachment A-- Radiated Emission Test Data

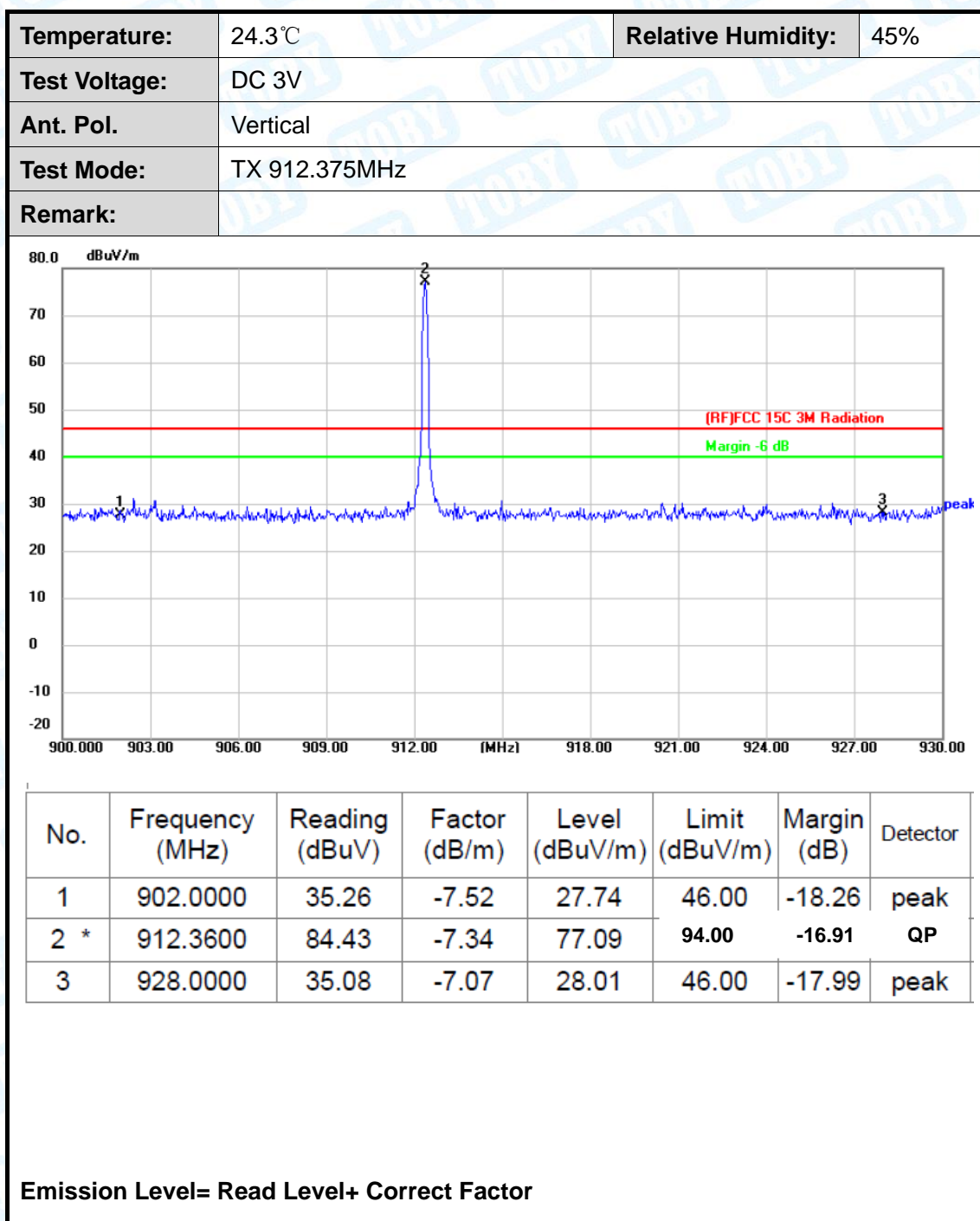
Field Strength of the Fundamental

Temperature:	24.3°C	Relative Humidity:	45%
Test Voltage:	DC 3V		
Ant. Pol.	Horizontal		
Test Mode:	TX 912.375MHz		
Remark:			

