FCC PART 15C
Measurement and Test Report

For

Seikaku Technical Group Limited

Offshore Chambers, P.O. Box 217 Apia, Samoa

FCC ID: H38WT-X

FCC Rules:	FCC Part 15.236
Product Description:	PLL UHF Creative pen-shape microphone System
Tested Model:	WT-X
Report No.:	WTD20X01000719W
Sample Receipt Date:	Jan.03, 2020
Tested Date:	Jan.03, 2020 to Apr.09, 2020
Issued Date:	Apr.30, 2020
Tested By:	Jason Su / Engineer
Reviewed By:	Lion Cai / RF Manager
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Waltek Testing Group (Shenzhen) Co., Ltd.

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Report version

Version No.	Date of issue	Description
Rev.00	Apr.09, 2020	Original
/	/	/

1. GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Seikaku Technical Group Limited
Address of applicant: Offshore Chambers, P.O. Box 217 Apia, Samoa

Manufacturer: Seikaku Technical Group Limited
Address of manufacturer: Offshore Chambers, P.O. Box 217 Apia, Samoa

General Description of EUT	
Product Name:	PLL UHF Creative pen-shape microphone System
Trade Name:	SHOW, TOPP PRO
Model No.:	WT-X
Adding Model(s):	/
Rated Voltage:	DC1.5V
Note: The test data is gathered from a production sample provided by the manufacturer.	

Items	**Description**
RF Output Power:	Max. 10.457dBm (Conducted)
Frequency Range:	470.125MHz - 565.975MHz
Modulation:	FM
Antenna Type:	Integral Antenna
Antenna Gain:	0dBi
For more information refer to the circuit diagram form and the user's manual.	

The test data gathered are from a production sample, provided by the manufacturer.

1.2 Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.236: Operation of wireless microphones in the bands 54-72MHz, 76-88MHz, 174-216 MHz,470-608MHz and 614-698MHz.
TIA/EIA 603 E March 2016: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
ETSI EN 300 422-2 V2.1.2 (2017-01): Wireless Microphones; Audio PMSE up to 3 GHz;Part 1: Class A Receivers;Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with FCC Rules Part 15.236.
The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

1.4 Test Facility

Address of the test laboratory
Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.
Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

FCC – Registration No.: 125990
Waltek Testing Group (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintain ed in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A
The 3m Semi-anechoic chamber of Waltek Testing Group (Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.5 EUT Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components. The test software is started while the whole system is on.

Test Mode List		
Test Mode	Description	Remark
TM1	Low Channel	470.125MHz
TM2	Middle Channel	518.000MHz
TM3	High Channel	565.975MHz

Test Conditions	
Temperature:	22~25 °C
Relative Humidity:	50~56 %.
ATM Pressure:	1019 mbar

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	±0.42dB
Occupied Bandwidth	---	±1×10-7
Frequency Stability	2.3%	±5%
Conducted Spurious Emission	Conducted	±2.17dB
Conducted Emissions	Conducted	9-150kHz ±3.74dB
		0.15-30MHz ±3.34dB
Transmitter Spurious Emissions	Radiated	30-200MHz ±4.52dB
		0.2-1GHz ±5.56dB
		1-6GHz ±3.84dB
		6-18GHz ±3.92dB

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2019-04-30	2020-04-29
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2019-04-30	2020-04-29
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2019-04-30	2020-04-29
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2019-04-30	2020-04-29
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2019-04-30	2020-04-29
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2019-05-05	2021-05-04
SEMT-1042	Horn Antenna	ETS	3117	00086197	2019-05-05	2021-05-04
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2019-05-05	2021-05-04
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2019-04-30	2020-04-29
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2019-04-30	2020-04-29
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2019-04-30	2020-04-29
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2019-04-30	2020-04-29
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2019-04-30	2020-04-29
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2019-04-30	2020-04-29
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	2020-03-17	2021-03-16
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2020-03-17	2021-03-16
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2020-03-17	2021-03-16
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2020-03-17	2021-03-16
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2020-03-17	2021-03-16
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2020-03-17	2021-03-16

Software List			
Description	**Manufacturer**	**Model**	**Version**
EMI Test Software (Radiated Emission)*	Farad	EZ-EMC	RA-03A1
EMI Test Software (Conducted Emission)*	Farad	EZ-EMC	RA-03A1

*Remark: indicates software version used in the compliance certification testing

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§15.203	Antenna Requirement	Compliant
§15.207	Conducted Emission	Compliant
§15.236(d)(1)	Output Power Measurement	Compliant
§15.236(f)(2)	Occupied Bandwidth Emission	Compliant
§15.236(g)/ ETSI EN 300 422-1	Necessary Bandwidth Spurious emissions	Compliant
§15.236(d)(2)	Radiated Spurious Emission	Compliant
§15.236(d)(2)	Spurious Emission at Antenna Port	Compliant
§15.236(f)(3)	Frequency Stability	Compliant

Note: N/A mean not applicable.

3. Antenna Requirement

3.1 Standard Applicable

According to FCC Part 15.203, 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.

3.2 Evaluation Information

This product has an Integral antenna, fulfill the requirement of this section.

4. RF OUTPUT POWER

4.1 Standard Applicable

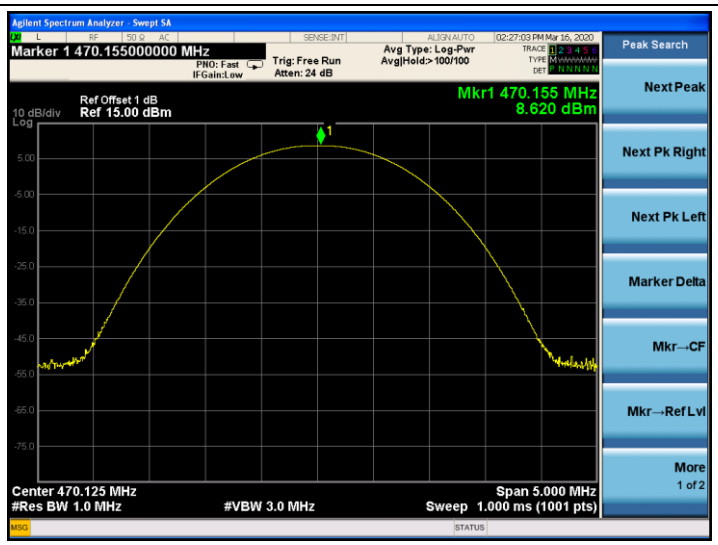
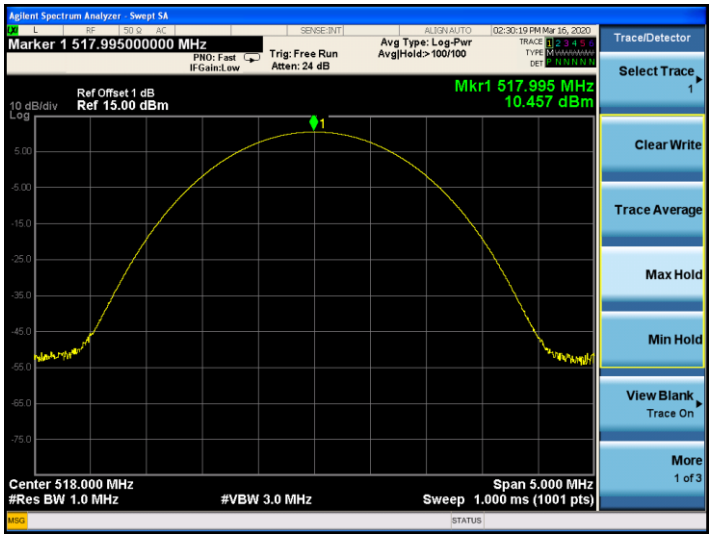
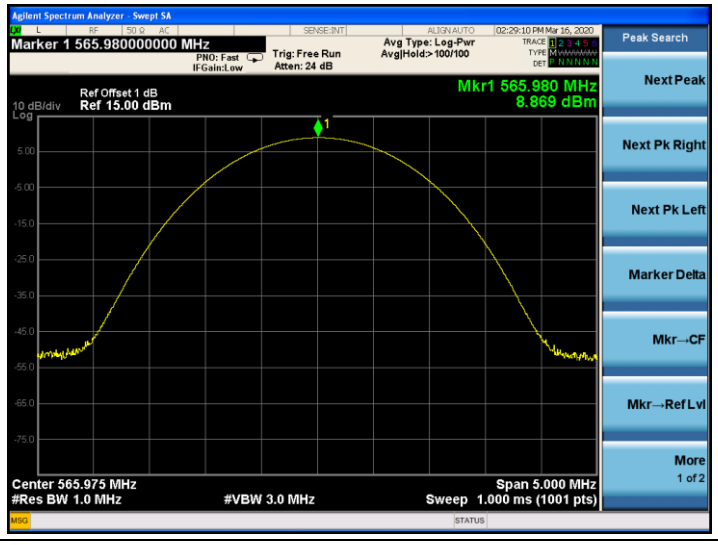
According to FCC 15.236(d)(1), for low power auxiliary station operating in the 470-608, and 614-698 MHz bands, In the bands allocated and assigned for broadcast television and in the 600 MHz service band: 50 mW EIRP

4.2 Test Procedure

a) Set RBW ≥ EBW
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Recorded the test data

4.3 Summary of Test Results/Plots

Channel	Frequency (MHz)	Measured Value （dBm）	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)
Low	470.125	8.620	0	8.620	17
Middle	518.000	10.457	0	10.457	17
High	565.975	8.869	0	8.869	17

Low	
Middle	
High	

5. OCCUPIED BANDWIDTH

5.1 Standard Applicable

According to FCC 15.236(f), the operating frequency within a permissible band of operation as defined in paragraph (c) must comply with the following requirements.

(1) The frequency selection shall be offset from the upper or lower band limits by 25 kHz or an integral multiple thereof.

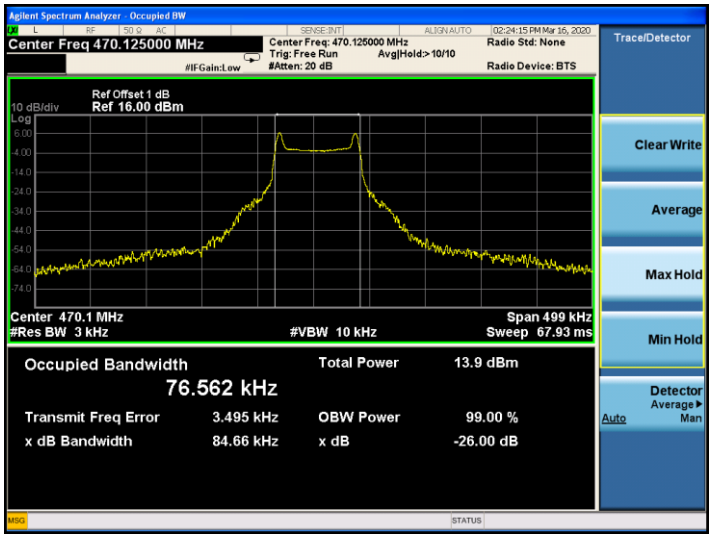
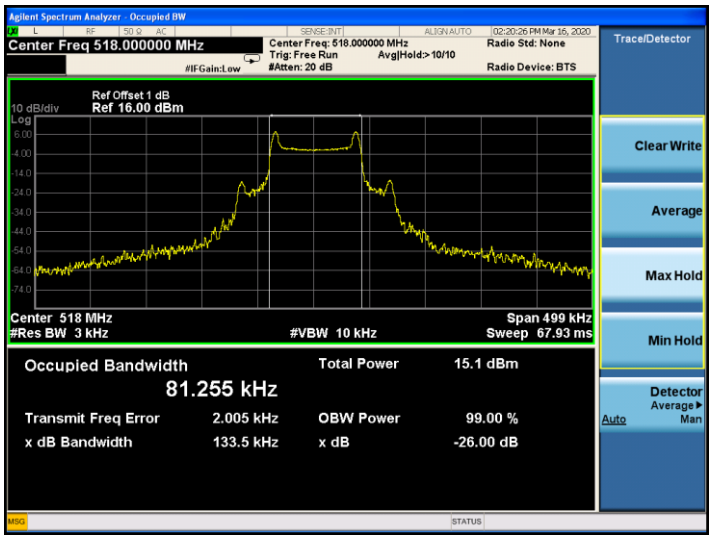
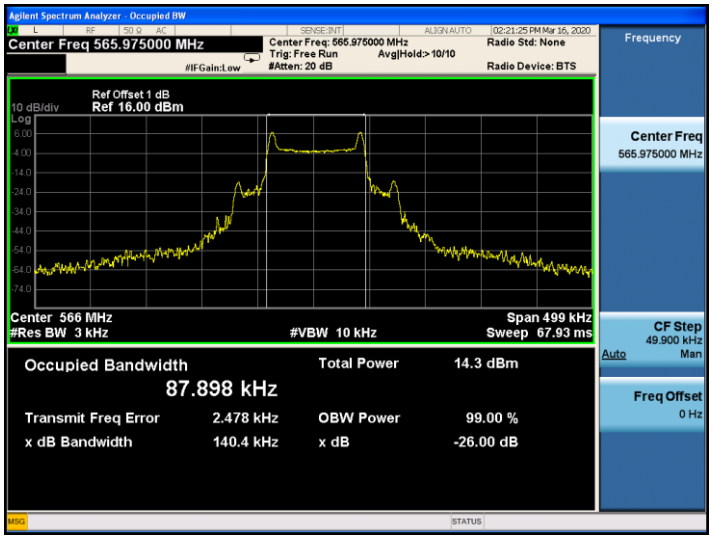
(2) One or more adjacent 25 kHz segments within the assignable frequencies may be combined to form a channel whose maximum bandwidth shall not exceed 200 kHz. The operating bandwidth shall not exceed 200 kHz. Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in Section 8.3 of ETSI EN 300 422-1 V1.4.2 (2011-08) (incorporated by reference, see §15.38). Emissions outside this band shall comply with the limit specified at the edges of the ETSI mask

