FCC TEST REPORT

Product	:	R500 Data Collector
Trade mark	:	SinoGNSS By ComNav Technology Ltd.
Model/Type reference	:	R500
Serial Number	:	N/A
Report Number	:	EED32L00018305
FCC ID	:	2ACHBR500
Date of Issue	:	Aug. 06, 2019
Test Standards	:	47 CFR Part 15 Subpart C
Test result	:	PASS

Prepared for:

ComNav Technology Ltd.
Building 2, No. 618 Chengliu Middle Rd.

Prepared by:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District,
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	Ware Xin		Kevin yang
Date:	Aug. 06, 2019		Check No.: 3319509675

CENTRE TESTING INTERNATIONAL GROUP CO.,LTD. CTI Report Seal

2 Version

Version No.	Date	Description
00	Aug. 06, 2019	Original

3 Test Summary

Test Item	Test Requirement	Test method	Result
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	PASS
Radiated Emission	47 CFR Part 15 Subpart C Section 15.209; 15.225(a)(b)(c)(d)	ANSI C63.10-2013	PASS
Frequency Tolerance	47 CFR Part 15 Subpart C Section 15.225(e)	ANSI C63.10-2013	PASS
Occupied Bandwidth	47 CFR Part 15 Subpart C Section 15.215	ANSI C63.10-2013	PASS

Remark:
The tested sample and the sample information are provided by the client.

4 Contents

5 General Information

5.1 Client Information

Applicant:	ComNav Technology Ltd.
Address of Applicant:	Building 2, No. 618 Chengliu Middle Rd.
Manufacturer:	ComNav Technology Ltd.
Address of Manufacturer:	Building 2, No. 618 Chengliu Middle Rd.
Factory:	ComNav Technology Ltd.
Address of Factory:	Building 2, No. 618 Chengliu Middle Rd.

5.2 General Description of EUT

Product Name:	R500 Data Collector	
Model No.(EUT):	R500	
Trade Mark:	SinoGNSS By ComNav Technology Ltd.	
EUT Supports Radios application:	BT4.0, 3.1+EDR	2402MHz to 2480MHz
	NFC	13.56MHz
	GSM	850/1900 GSM, GPRS, EGPRS
Power Supply:	AC adapter	MODEL No.: HKA01105021-XE INPUT: 100-240V~50/60Hz 0.5A OUTPUT: 5V⎓2.1A
	Li-ion Battery	MODEL No.: BL-R500 Capacity: 6500mAh, 24.0Wh Nominal Voltage: 3.7V Limited Charing Voltage: 4.2V

5.3 Product Specification subjective to this standard

Carrier Frequency:	13.56MHz	
Modulation Type:	FSK	
Antenna Type and Gain:	2G	pifa antenna, -2.3 dBi
	BT	pifa antenna, 2.37 dBi
	NFC	FPC antenna, 0 dBi
Test voltage:	AC 120V, 60Hz, DC 3.7V	
Sample Received Date:	Jan. 25, 2019	
Sample tested Date:	Jan. 25, 2019 to Jul. 28, 2019	

5.4 Test Environment and Mode

Operating Environment:	
Temperature:	25°C
Humidity:	49% RH
Atmospheric Pressure:	1010 mbar
Test mode:	
TX mode:	The EUT transmitted the continuous signal at the specific channel(s).

5.5 Description of Support Units

The EUT has been tested independently

5.6 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd.

Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China 518101

Telephone: +86 (0) 755 3368 3668 Fax:+86 (0) 755 3368 3385

No tests were sub-contracted.

5.7 Deviation from Standards

None.

5.8 Abnormalities from Standard Conditions

None.

5.9 Other Information Requested by the Customer

None.

5.10 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	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%

6 Equipment List

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	05-20-2019	05-19-2020
Temperature/ Humidity Indicator	Defu	TH128	/	06-14-2019	06-13-2020
LISN	R&S	ENV216	100098	05-08-2019	05-07-2020
Barometer	changchun	DYM3	1188	06-20-2019	06-19-2020

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	07-26-2019	07-25-2020
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-076	04-25-2018	04-24-2021
Receiver	R&S	ESCI7	100938-003	10-21-2019	10-20-2020
Multi device Controller	maturo	NCD/070/10711112	---	01-09-2019	01-08-2020
Temperature/ Humidity Indicator	Shanghai qixiang	HM10	1804298	07-26-2019	07-25-2020
Cable line	Fulai(7M)	SF106	5219/6A	01-09-2019	01-08-2020
Cable line	Fulai(6M)	SF106	5220/6A	01-09-2019	01-08-2020
Cable line	Fulai(3M)	SF106	5216/6A	01-09-2019	01-08-2020
Cable line	Fulai(3M)	SF106	5217/6A	01-09-2019	01-08-2020

7 Test Result & Measurement Data

7.1 Conducted Emissions

Test Requirement: 47 CFR Part 15C Section 15.207

Test Method: ANSI C63.10-2013

Test Frequency Range: 150kHz to 30MHz

Limit:

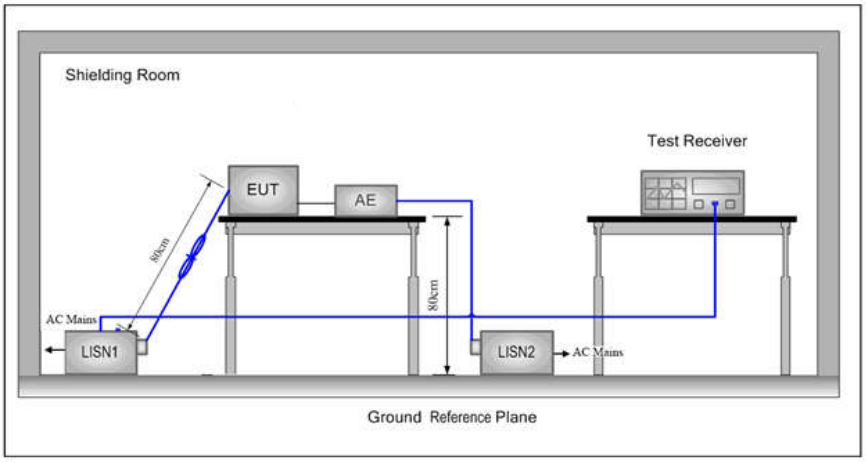
Frequency range (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Procedure:

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: 2009 on conducted measurement.

Test Setup:



Test Mode: Transmitting mode

Instruments Used: Refer to section 6 for details

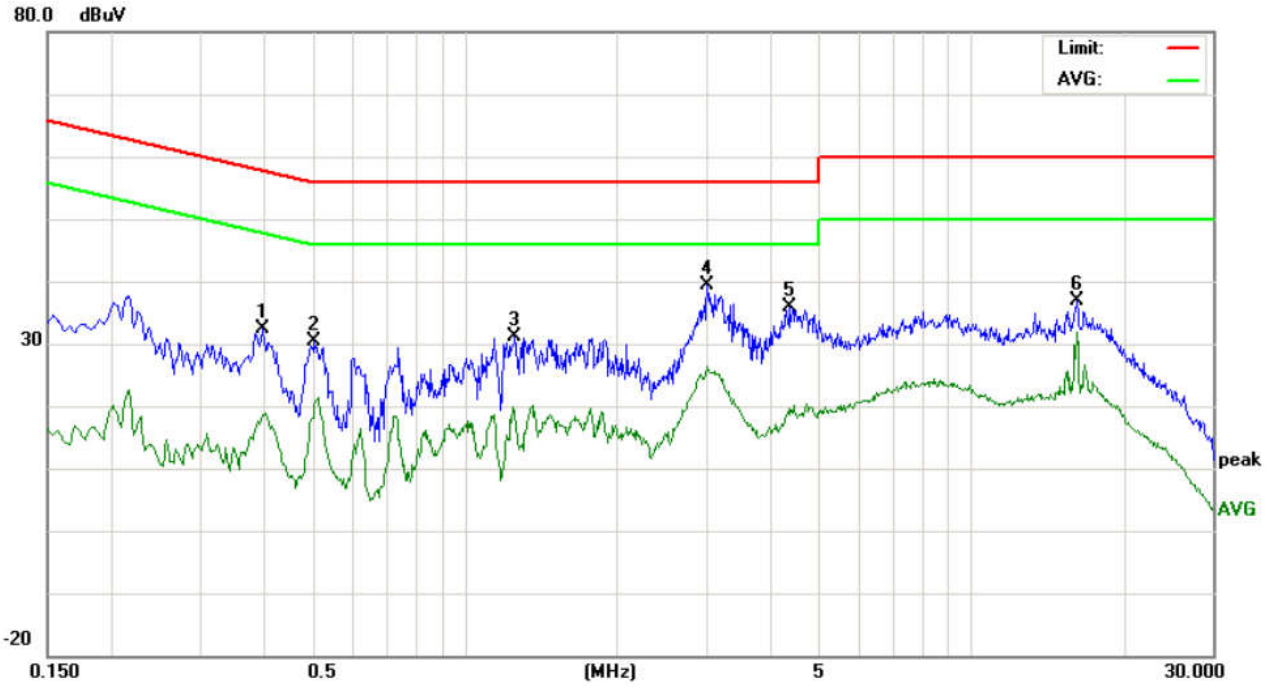
Test Results: Pass

Test Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

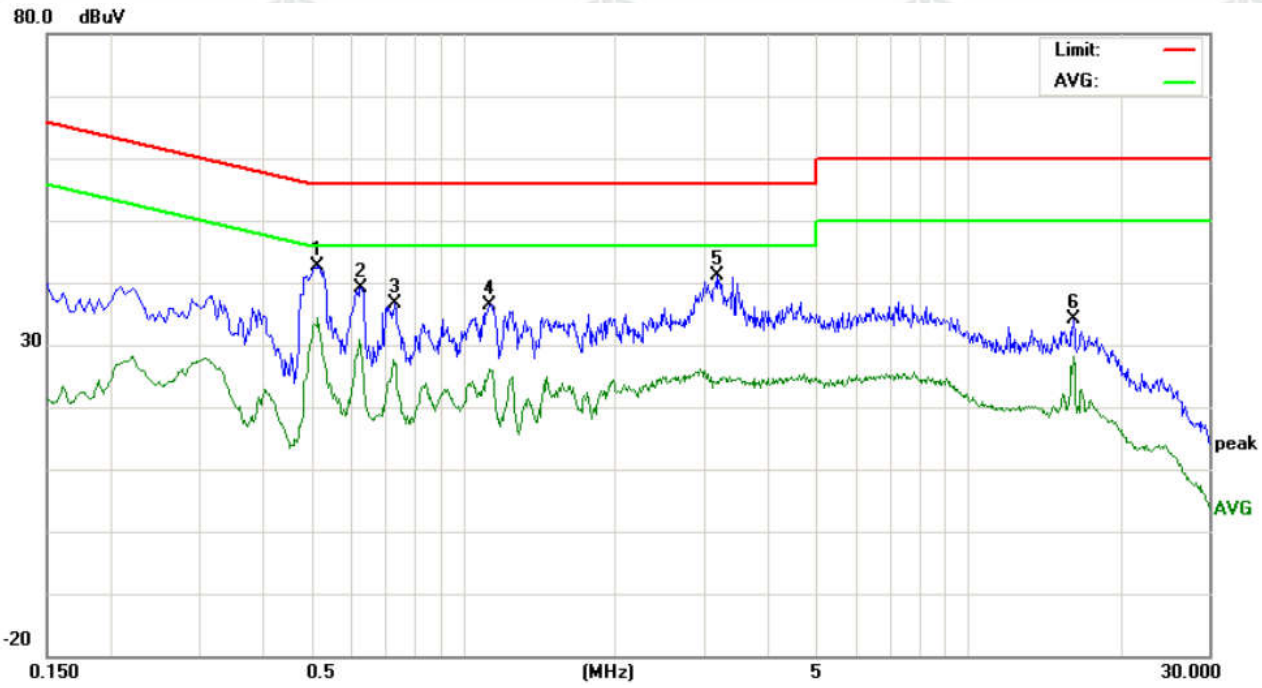
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Product	:	R500 Data Collector	**Model/Type reference**	:	R500
Temperature	:	22℃	**Humidity**	:	53%
Phase	:	L			



No.	Freq.	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)			
	MHz	Peak	QP	AVG	dB	peak	QP	AVG	QP	AVG	QP	AVG	P/F	Comment
1	0.3980	22.44	19.28	8.65	9.89	32.33	29.17	18.54	57.89	47.89	-28.72	-29.35	P	
2	0.5060	20.53	17.56	10.31	9.90	30.43	27.46	20.21	56.00	46.00	-28.54	-25.79	P	
3	1.2579	21.42	17.58	8.69	9.79	31.21	27.37	18.48	56.00	46.00	-28.63	-27.52	P	
4	3.0220	29.70	26.68	16.59	9.72	39.42	36.40	26.31	56.00	46.00	-19.60	-19.69	P	
5	4.3980	26.23	23.14	10.00	9.73	35.96	32.87	19.73	56.00	46.00	-23.13	-26.27	P	
6	16.1660	26.95	23.52	21.90	9.96	36.91	33.48	31.86	60.00	50.00	-26.52	-18.14	P	

Product	:	R500 Data Collector	**Model/Type reference**	:	R500
Temperature	:	22℃	**Humidity**	:	53%
Phase	:	N			



No.	Freq.	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)			
	MHz	Peak	QP	AVG	dB	peak	QP	AVG	QP	AVG	QP	AVG	P/F	Comment
1	0.5180	32.60	30.24	24.53	9.92	42.52	40.16	34.45	56.00	46.00	-15.84	-11.55	P	
2	0.6300	29.27	26.12	19.81	9.98	39.25	36.10	29.79	56.00	46.00	-19.90	-16.21	P	
3	0.7340	26.73	23.01	16.98	9.81	36.54	32.82	26.79	56.00	46.00	-23.18	-19.21	P	
4	1.1260	26.61	23.14	16.06	9.80	36.41	32.94	25.86	56.00	46.00	-23.06	-20.14	P	
5	3.1780	31.29	28.13	14.12	9.72	41.01	37.85	23.84	56.00	46.00	-18.15	-22.16	P	
6	16.1660	24.15	21.63	18.06	9.96	34.11	31.59	28.02	60.00	50.00	-28.41	-21.98	P	

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. 13.56MHz is the Fundamental field strength of NFC. According to the 15.207, the limit is not apply.

7.2 Radiated Emissions

Test Requirement: 47 CFR Part 15 Subpart C Section 15.209; 15.225(a)(b)(c)(d)

Test Method: ANSI C63.10-2013

Test Site: 3m (Semi-Anechoic Chamber)

Requirements: (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed
15,848 microvolts/meter at 30 meters.
(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

Receiver Setup:

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

Test Setup:

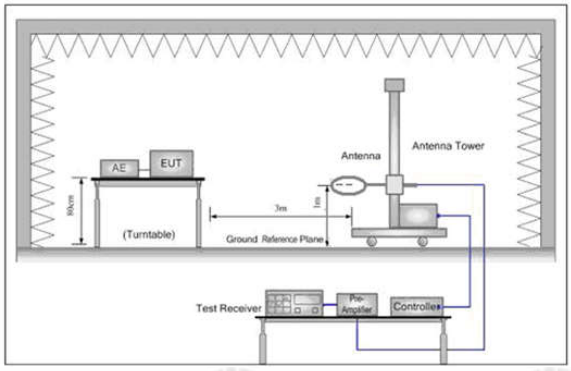


Figure 1. Below 30MHz

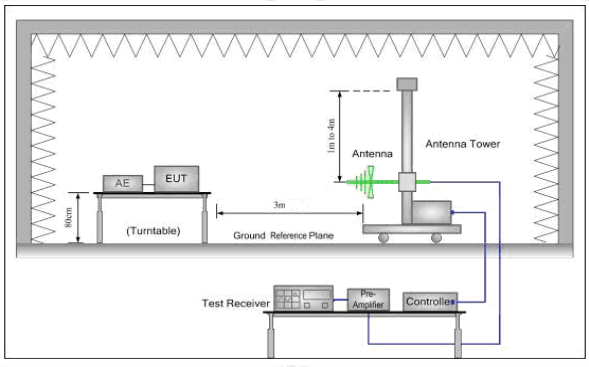


Figure 2. 30MHz to 1GHz

Test Procedure:

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The limit 1.705MHz to 30MHz in clause 4.3 are specified at 30 meters, and measurements were made at 3 meters, the limit is translated to 3 meters by using a formula as follows:

   Limit3m = Limit30m + 40log(30m/3)
8. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode: Transmitting mode

Instruments Used: Refer to section 6 for details

Test Result: Pass

1.705-30MHz Mode

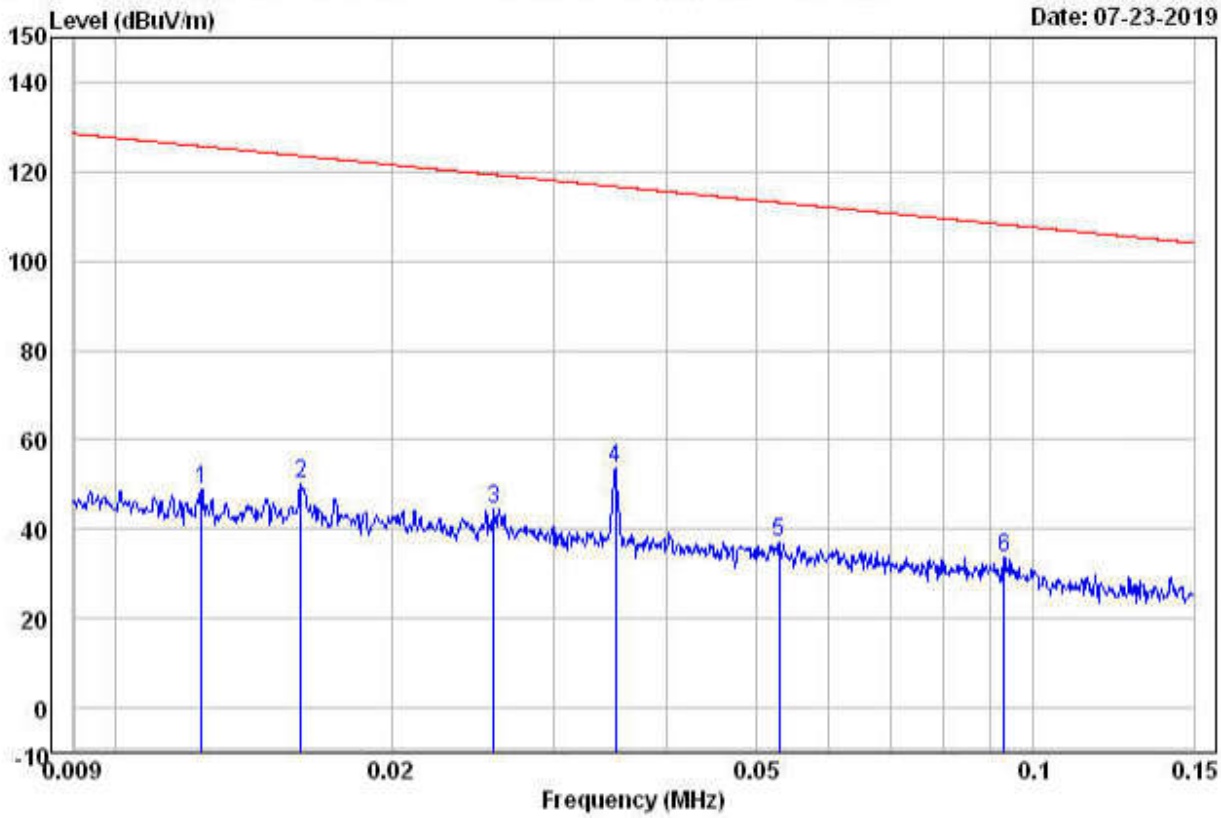
Test Procedure: For testing performed with the loop antenna, testing was performed in accordance to ANSI C63.4: 2014, section 8.2.1. The center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.