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	902.0000	35.57	-7.52	28.05	46.00	-17.95	peak
2 *	912.3600	85.01	-7.34	77.67	94.00	-16.33	QP
3	928.0000	34.48	-7.07	27.41	46.00	-18.59	peak

Emission Level= Read Level+ Correct Factor





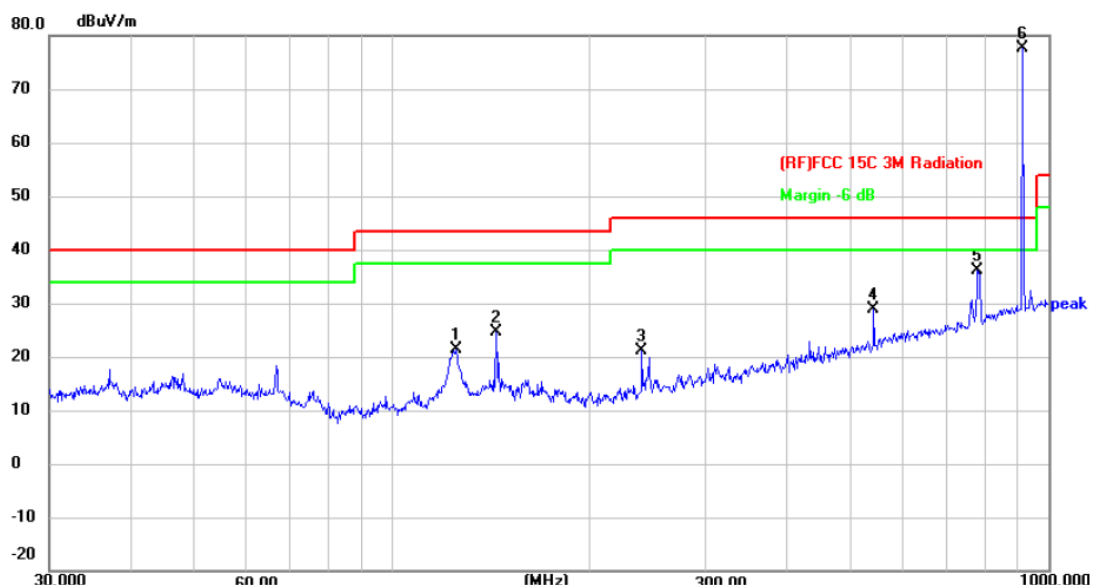
Radiated Spurious Emission (9 KHz~30 MHz)

From 9 KHz to 30 MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Radiated Spurious Emission (Below 1 GHz)

Temperature:	24.3℃	Relative Humidity:	45%
Test Voltage:	DC 3V		
Ant. Pol.	Horizontal		
Test Mode:	TX 912.375MHz		
Remark:	Only worse case is reported		

