TEST REPORT

Product	:	Intelligent Automotive Detection Tool
Trade mark	:	SmartSafe
Model/Type reference	:	iSmartTool 601Max, iSmartTool 601, iSmartTool 601BT, iSmartTool 601TT
Serial Number	:	N/A
Report Number	:	EED32N80831504
FCC ID	:	2AYANISMARTTOOL
Date of Issue	:	Oct. 25, 2021
Test Standards	:	47 CFR Part 15 Subpart C
Test result	:	PASS

Prepared for:

SHENZHEN SMARTSAFE TECH CO., LTD.
3F, Building B, Qiao'an Technology Industrial Park, Guanlan, Longhua New District, Shenzhen, China

Prepared by:

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Compiled by:	Frazer Li	Reviewed by:	Aaron Ma
Approved by:	David Wang	Date:	Oct. 25, 2021

Check No.:2230060921

1 Version

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

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15 Subpart C Section 15.203	ANSI C63.10:2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10:2013	PASS
Radiated Spurious Emissions	47 CFR Part 15 Subpart C Section 15.209	ANSI C63.10:2013	PASS
20dB Bandwidth	47 CFR Part 15 Subpart C Section 2.1049	ANSI C63.10:2013	PASS

Remark:
1.Company Name and Address shown on Report, the sample(s) and sample Information were provided by the applicant who should be responsible for the authenticity which CTI hasn't verified.
2.Model No.: iSmartTool 601Max,iSmartTool 601,iSmartTool 601BT,iSmartTool 601TT
Only the model iSmartTool 601Max was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being software, and model name.

3 Contents

4 General Information

4.1 Client Information

Applicant:	SHENZHEN SMARTSAFE TECH CO., LTD.
Address of Applicant:	3F, Building B, Qiao'an Technology Industrial Park, Guanlan, Longhua New District, Shenzhen, China
Manufacturer:	SHENZHEN SMARTSAFE TECH CO., LTD.
Address of Manufacturer:	3F, Building B, Qiao'an Technology Industrial Park, Guanlan, Longhua New District, Shenzhen, China
Factory:	SHENZHEN SMARTSAFE TECH CO., LTD.
Address of Factory:	3F, Building B, Qiao'an Technology Industrial Park, Guanlan, Longhua New District, Shenzhen, China

4.2 General Description of EUT

Product Name:	Intelligent Automotive Detection Tool	
Model No.(EUT):	iSmartTool 601Max	
Add Model No.:	iSmartTool 601, iSmartTool 601BT, iSmartTool 601TT	
Trade Mark:	SmartSafe	
Product Type:	☐ Mobile ☒ Portable ☐ Fix Location	
Frequency Range:	125kHz	
Modulation Type:	ASK	
Number of Channels:	1	
Antenna Type:	Internal antenna	
Antenna Gain:	0dBi	
Power Supply:	AC Adapter	Model:C1902XZ/C1902XA/C1902XJ Input:100-240V~50/60Hz 0.5A Output:PD:5.0V,3.0A/9.0V,2.22A/12.0V,1.67A MAX:20.0W
	Rechargeable lithium ion battery	Model:KPL3878100-2S1P DC 7.6V,4500mAh,34.2Wh
Test voltage:	Rechargeable lithium ion battery DC 7.6V	
Sample Received Date:	Sep. 06, 2021	
Sample tested Date:	Sep. 06, 2021 to Oct. 25, 2021	

4.3 Test Environment and Mode

Operating Environment:	
Radiated Spurious Emissions:	
Temperature:	22~25.0 °C
Humidity:	50~55 % RH
Atmospheric Pressure:	1010mbar
Conducted Emissions:	
Temperature:	22~25.0 °C
Humidity:	50~55 % RH
Atmospheric Pressure:	1010mbar
RF Conducted:	
Temperature:	22~25.0 °C
Humidity:	50~55 % RH
Atmospheric Pressure:	1010mbar
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with modulation.

4.4 Description of Support Units

The EUT has been tested with associated equipment below.

1）support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
Sensor	SHENZHEN SMARTSAFE TECH CO., LTD.	LTR-01	CE&FCC	Client

4.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd

Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China

Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385

No tests were sub-contracted.

FCC Designation No.: CN1164

4.6 Deviation from Standards

None.

4.7 Abnormalities from Standard Conditions

None.

4.8 Other Information Requested by the Customer

None.