5.2 Test Procedure

According to TIA-603 for additional Test Set-Up procedures, the occupied bandwidth of emission was measured with a Spectrum Analyzer connected to the antenna terminal while EUT was operating in 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. Then mark the –26dB Bandwidth and record it.

5.4 Summary of Test Results/Plots

Test Channel	-26dB Bandwidth (kHz)	99% Bandwidth(kHz)	Limit (kHz)	Result
Low	84.66	76.562	200	Pass
Middle	133.50	81.255	200	Pass
High	140.40	87.898	200	Pass

Low	
Middle	
High	

5. RADIATED SPURIOUS EMISSION

5.1 Standard Applicable

According to FCC 15.236(g), emission within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the Spurious emissions in Section 8.4 of ETSI EN 300422-1. Emissions outside this band shall comply with the limit specified at the edges of the ETSI mask.

5.2 Test Procedure

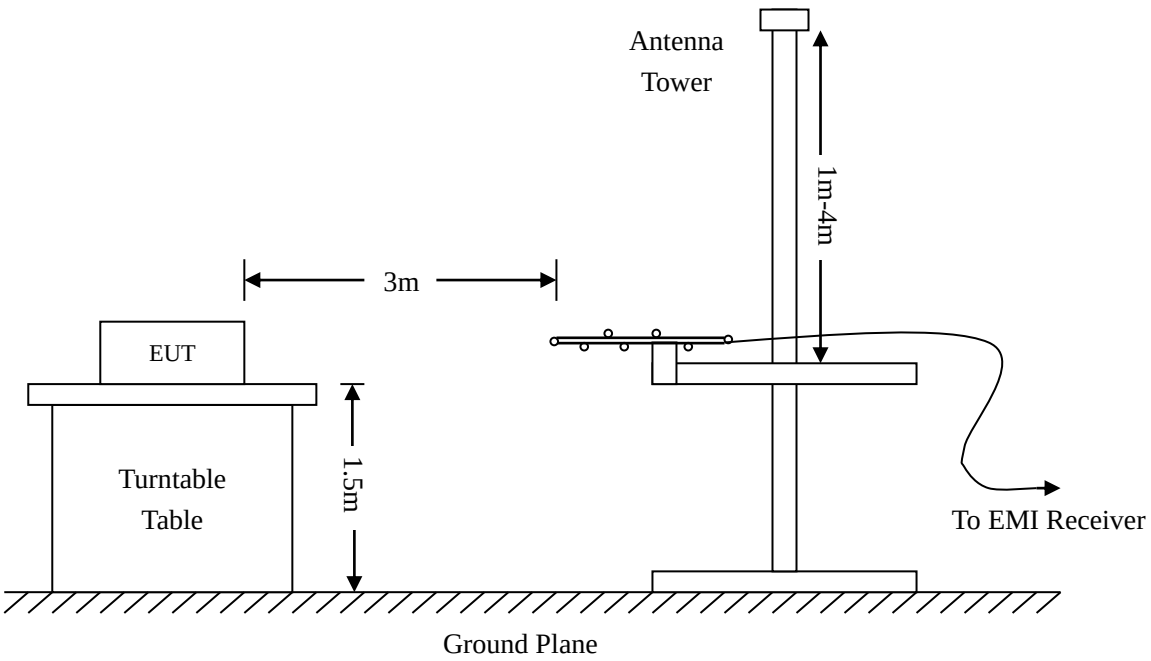
The setup of EUT is according with per TIA/EIA Standard 603 and ANSI C63.4-2014 measurement procedure.

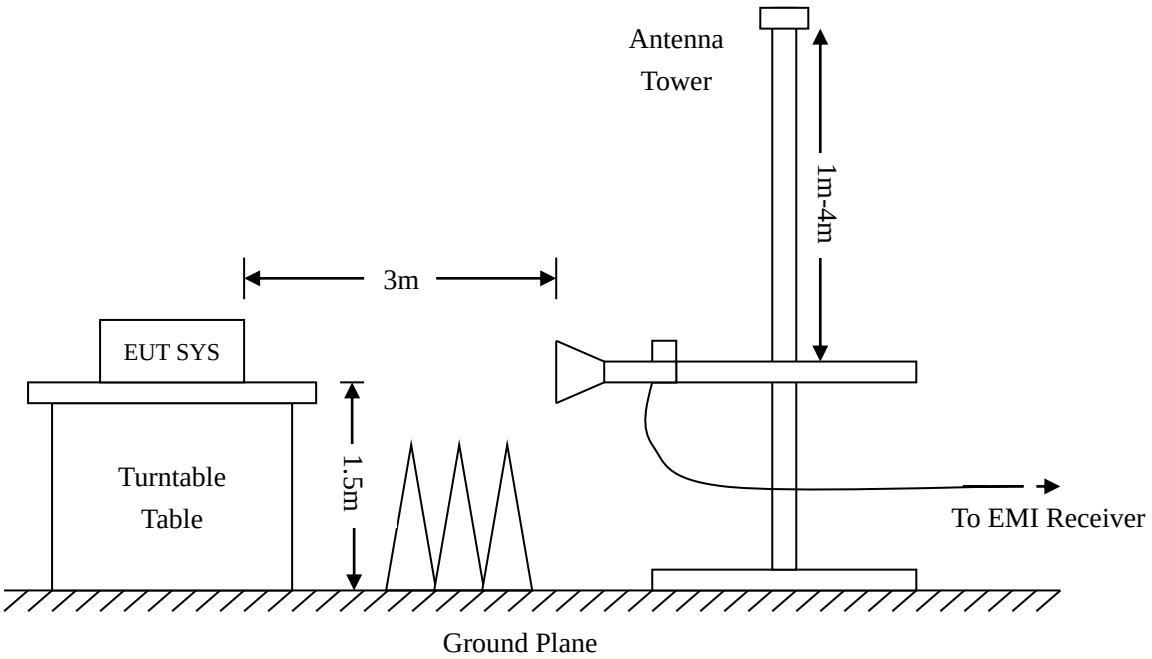
The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious attenuation limit in dB = 43 + 10 Log_{10} (power in Watts)