Product : R500 Data Collector **Model/Type reference** : R500

Temperature : 23℃ **Humidity** : 54%

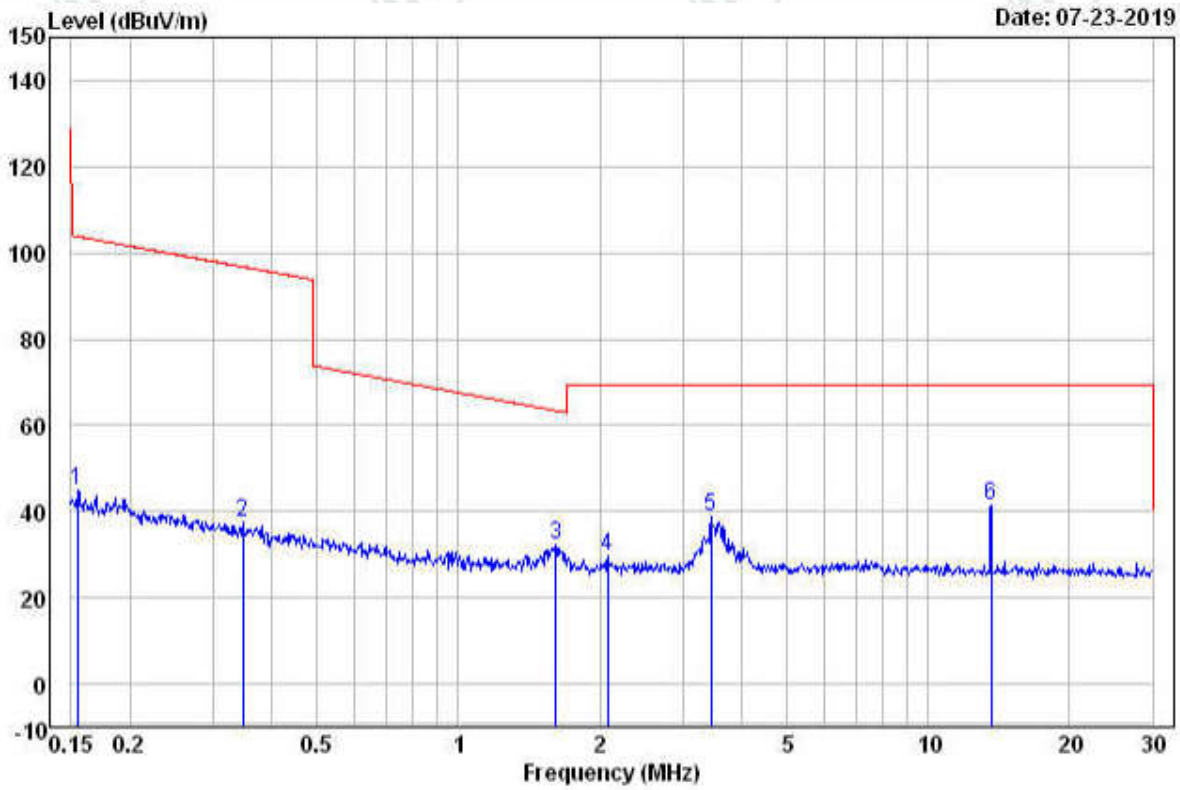
Test data:

9KHz-150KHz:



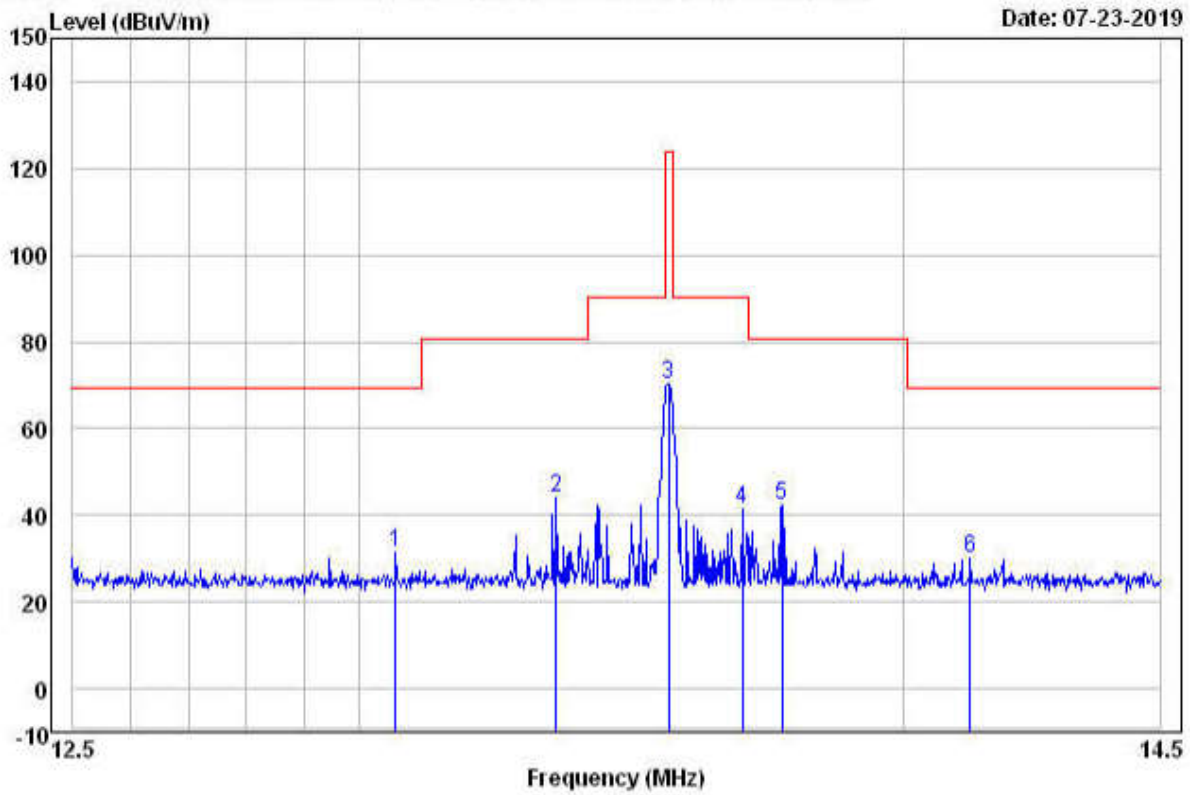
Freq (MHz)	Antenna_Factor (dB/m)	Cable_Loss (dB)	Read_Level (dBuV)	Level (dBuV/m)	Limit_Line (dBuV/m)	Over_Limit (dB)	Polarization	Remark
0.012	18.39	0.03	28.44	48.84	125.72	-76.88	X	PK
0.016	16.12	0.05	29.58	49.98	123.54	-73.56	X	PK
0.026	12.41	0.07	24.18	44.58	119.34	-74.76	X	PK
0.035	11.57	0.08	33.17	53.55	116.68	-63.13	X	PK
0.053	11.33	0.11	16.59	36.97	113.11	-76.14	X	PK
0.093	11.30	0.12	13.25	33.64	108.20	-74.56	X	QP