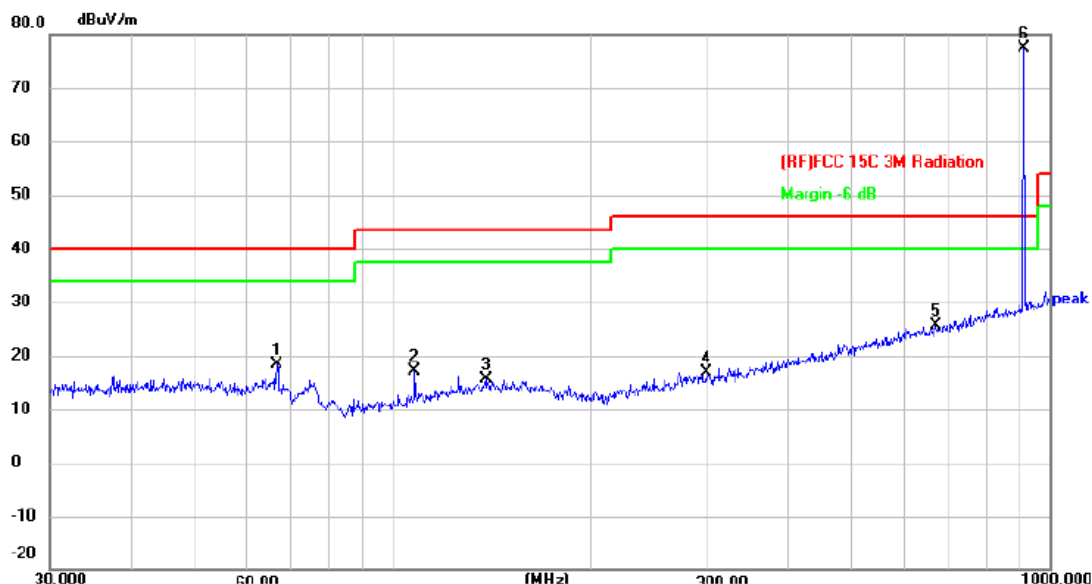


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	125.0066	44.93	-23.52	21.41	43.50	-22.09	peak
2	143.8295	47.19	-22.58	24.61	43.50	-18.89	peak
3	239.9874	43.99	-22.91	21.08	46.00	-24.92	peak
4	541.3725	43.10	-14.32	28.78	46.00	-17.22	peak
5	779.6068	45.58	-9.50	36.08	46.00	-9.92	peak
6 *	912.8620	84.98	-7.34	77.64	94.00	-16.36	QP

Emission Level= Read Level+ Correct Factor



Temperature:	24.3°C	Relative Humidity:	45%
Test Voltage:	DC 3V		
Ant. Pol.	Vertical		
Test Mode:	TX 912.375MHz		
Remark:	Only worse case is reported		



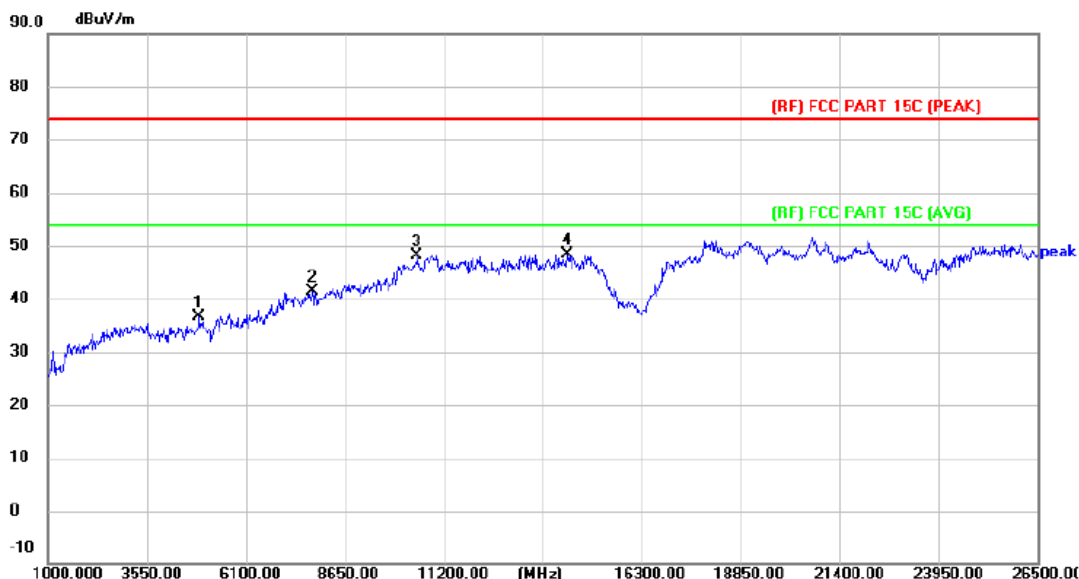
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	66.4989	42.45	-24.15	18.30	40.00	-21.70	peak
2	107.8877	42.05	-24.93	17.12	43.50	-26.38	peak
3	138.3873	38.33	-22.77	15.56	43.50	-27.94	peak
4	300.3672	37.66	-20.84	16.82	46.00	-29.18	peak
5	670.4893	37.40	-11.72	25.68	46.00	-20.32	peak
6 *	912.8620	84.78	-7.34	77.44	94.00	-16.56	QP