4.9 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9×10^{-8}
2	RF power, conducted	0.46dB (30MHz-1GHz)
		0.55dB (1GHz-18GHz)
3	Radiated Spurious emission test	3.3dB (9kHz-30MHz)
		4.3dB (30MHz-1GHz)
		4.5dB (1GHz-12.75GHz)
4	Conduction emission	3.5dB (9kHz to 150kHz)
		3.1dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	3.8%
7	DC power voltages	0.026%

5 Equipment List

RF test system					
Equipment	**Manufacturer**	**Mode No.**	**Serial Number**	**Cal. Date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Spectrum Analyzer	R&S	FSV40	101200	08-26-2021	08-25-2022

3M Semi/full-anechoic Chamber					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
3M Chamber & Accessory Equipment	TDK	SAC-3	---	05-24-2019	05-23-2022
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-618	05-16-2021	05-15-2022
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-076	04-15-2021	04-14-2024
Receiver	R&S	ESCI7	100938-003	10-16-2020 10-15-2021	10-15-2021 10-14-2022
Multi device Controller	maturo	NCD/070/107 11112	---	---	---
Temperature/ Humidity Indicator	Shanghai qixiang	HM10	1804298	06-24-2021	06-23-2022
Communication test set	Agilent	E5515C	GB4705053 4	03-01-2019	02-28-2022
Cable line	Fulai(7M)	SF106	5219/6A	---	---
Cable line	Fulai(6M)	SF106	5220/6A	---	---
Cable line	Fulai(3M)	SF106	5216/6A	---	---
Cable line	Fulai(3M)	SF106	5217/6A	---	---
band rejection filter	Sinoscite	FL5CX01CA 08CL12-0393-001	---	---	---

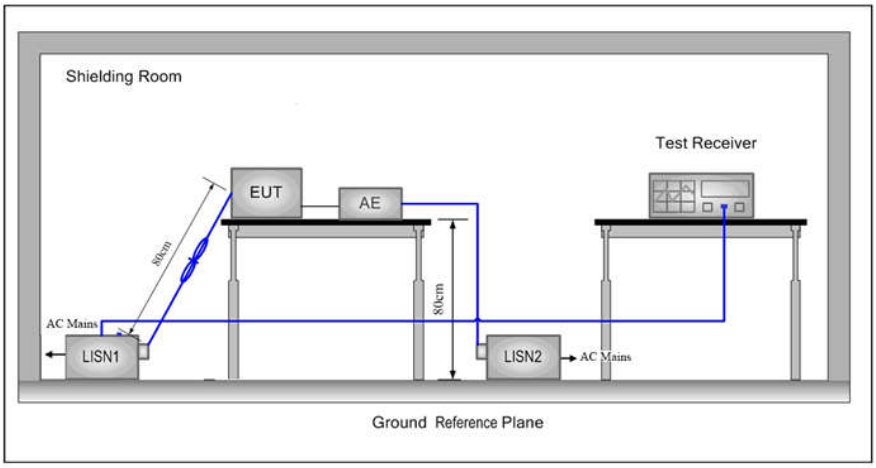
Conducted disturbance Test					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Receiver	R&S	ESCI	100435	04-15-2021	04-14-2022
Temperature/ Humidity Indicator	Defu	TH128	/	---	---
LISN	R&S	ENV216	100098	03-04-2021	03-03-2022
Barometer	changchun	DYM3	1188	---	---