150KHz-30MHz:



Freq (MHz)	Antenna_Factor (dB/m)	Cable_Loss (dB)	Read_Level (dBuV)	Level (dBuV/m)	Limit_Line (dBuV/m)	Over_Limit (dB)	Polarization	Remark
0.155	11.40	0.20	44.79	44.90	103.80	-58.90	X	PK
0.348	11.48	0.16	37.43	37.54	96.76	-59.22	X	PK
1.610	11.27	0.18	32.26	32.44	63.40	-30.96	X	QP
2.077	11.03	0.43	29.49	29.69	69.50	-39.81	X	QP
3.454	10.92	0.61	38.75	38.93	69.50	-30.57	X	QP
13.623	10.75	0.69	40.59	41.28	69.50	-28.22	X	QP

12.5MHz-14.5MHz：

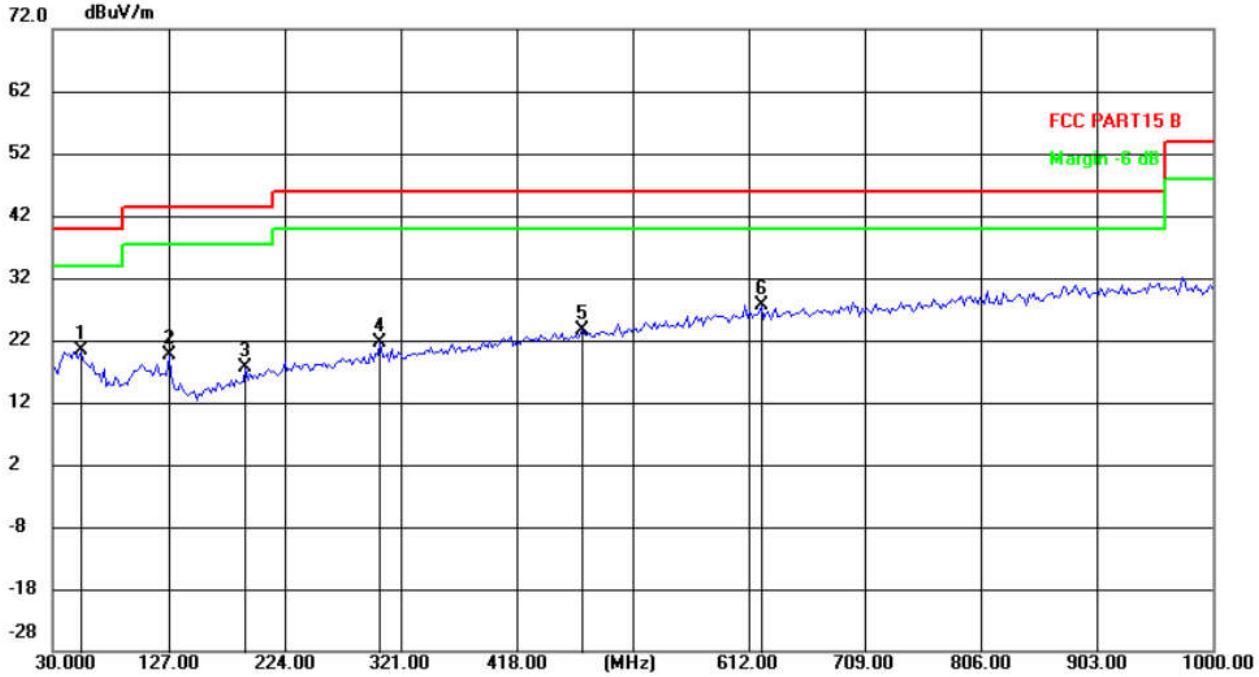


Freq (MHz)	Antenna_Factor (dB/m)	Cable_Loss (dB)	Read_Level (dBuV)	Level (dBuV/m)	Limit_Line (dBuV/m)	Over_Limit (dB)	Polarization	Remark
13.063	10.75	0.68	10.80	31.56	69.50	-37.94	X	QP
13.353	10.75	0.68	23.40	44.16	80.50	-36.34	X	QP
13.559	10.75	0.69	49.65	70.42	123.90	-53.48	X	QP
13.697	10.75	0.69	20.55	41.32	90.40	-49.08	X	QP
13.772	10.74	0.69	21.37	42.14	80.50	-38.36	X	QP
14.130	10.74	0.69	9.36	30.13	69.50	-39.37	X	QP