Emission Level= Read Level+ Correct Factor



Radiated Spurious Emission (Above 1 GHz)

Temperature:	26°C	Relative Humidity:	54%
Test Voltage:	DC 3V		
Ant. Pol.	Horizontal		
Test Mode:	TX 912.375MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



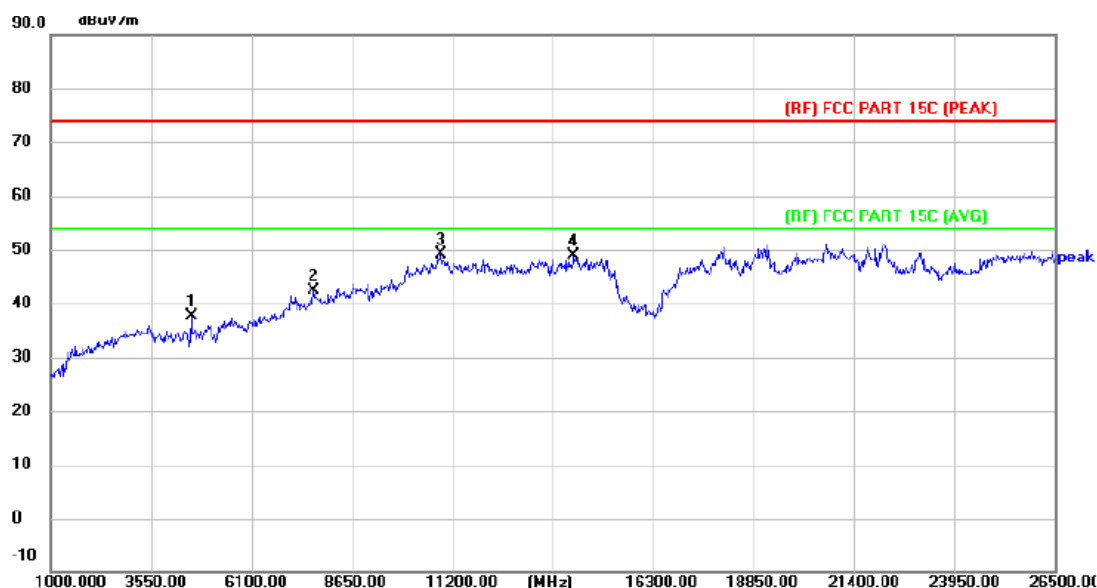
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4901.500	50.41	-13.85	36.56	74.00	-37.44	peak
2	7808.500	48.22	-6.87	41.35	74.00	-32.65	peak
3	10511.500	45.78	2.44	48.22	74.00	-25.78	peak
4 *	14362.000	41.69	6.73	48.42	74.00	-25.58	peak

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. Peak/AVG (dBμV/m) = Corr. (dB/m) + Read Level (dBμV)
3. Margin (dB) = Peak/AVG (dBμV/m) - Limit PK/AVG (dBμV/m)
4. The tests evaluated 1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
5. No report for the emission which more than 20dB below the prescribed limit.
6. The peak value < average limit, So only show the peak value.



Temperature:	26°C	Relative Humidity:	54%
Test Voltage:	DC 3V		
Ant. Pol.	Vertical		
Test Mode:	TX 912.375MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



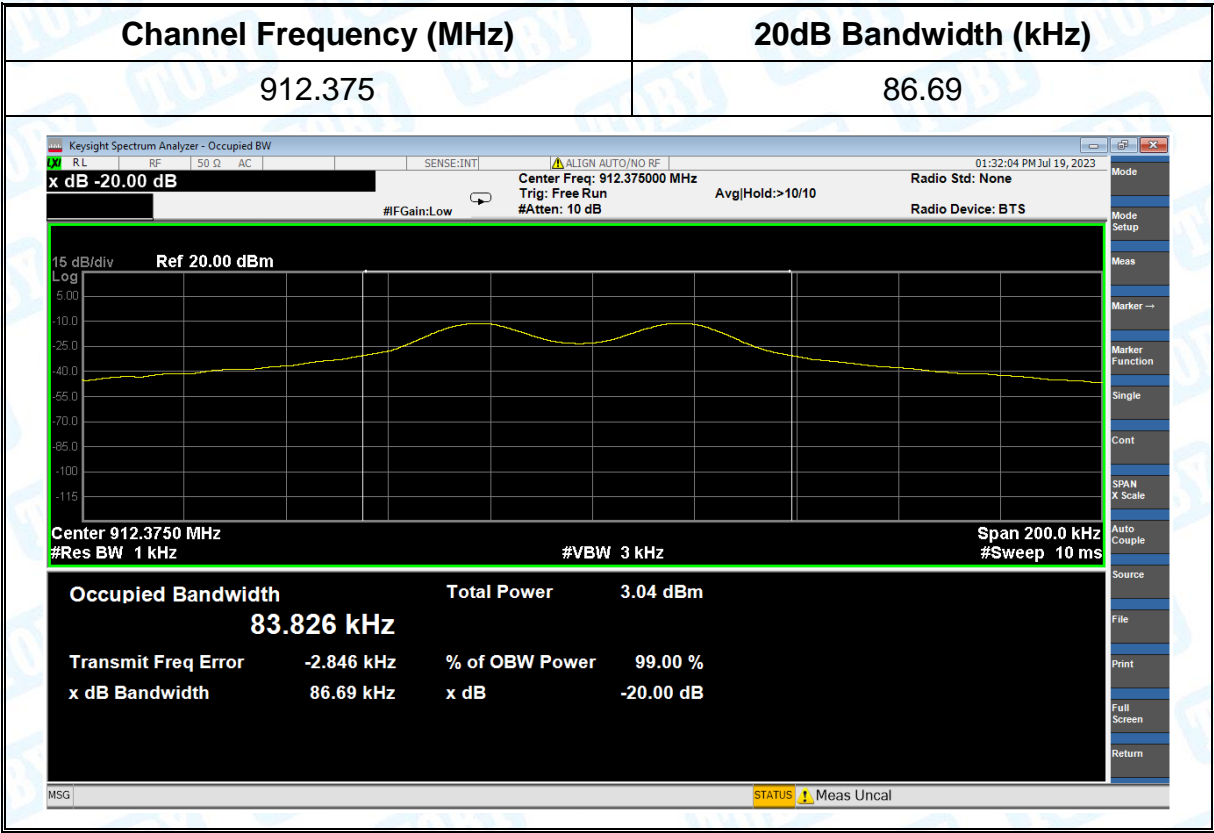
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4570.000	52.60	-15.05	37.55	74.00	-36.45	peak
2	7681.000	49.45	-7.07	42.38	74.00	-31.62	peak
3 *	10894.000	44.94	4.20	49.14	74.00	-24.86	peak
4	14285.500	42.47	6.30	48.77	74.00	-25.23	peak

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. Peak/AVG (dBμV/m) = Corr. (dB/m) + Read Level (dBμV)
3. Margin (dB) = Peak/AVG (dBμV/m) - Limit PK/AVG (dBμV/m)
4. The tests evaluated 1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
5. No report for the emission which more than 20dB below the prescribed limit.
6. The peak value < average limit, So only show the peak value.



Attachment B--Bandwidth Test Data



-----END OF THE REPORT-----