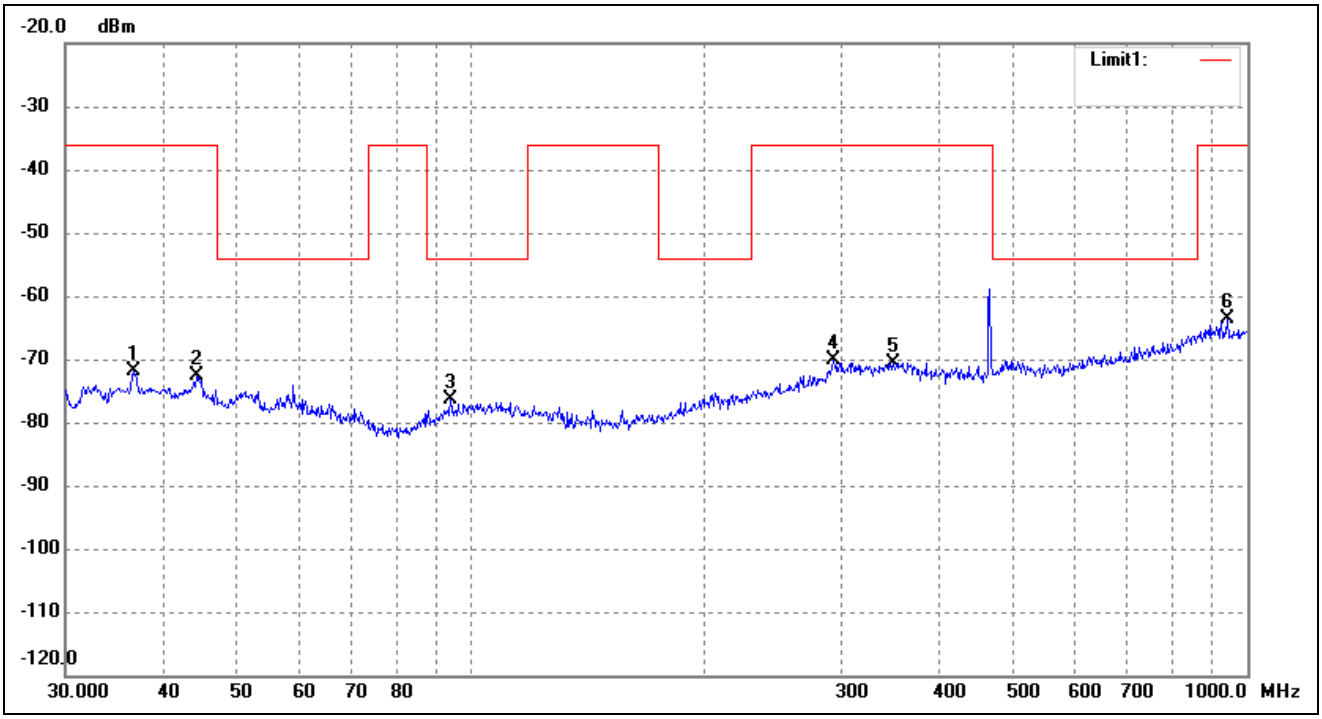


Frequency :9kHz-30MHz	Frequency :30MHz-1GHz	Frequency :Above 1GHz
RBW=10KHz,	RBW=120KHz,	RBW=1MHz,
VBW =30KHz	VBW=300KHz	VBW=3MHz(Peak), 10Hz(AV)
Sweep time= Auto	Sweep time= Auto	Sweep time= Auto
Trace = max hold	Trace = max hold	Trace = max hold
Detector function = peak	Detector function = peak, QP	Detector function = peak, AV

5.3 Summary of Test Results/Plots

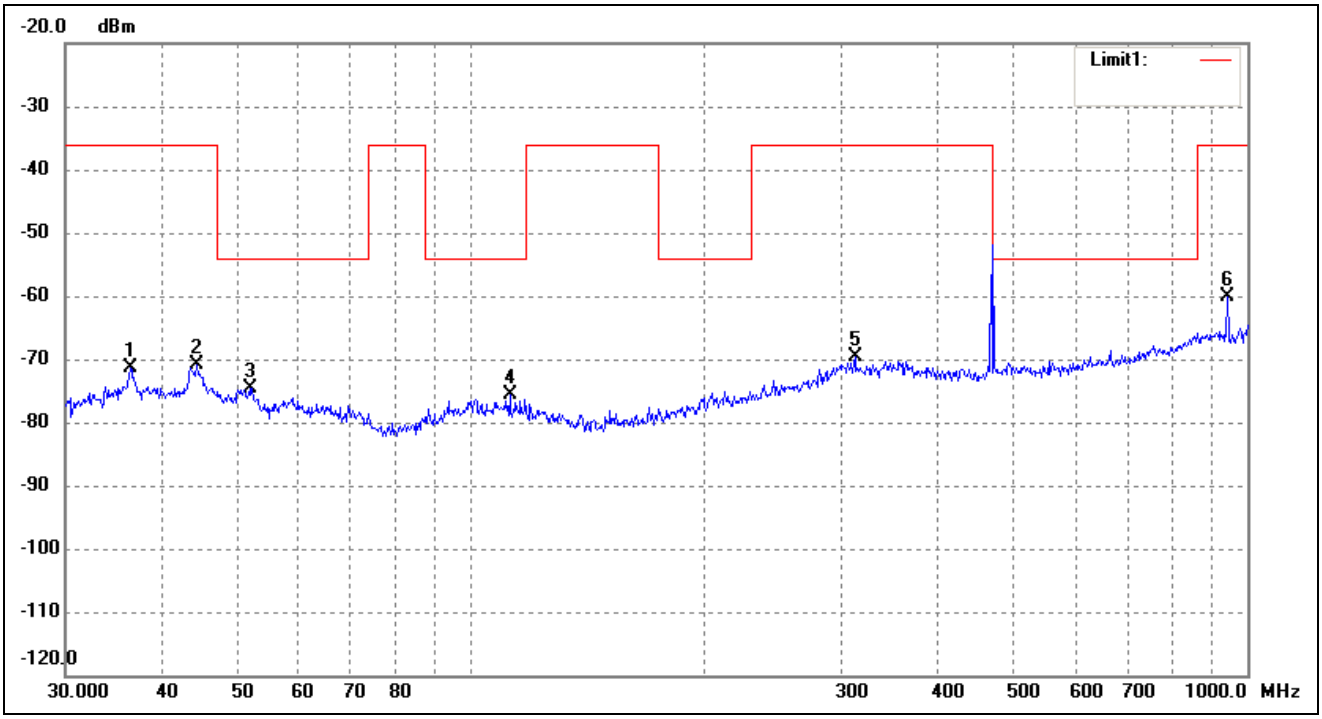
According to the data below, the FCC Part 15.236 standards, and had the worst margin of:

Test Channel	Low	Polarity:	Horizontal



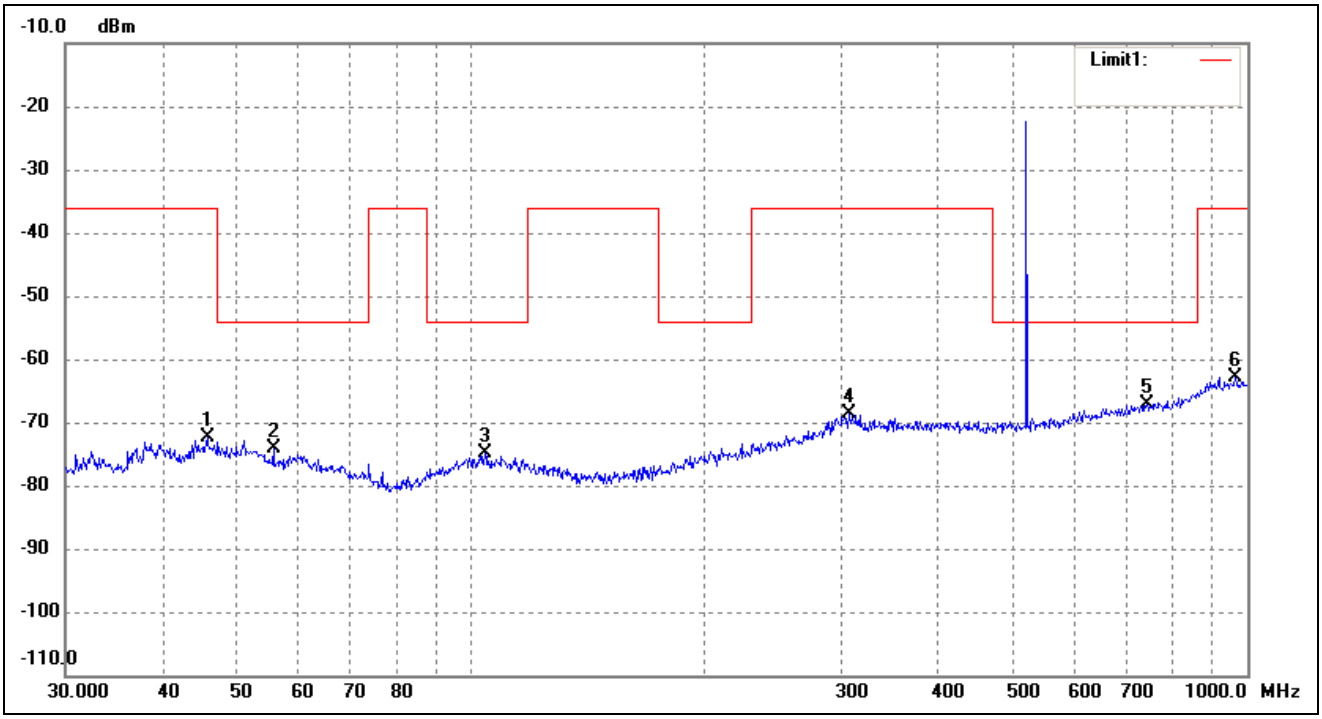
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	( )	(cm)	
1	36.7662	-68.38	-3.60	-71.98	-36.00	-35.98	315	100	peak
2	44.2752	-70.34	-2.17	-72.51	-36.00	-36.51	132	100	peak
3	94.0979	-72.02	-4.30	-76.32	-54.00	-22.32	89	100	peak
4	293.0842	-73.39	3.38	-70.01	-36.00	-34.01	123	100	peak
5	349.2500	-74.70	4.19	-70.51	-36.00	-34.51	191	100	peak
6	940.2500	-74.51	10.78	-63.73	-36.00	-27.73	303	100	peak

Test Channel	Low	Polarity:	Vertical



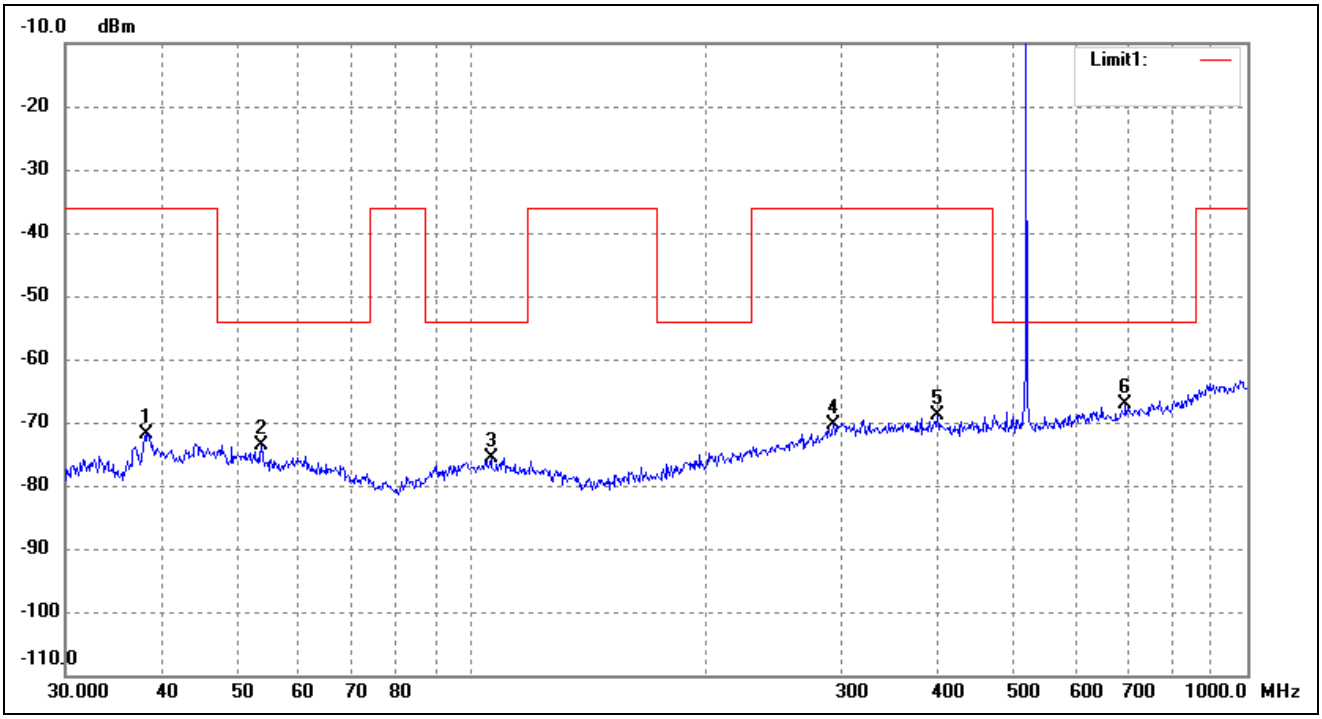
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	( )	(cm)	
1	36.3814	-67.51	-3.75	-71.26	-36.00	-35.26	55	100	peak
2	44.2752	-68.67	-2.17	-70.84	-36.00	-34.84	125	100	peak
3	51.8430	-72.25	-2.36	-74.61	-54.00	-20.61	67	100	peak
4	112.1305	-72.48	-3.16	-75.64	-54.00	-21.64	127	100	peak
5	312.1794	-73.35	3.65	-69.70	-36.00	-33.70	148	100	peak
6	942.1305	-70.83	10.75	-60.08	-36.00	-24.08	171	100	peak

Test Channel	Middle	Polarity:	Horizontal



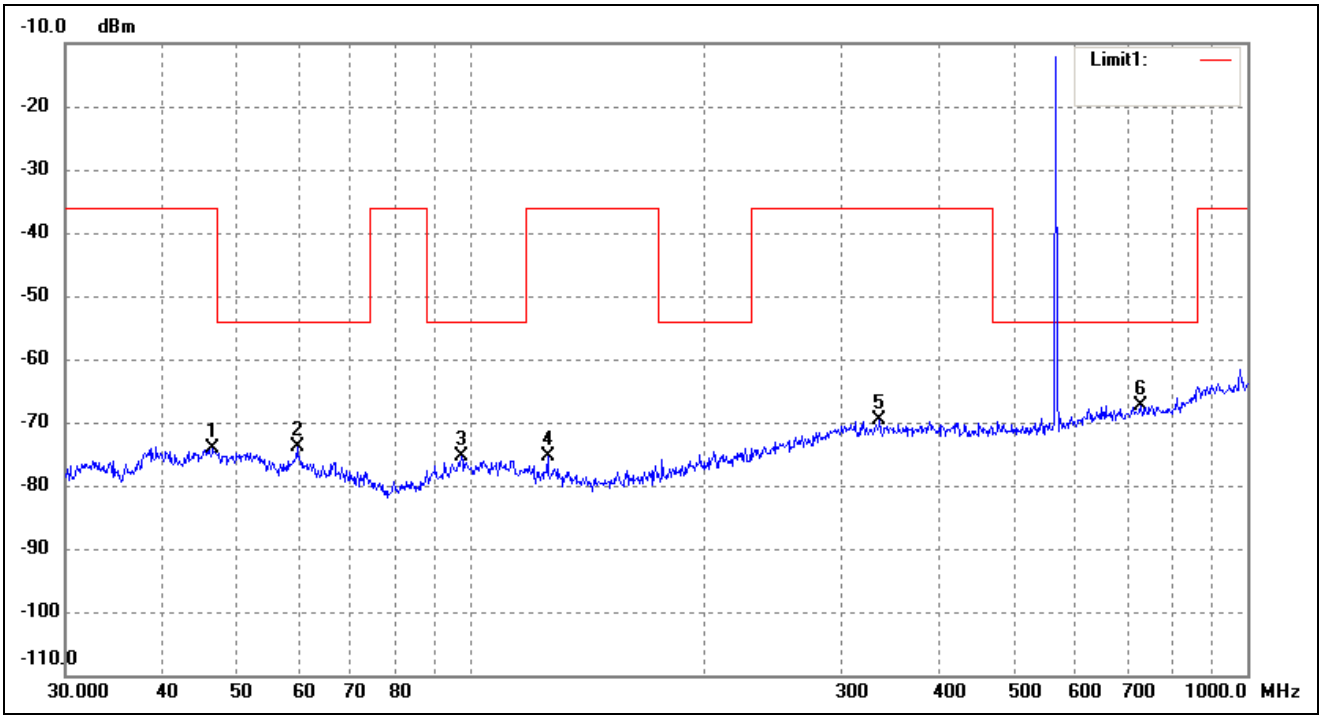
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	( )	(cm)	
1	45.6948	-70.38	-2.09	-72.47	-36.00	-36.47	276	100	peak
2	55.6094	-70.77	-3.29	-74.06	-54.00	-20.06	158	100	peak
3	104.1701	-71.80	-3.06	-74.86	-54.00	-20.86	63	100	peak
4	306.7537	-72.52	3.80	-68.72	-36.00	-32.72	115	100	peak
5	742.2587	-74.30	7.26	-67.04	-54.00	-13.04	108	100	peak
6	965.5421	-73.57	10.78	-62.79	-36.00	-26.79	191	100	peak

Test Channel	Middle	Polarity:	Vertical



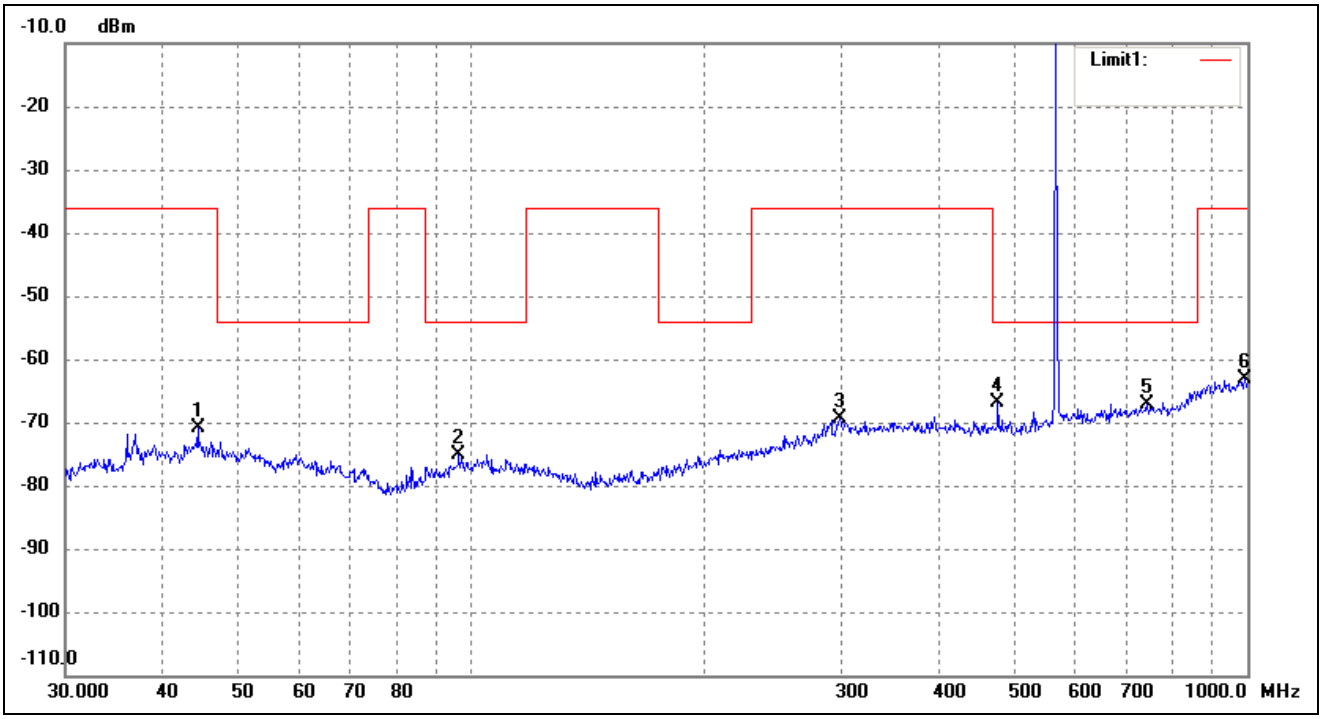
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	( )	(cm)	
1	38.2120	-68.83	-3.05	-71.88	-36.00	-35.88	294	100	peak
2	53.6932	-70.66	-2.90	-73.56	-54.00	-19.56	90	100	peak
3	106.0126	-72.59	-3.03	-75.62	-54.00	-21.62	140	100	peak
4	293.0842	-73.63	3.38	-70.25	-36.00	-34.25	100	100	peak
5	399.0302	-72.72	3.94	-68.78	-36.00	-32.78	196	100	peak
6	696.8567	-73.61	6.49	-67.12	-54.00	-13.12	335	100	peak

Test Channel	High	Polarity:	Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	( )	(cm)	
1	46.5030	-72.07	-2.05	-74.12	-36.00	-38.12	245	100	peak
2	59.6493	-70.49	-3.34	-73.83	-54.00	-19.83	134	100	peak
3	97.1148	-71.67	-3.70	-75.37	-54.00	-21.37	150	100	peak
4	125.4457	-70.22	-5.20	-75.42	-36.00	-39.42	94	100	peak
5	336.0352	-73.38	3.72	-69.66	-36.00	-33.66	334	100	peak
6	729.3583	-74.81	7.40	-67.41	-54.00	-13.41	300	100	peak

Test Channel	High	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	( )	(cm)	
1	44.4308	-68.70	-2.16	-70.86	-36.00	-34.86	162	100	peak
2	96.4362	-71.25	-3.83	-75.08	-54.00	-21.08	191	100	peak
3	298.2681	-73.14	3.83	-69.31	-36.00	-33.31	52	100	peak
4	477.1694	-70.65	3.73	-66.92	-54.00	-12.92	321	100	peak
5	742.2587	-74.27	7.26	-67.01	-54.00	-13.01	125	100	peak
6	993.0114	-74.25	11.24	-63.01	-36.00	-27.01	319	100	peak

➢ Spurious Emissions Above 1GHz

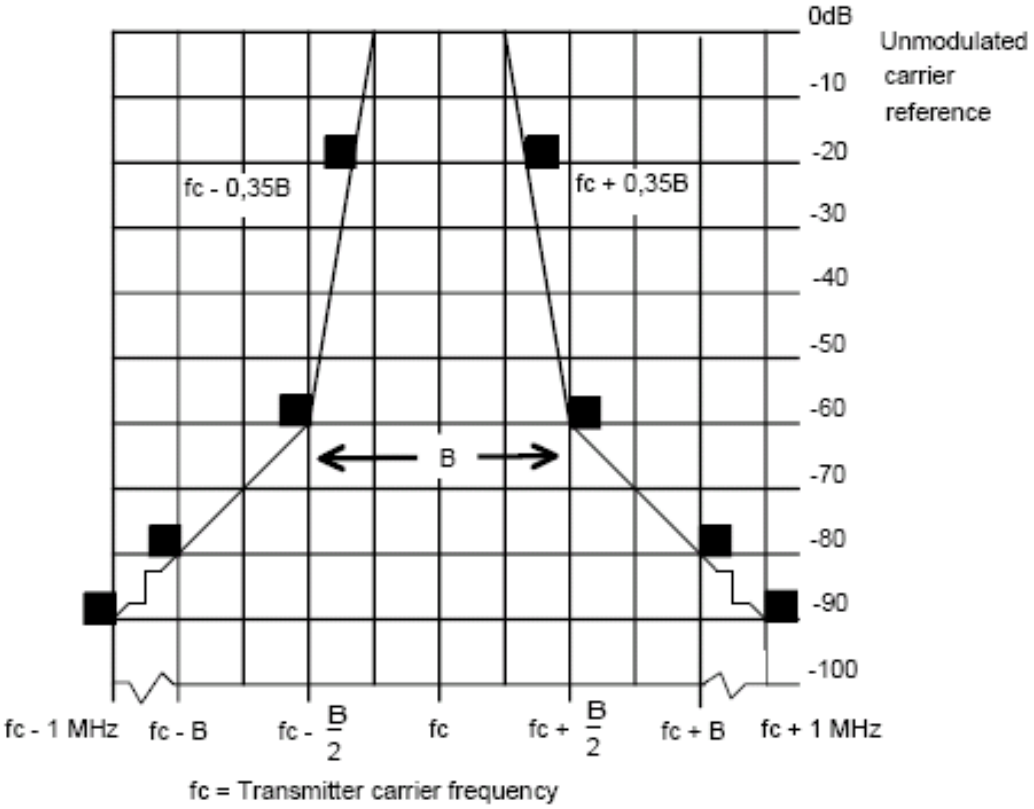
Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel						
1410.375	-54.33	-2.24	-56.57	-30.00	-26.57	H
1880.500	-53.90	3.07	-50.83	-30.00	-20.83	H
2350.625	-54.31	2.22	-52.09	-30.00	-22.09	H
1410.375	-54.82	-2.24	-57.06	-30.00	-27.06	V
1880.500	-54.92	3.07	-51.85	-30.00	-21.85	V
2350.625	-54.07	2.22	-51.85	-30.00	-21.85	V
Middle Channel						
1036	-54.20	-1.90	-56.10	-30.00	-26.10	H
1554	-54.55	-1.95	-56.50	-30.00	-26.50	H
2072	-54.44	1.66	-52.78	-30.00	-22.78	H
1036	-54.57	-1.90	-56.47	-30.00	-26.47	V
1554	-55.22	-1.95	-57.17	-30.00	-27.17	V
2072	-54.93	1.66	-53.27	-30.00	-23.27	V
High Channel						
1131.950	-54.41	-2.07	-56.48	-30.00	-26.48	H
1697.925	-54.96	-0.13	-55.09	-30.00	-25.09	H
2263.900	-55.71	2.05	-53.66	-30.00	-23.66	H
1131.950	-54.90	-2.07	-56.97	-30.00	-26.97	V
1697.925	-55.55	-0.13	-55.68	-30.00	-25.68	V
2263.900	-56.14	2.05	-54.09	-30.00	-24.09	V

6. Necessary bandwidth

6.1 Standard Applicable

According to §15.236(g), emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in §8.3 of ETSI EN 300 422-1, Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement. Emissions outside of this band shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1.

According to ETSI EN 300 422-2 V2.1.1 section 8.3, the transmitter output spectrum shall be within the mask defined in the following figure.

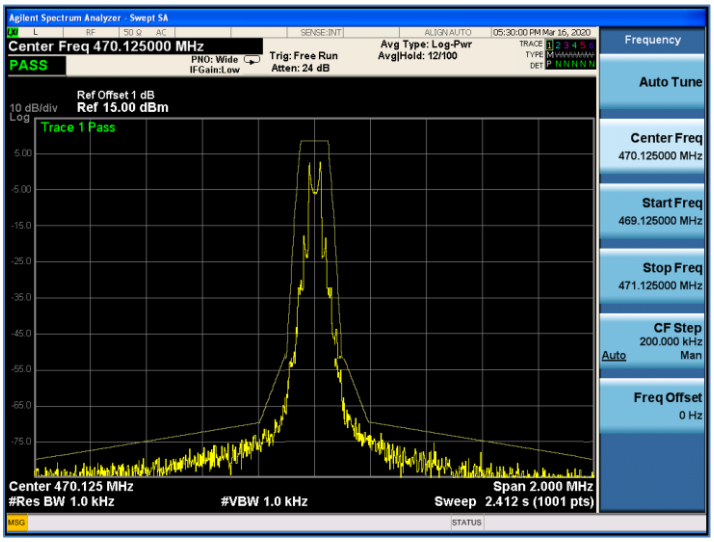
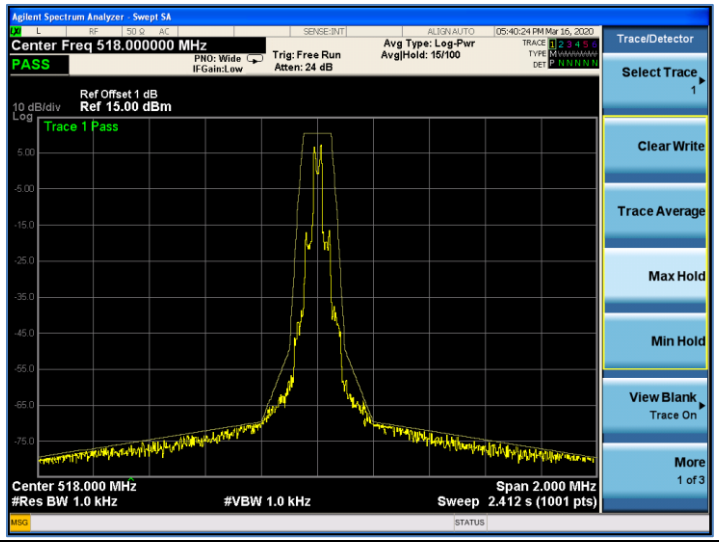
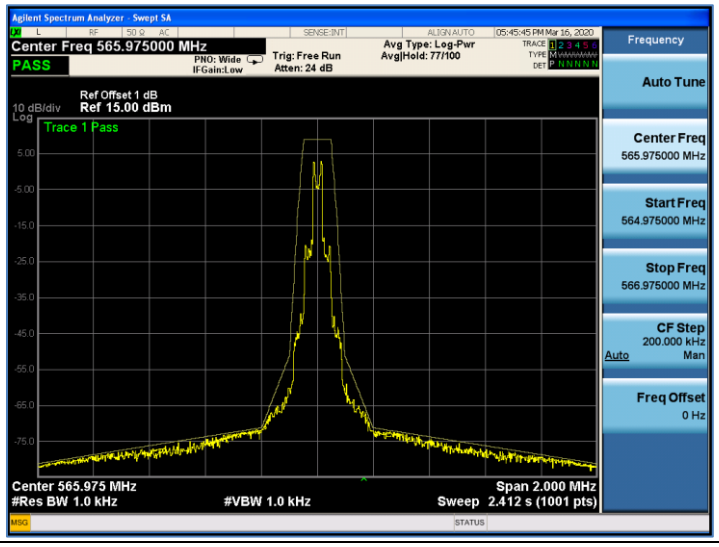


6.2 Test Procedure

Please refer to ETSI EN 300 422-2 V2.1.1 section 8.3

6.3 Summary of Test Results/Plots

Refer to the attached plots.

Low	
Middle	
High	

7. FREQUENCY STABILITY

7.1 Standard Applicable

According to FCC 15.236(f)(3), the frequency tolerance of the carrier signal shall be maintained within ±0.005% 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. Battery operated equipment shall be tested using a new battery.

7.2 Test Procedure

1. Setup the configuration of the ambient temperature form -30 ℃ to 50 ℃ with sufficient time. And measure the different power of the EUT with an artificial power from highest to end point voltage.
2. Set frequency counter center frequency to the right frequency needs to be measured.

7.3 Test Results/Plots

Worst case at middle channel					
Voltage(%)	Power(VDC)	TEMP(℃)	Freq.Dev(Hz)	Deviation(ppm)	Limit(ppm)
100%	1.5	-30	986	1.903	±50
100%		-20	975	1.882	±50
100%		-10	959	1.851	±50
100%		0	997	1.925	±50
100%		+10	961	1.855	±50
100%		+20	1000	1.931	±50
100%		+30	979	1.890	±50
100%		+40	945	1.824	±50
100%		+50	965	1.863	±50
Low Battery power	1.35	+20	934	1.803	±50
High Battery power	1.65	+20	978	1.888	±50

******* END OF REPORT *******