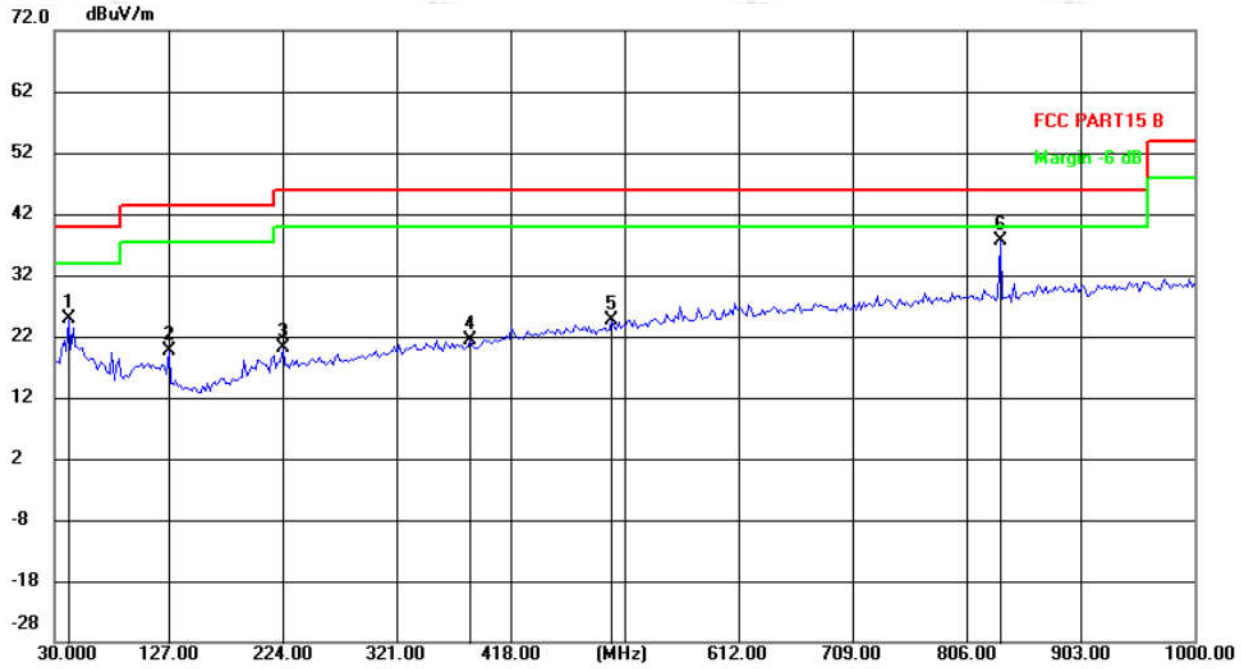
Remark: The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case X axis is shown in the report.

30MHz-1000MHz

QP:



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		53.3266	6.32	14.18	20.50	40.00	-19.50	peak	200	355	
2		127.1943	9.30	10.22	19.52	43.50	-23.98	peak	200	355	
3		191.3426	6.32	11.42	17.74	43.50	-25.76	peak	200	355	
4		304.0881	7.28	14.44	21.72	46.00	-24.28	peak	100	156	
5		473.2064	5.70	17.93	23.63	46.00	-22.37	peak	200	0	
6	*	622.8857	7.19	20.47	27.66	46.00	-18.34	peak	100	105	



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		41.6633	10.92	13.92	24.84	40.00	-15.16	peak	100	355	
2		127.1943	9.46	10.22	19.68	43.50	-23.82	peak	100	154	
3		224.3887	7.67	12.48	20.15	46.00	-25.85	peak	200	5	
4		383.7875	5.12	16.19	21.31	46.00	-24.69	peak	200	105	
5		504.3086	6.05	18.52	24.57	46.00	-21.43	peak	200	155	
6	*	834.7695	14.40	23.26	37.66	46.00	-8.34	peak	200	5	

Remark:

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 + Antenna Factor + Cable Factor – Preamplifier Factor

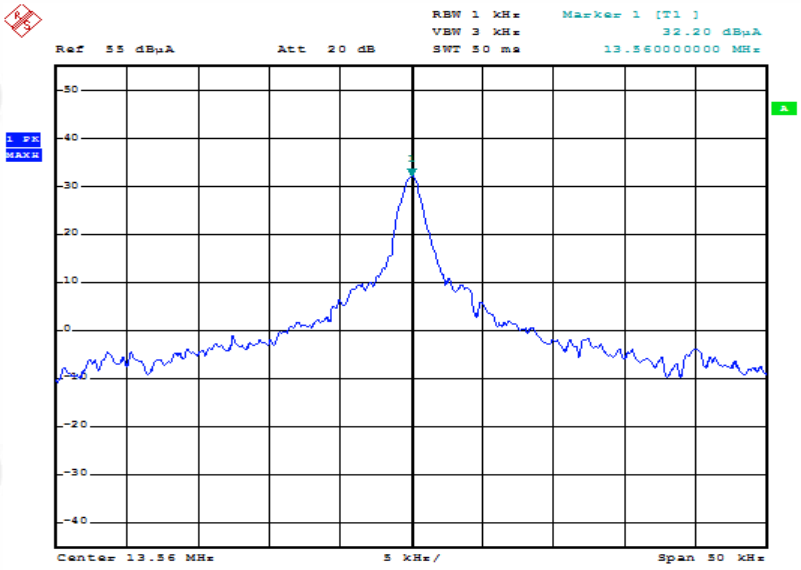
7.3 Frequency Tolerance

Test Requirement:	47 CFR Part 15 Subpart C Section 15.225(e)
Test Method:	ANSI C63.10-2013
Frequency range:	Operation within the band 13.110-14.010 MHz
Requirement :	The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.
Test Mode:	Transmitter mode
Method of measurement:	The EUT was placed in an environmental test chamber and powered such that control element received normal voltage and the transmitter provided maximum RF output.
Instruments Used:	Refer to section 6 for details
Test Result:	Pass

Test Frequency: 13.56MHz				**Temperature:22℃**
Supply Voltage (V)	**Test Result (MHz)**	**Deviation (kHz)**	**Limit (kHz)**	**Result**
3.7	**13.5600**	**0**	**1.356**	**Pass**

Test Frequency: 13.56MHz				**Temperature:20℃**
Supply Voltage (V)	**Test Result (MHz)**	**Deviation (kHz)**	**Limit (kHz)**	**Result**
3.1	**13.5602**	**0.2**	**1.356**	**Pass**
3.4	**13.5601**	**0.1**	**1.356**	**Pass**
3.7	**13.5599**	**0.1**	**1.356**	**Pass**
4.0	**13.5603**	**0.3**	**1.356**	**Pass**
4.3	**13.5604**	**0.4**	**1.356**	**Pass**

Test Frequency: 13.56MHz				**Voltage: 3.7V**
Temperature (℃)	**Test Result (MHz)**	**Deviation (kHz)**	**Limit (kHz)**	**Result**
-20	**13.5604**	**0.4**	**1.356**	**Pass**
-10	**13.5602**	**0.2**	**1.356**	
0	**13.5603**	**0.3**	**1.356**	
10	**13.5598**	**0.2**	**1.356**	
20	**13.5599**	**0.1**	**1.356**	
30	**13.5602**	**0.2**	**1.356**	
40	**13.5603**	**0.3**	**1.356**	
50	**13.5603**	**0.3**	**1.356**	

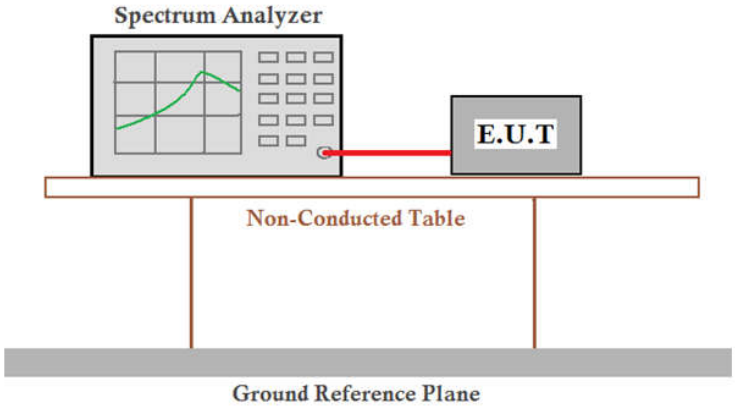


Date: 24.JUL.2019 09:55:30

7.4 Occupied Bandwidth

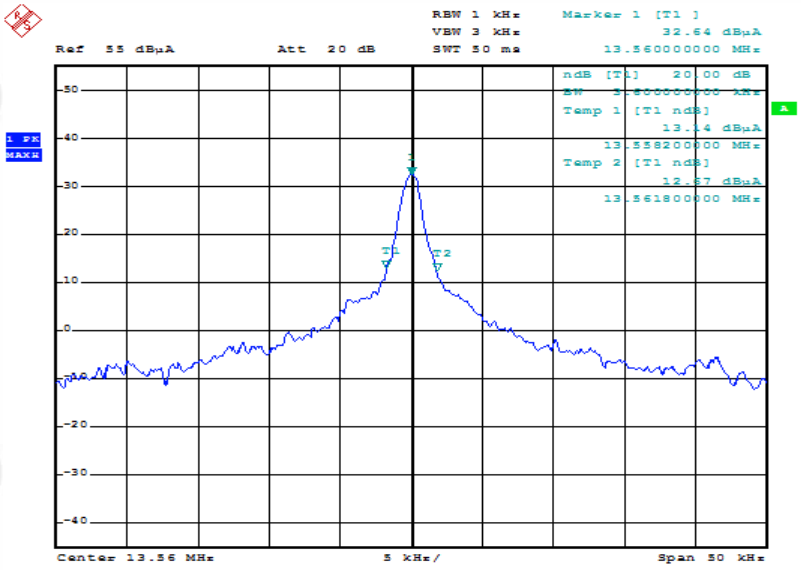
Test Requirement:	47 CFR Part 15C Section 15.215 (C)
Test Method:	ANSI C63.10-2013
Frequency range:	Operation within the band 13.110 – 14.010 MHz
Requirement :	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equip compliance with the 20dB attenuation specification may base on measurement at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be.deomonstrated by measuring the radiated emissions.

Test Setup:



Test Mode:	Transmitter mode
Instruments Used:	Refer to section 6 for details
Test Result:	Pass

The graph as below: represents the emissions take for this device.



Date: 24.JUL.2019 09:54:39

APPENDIX 2 PHOTOGRAPHS OF EUT

Refer to Report No.EED32L00018301 for EUT external and internal photos.

*** End of Report ***