6 Test results and Measurement Data

6.1 Antenna Requirement

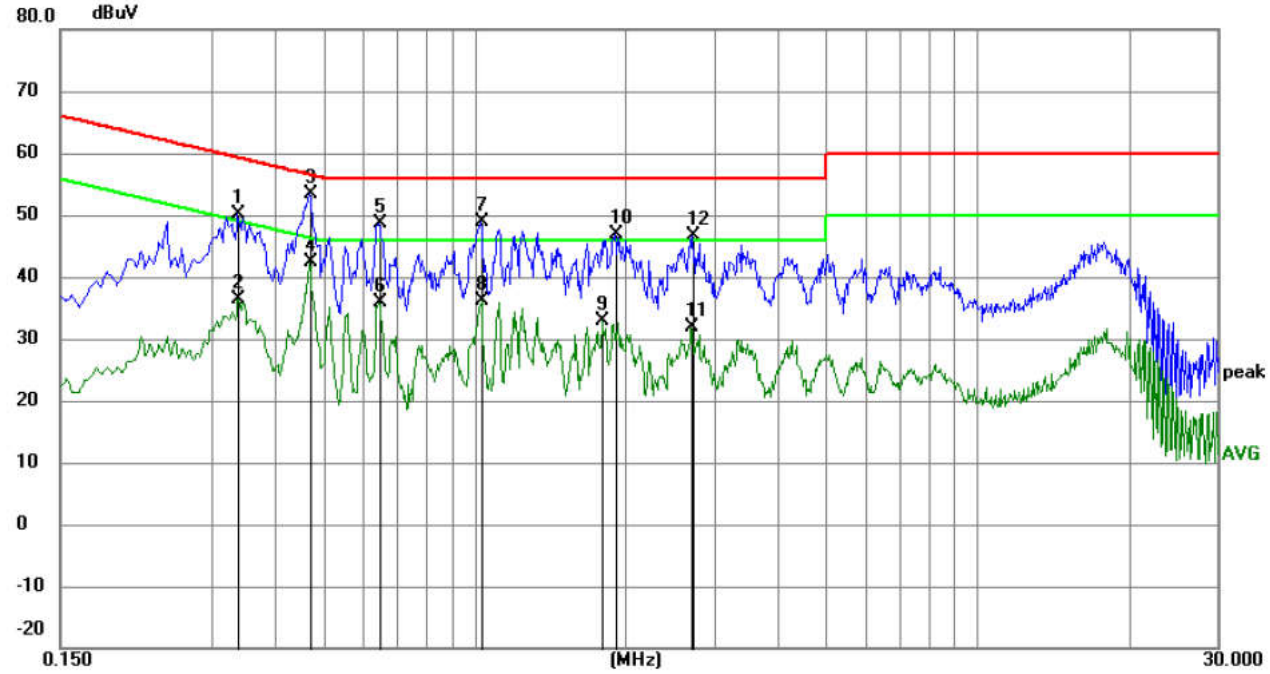
Standard requirement:	47 CFR Part 15C Section 15.203
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique 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.	
EUT Antenna:	Please see Internal photos
The antenna is Internal antenna. The best case gain of the antenna is 0dBi.	

6.2 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207
Test Method:	ANSI C63.10: 2013
Test Frequency Range:	150kHz to 30MHz
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto
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 Setup:	
Test Procedure:	1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane. 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. 5) 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: 2013 on conducted measurement.
Test Mode:	All modes were tested, only the worst case was recorded in the report.
Test Voltage:	AC 120V/60Hz
Test Results:	Pass

Measurement Data

Live line:

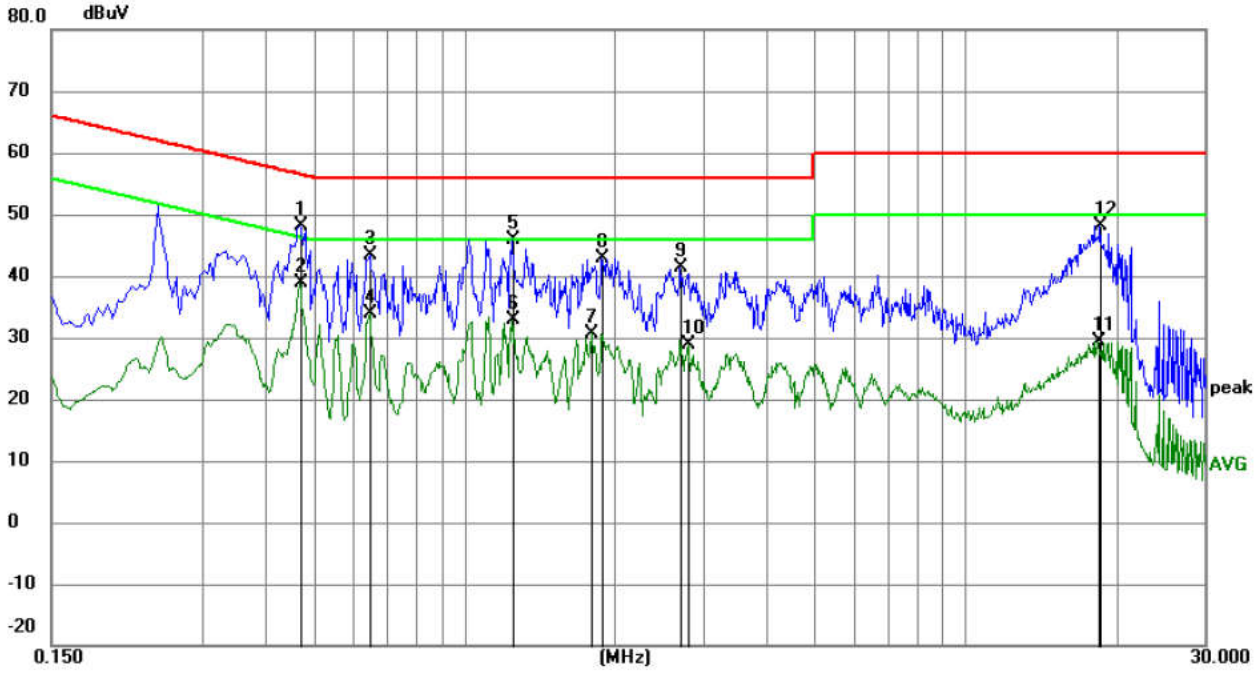


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3390	40.03	10.03	50.06	59.23	-9.17	peak	
2		0.3390	26.31	10.03	36.34	49.23	-12.89	AVG	
3	*	0.4695	43.40	9.96	53.36	56.52	-3.16	peak	
4		0.4695	32.49	9.96	42.45	46.52	-4.07	AVG	
5		0.6450	38.60	9.98	48.58	56.00	-7.42	peak	
6		0.6450	25.83	9.98	35.81	46.00	-10.19	AVG	
7		1.0275	39.16	9.83	48.99	56.00	-7.01	peak	
8		1.0320	26.33	9.83	36.16	46.00	-9.84	AVG	
9		1.7970	23.01	9.80	32.81	46.00	-13.19	AVG	
10		1.9050	36.99	9.79	46.78	56.00	-9.22	peak	
11		2.6970	22.06	9.79	31.85	46.00	-14.15	AVG	
12		2.7105	36.76	9.79	46.55	56.00	-9.45	peak	

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Neutral line:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.4695	38.23	9.96	48.19	56.52	-8.33	peak	
2	*	0.4695	29.02	9.96	38.98	46.52	-7.54	AVG	
3		0.6495	33.48	9.98	43.46	56.00	-12.54	peak	
4		0.6495	23.81	9.98	33.79	46.00	-12.21	AVG	
5		1.2435	36.09	9.82	45.91	56.00	-10.09	peak	
6		1.2435	23.09	9.82	32.91	46.00	-13.09	AVG	
7		1.7970	20.95	9.80	30.75	46.00	-15.25	AVG	
8		1.8870	33.14	9.79	42.93	56.00	-13.07	peak	
9		2.7015	31.65	9.79	41.44	56.00	-14.56	peak	
10		2.7960	19.14	9.79	28.93	46.00	-17.07	AVG	
11		18.3750	19.51	9.96	29.47	50.00	-20.53	AVG	
12		18.6180	38.28	9.96	48.24	60.00	-11.76	peak	

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

6.3 Radiated Spurious Emissions

Test Requirement: 47 CFR Part 15C Section 15.231(b) and 15.209

Test Method: ANSI C63.10 2013

Test Site: Measurement Distance: 3m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Setup:

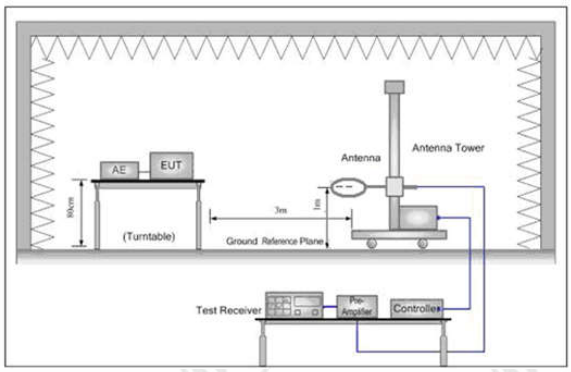


Figure 1. Below 30MHz

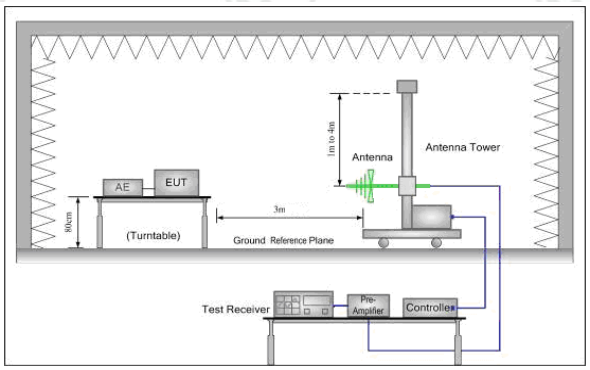


Figure 2. 30MHz to 1GHz

Test Procedure:

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. 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.

d. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB 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 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Limit: (Spurious Emissions)

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

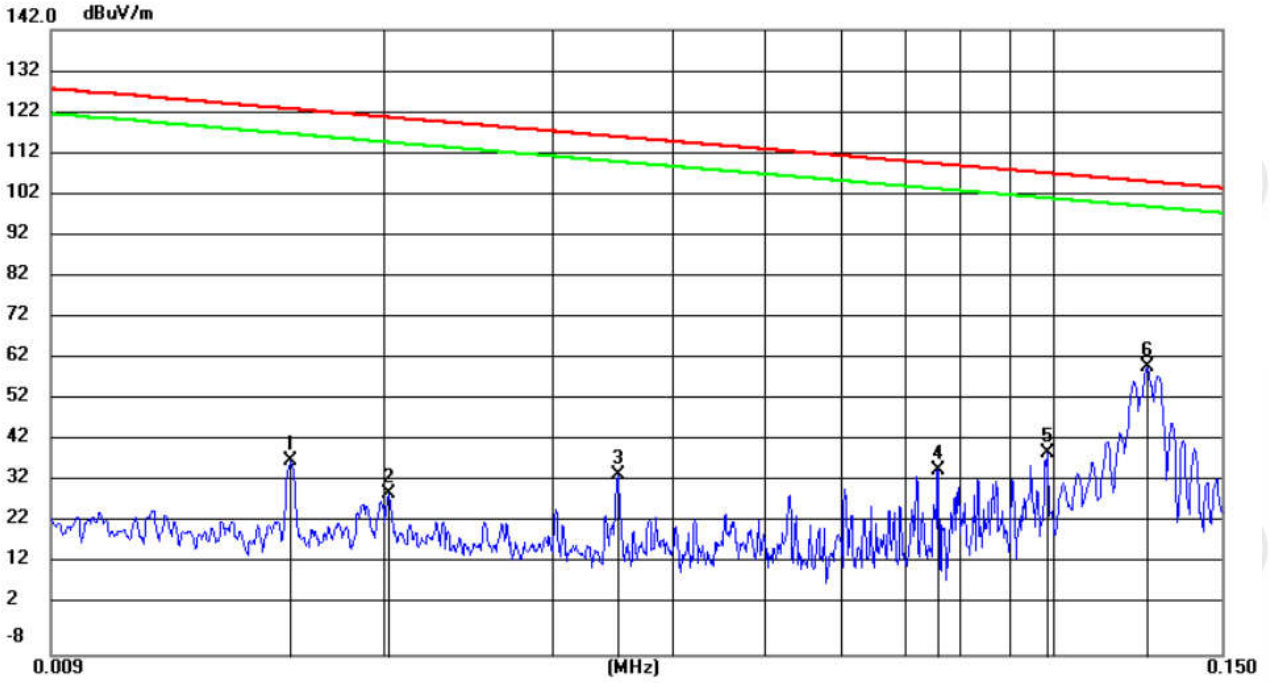
Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Test Mode: Transmitting mode

Test Results: Pass

Measurement Data

9kHz~150kHz:

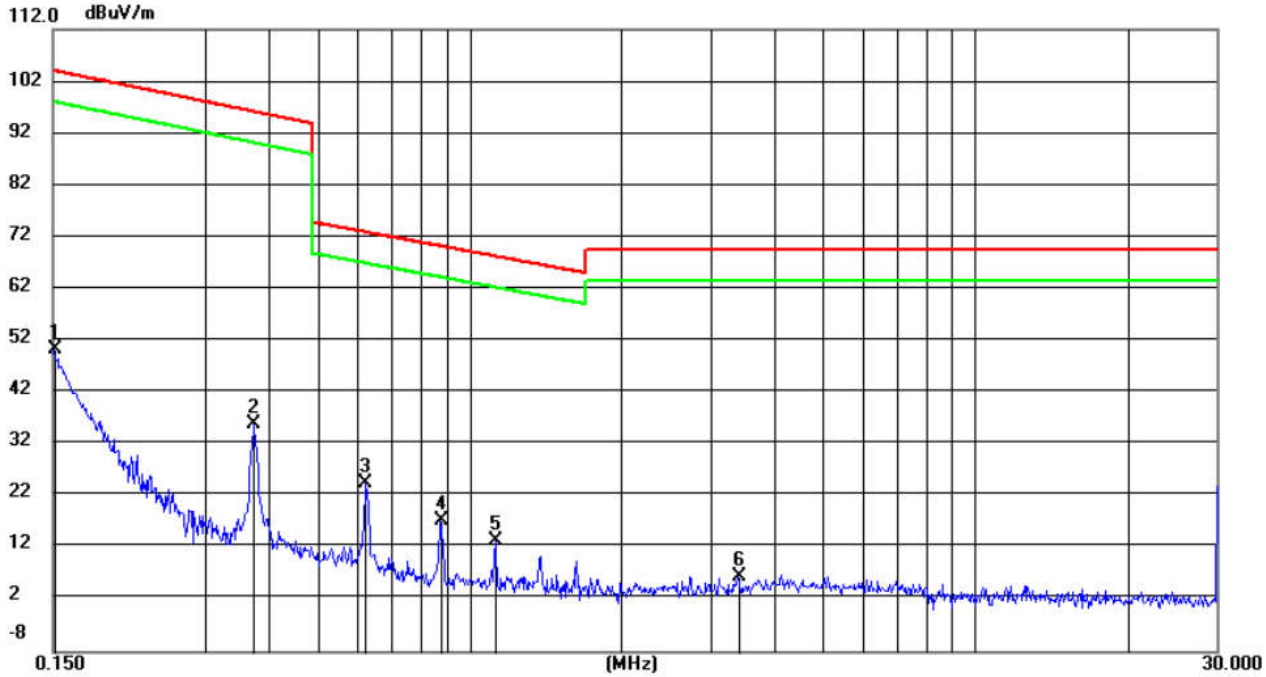


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		0.0160	17.37	21.17	38.54	122.96	-84.42	peak			
2		0.0202	9.99	20.93	30.92	120.99	-90.07	peak			
3		0.0351	14.76	20.37	35.13	116.33	-81.20	peak			
4		0.0759	15.93	20.35	36.28	109.83	-73.55	peak			
5		0.0986	20.19	20.40	40.59	107.62	-67.03	peak			
6	*	0.1253	40.86	20.37	61.23	105.60	-44.37	peak			

Remark:

1. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
2. The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
   Final Test Level =Receiver Reading - Correct Factor
   Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor
3. The highest frequency is 125kHz of the EUT, so upper frequency of measurement range is 30MHz.

150kHz~30MHz:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		0.1508	30.16	20.33	50.49	104.03	-53.54	peak			
2		0.3751	15.45	20.40	35.85	96.12	-60.27	peak			
3	*	0.6238	3.88	20.55	24.43	72.90	-48.47	peak			
4		0.8757	-3.19	20.45	17.26	70.22	-52.96	peak			
5		1.1233	-6.99	20.41	13.42	68.26	-54.84	peak			
6		3.3994	-14.13	20.54	6.41	69.54	-63.13	peak			

Remark:

1.The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

2.The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading - Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

3.The highest frequency is 125kHz of the EUT, so upper frequency of measurement range is 30MHz.

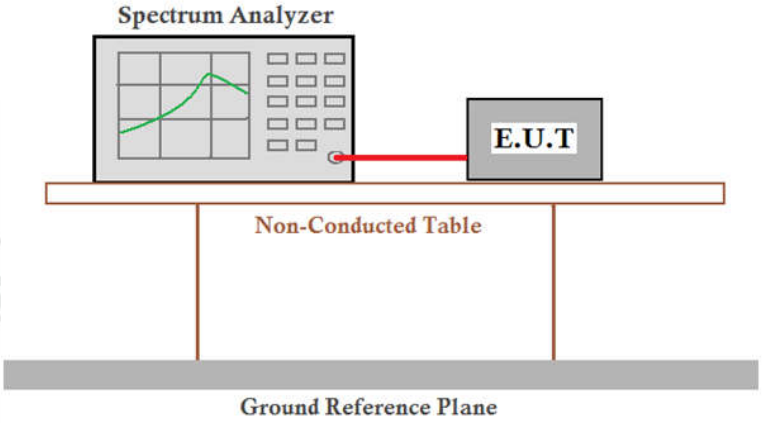
6.4 20dB Bandwidth

Test Requirement: 47 CFR Part 15C Section 2.1049

Test Method: ANSI C63.10 2013

Limit: 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. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Setup:



Test Mode: Transmitting mode

Test Results: Pass

Measurement Data

20dB bandwidth (kHz)	Results
27.13	Pass

Test plot as follows: