TIMCO ENGINEERING, Inc.

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FCC PART 15.236

WIRELESS MICROPHONE

TEST REPORT

APPLICANT	**AUDIO-TECHNICA CORPORATION**
	2-46-1 NISHI-NARUSE **TOKYO, JAPAN 194-8666**
FCC ID	**JFZT3201EE1**
PRODUCT DESCRIPTION	3000 SERIES BELTPPACK WIRELESS MICROPHONE
DATE SAMPLE RECEIVED	9/27/2017
DATE TESTED	11/21/2011
TESTED BY	Tim Royer
APPROVED BY	Sid Sanders
TEST RESULTS	☒ PASS ☐ FAIL

Report Number	Version Number	Description	Issue Date
1736BUT17TestReport	Rev1	Initial Issue	11/27/2017
	Rev2	Updated emission designator	2/16/2018

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GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

Summary

The device under test does:

☒ Fulfill the general approval requirements as identified in this test report and was selected by the customer.

☐ Not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669

Tested by:
Name and Title: Tim Royer, Project Manager/Testing Engineer

Sr. EMC Engineer
EMC-003838-NE

Date: 11/27/2017

Reviewed and approved by:
Name and Title: Sid Sanders, Engineer

Date: 11/30/2017

GENERAL INFORMATION
RULES PART 2.1033

TECHNICAL DESCRIPTION

The test results relate only to the items tested.	
EUT Description	3000 SERIES BELTPPACK WIRELESS MICROPHONE
FCC ID	JFZT3201EE1
Modulation	FM
Type of Emission	88K0F3E
Frequency Range	530 – 590 MHz
Test Frequencies	530, 560 & 589.97 MHz
Maximum Output Power	30mW
EUT Power Source	☐ 110–120Vac/50– 60Hz
	☐ DC Power
	☒ Battery Operated Exclusively
Test Item	☐ Prototype
	☒ Pre-Production
	☐ Production
Type of Equipment	☐ Fixed
	☐ Mobile
	☒ Portable

GENERAL INFORMATION

Test Facility	**Timco Engineering, Inc. 849 NW State Road 45, Newberry, FL 32669**
Test Condition	The temperature was 26ºC with a relative humidity of 50%.
Modifications	None
Test Exercise (e.g. software description, test signal, etc.)	The EUT was placed in continuous transmit mode of operation.
Applicable Standards	TIA 603, FCC CFR 47 Parts 2 and 15

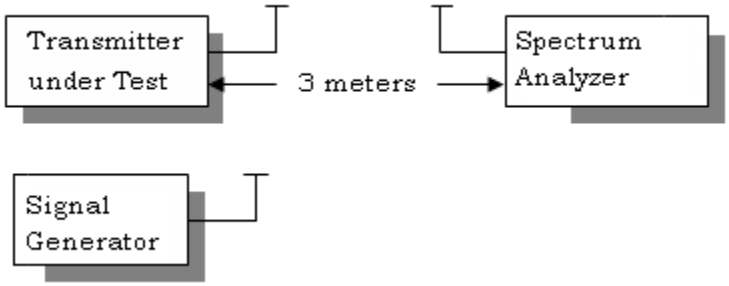
RF POWER OUTPUT

Rule Part No.: Part 2.1046 ,15.236 (d) (1)

Test Requirements: In the bands allocated and assigned for broadcast television and in the 600 MHz service band: 50 mW EIRP **;** in the Guard Band 614-617MHz the limit is 20 mW EIRP.

Method of Measurement: For a device that has a permanently attached antenna, RF power is measured as ERP. The substitution method was used. With a nominal battery voltage, and the transmitter properly adjusted, the ,RF output measures:

Test Setup Diagram:



Test Data:

OUTPUT POWER:

Emission Frequency MHz	Antenna Polarity	eirp (dBm)	Margin
530.00	H	12.5928	4.3872
530.00	V	6.2228	10.7572
560.00	V	3.6428	13.3372
560.00	H	10.8628	6.1172
589.97	H	15.2028	1.7772
589.97	V	5.0727	11.9073

Result: Meets Requirements

Test Data:

Guard Band 614-617MHz:

Emission Frequency MHz	Antenna Polarity	eirp (dBm)	Margin
653.00	H	-44.69	57.69
654.99	V	-42.02	55.02
660.04	V	-41.84	54.84
653.15	V	-43.71	56.71
656.00	V	-43.90	56.90
660.03	V	-41.02	54.02
652.88	V	-43.79	56.79
656.74	V	-43.39	56.39
660.03	V	-40.99	53.99

Result: Meets Requirements

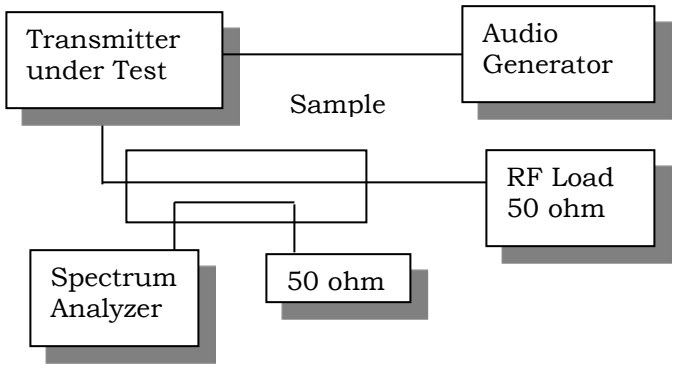
Frequency Selection

Rule Part No.: 15.236 (f) (1)

Test Requirements: The frequency selection shall be offset from the upper or lower band limits by 25 kHz or an integral multiple thereof.470 – 608 MHz , and 614-698 MHz.

Method of Measurement: For a device that has a permanently attached antenna, RF power is measured radiated. With a nominal battery voltage, and the transmitter properly adjusted, the ,RF output measures:

Test Setup Diagram:



Test Data:

Frequency Range
470 - 608 MHz

Low Frequency	530	MHz
High Frequency	589.975	MHz

Result: Meets Requirements

MODULATION CHARACTERISTICS

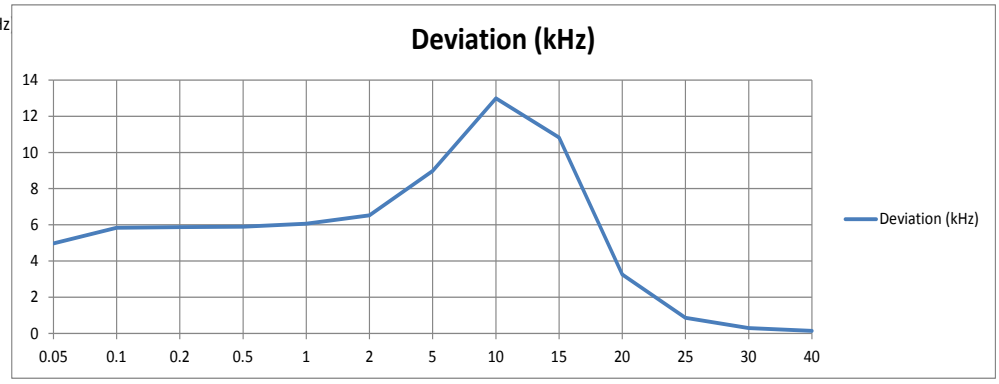
Rule Part No.: Part 2.1047(b)(d)

Test Requirements:

Method of Measurement: ANSI/TIA 603-D.

1736AUT17 Testing at 1 Vpp

Audio In (k	Deviation (kHz
0.05	4.98
0.1	5.84
0.2	5.87
0.5	5.9
1	6.06
2	6.52
5	8.98
10	12.99
15	10.82
20	3.26
25	0.87
30	0.3
40	0.15



NOTES: 2.1047(b) - EUT does not employ Modulation limiting.

2.1047(d) - EUT is tested as a 15.236 device, which has no specific requirement for Modulation Characteristics.

90.214 - Transient Frequency Response does not apply to EUT. The EUT exhibits transmissions immediately when powered-on, continuously without interruptior

Result: Meets Requirements

MODULATION CHARACTERISTICS

Rule Part No.: Part 2.1033(c) (4)

Test Data:

The 99 % bandwidth is 87.9 kHz. 88k0F3E

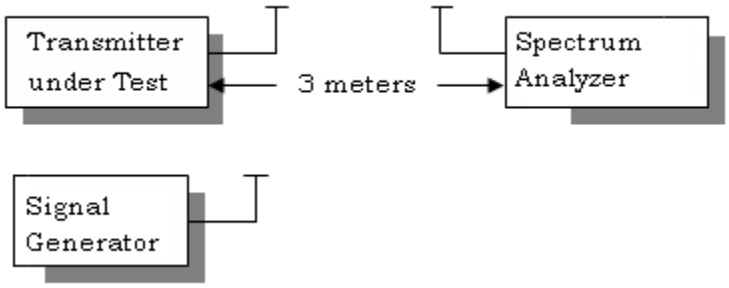
OCCUPIED BANDWIDTH

Rules Part No.: FCC Part 15.236

Requirements: 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.

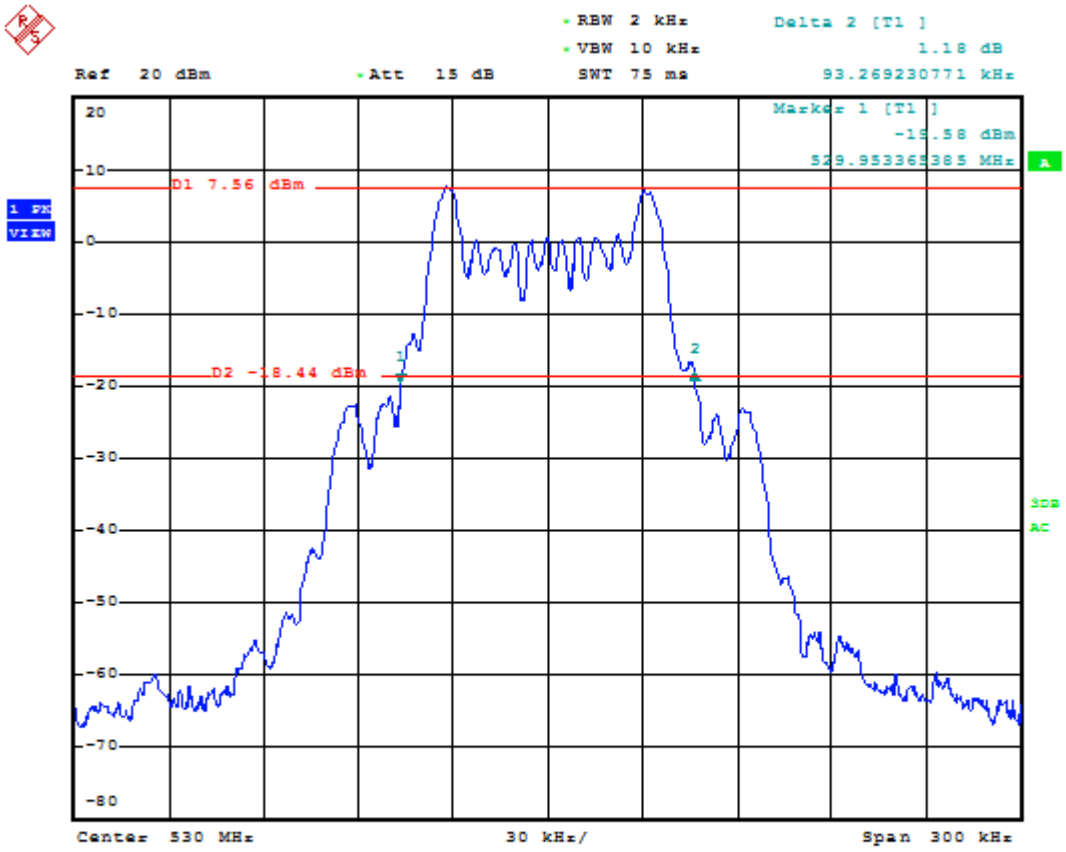
Measurement Procedure: ANSI C63.26 sec. 5.4.3

Test Setup Diagram:



OCCUPIED BANDWIDTH (26 dB)

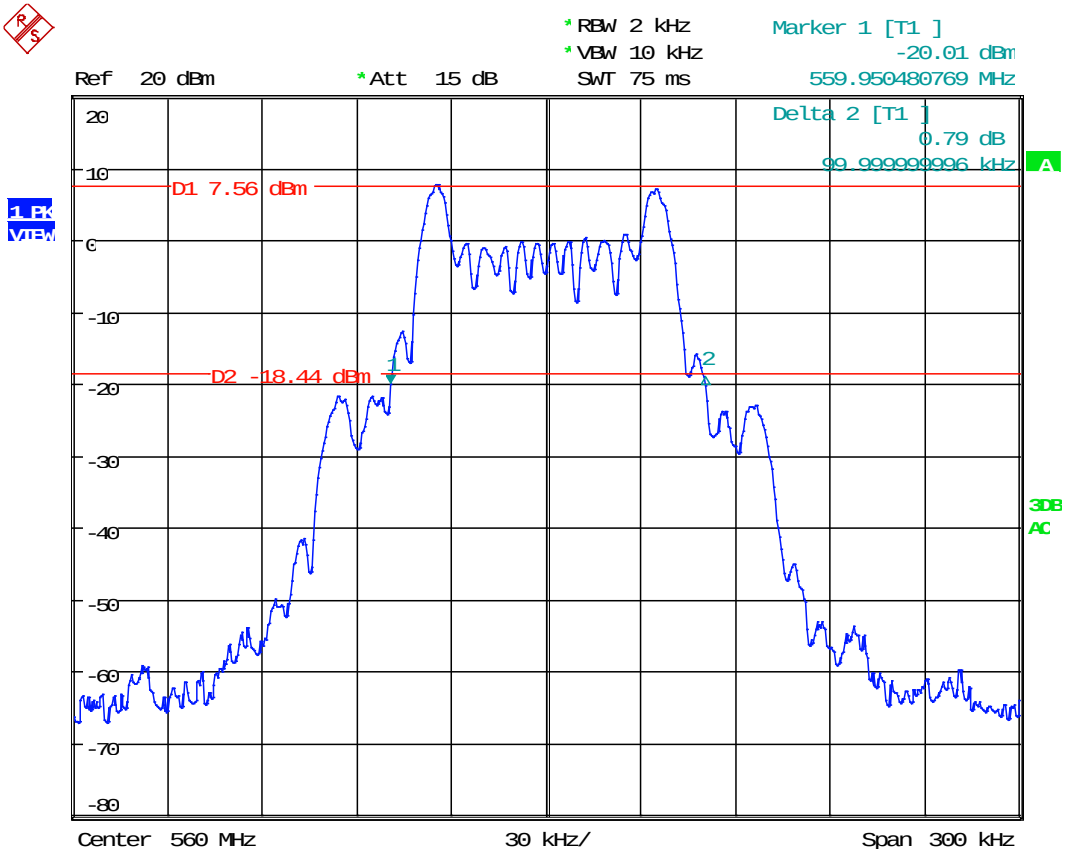
Test Data: 530 MHz



Date: 25.OCT.2017 13:59:52

OCCUPIED BANDWIDTH PLOT (26 dB)

Test Data: 560 MHz



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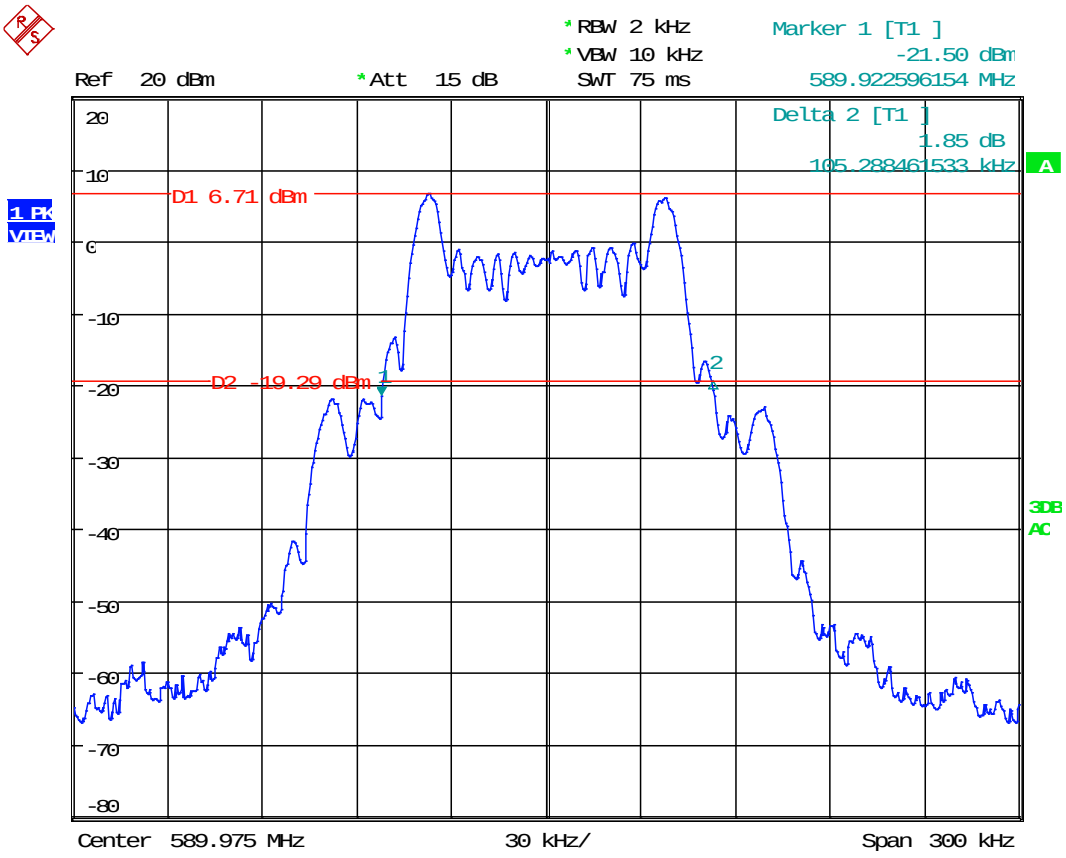
OCCUPIED BANDWIDTH PLOT (26 dB)

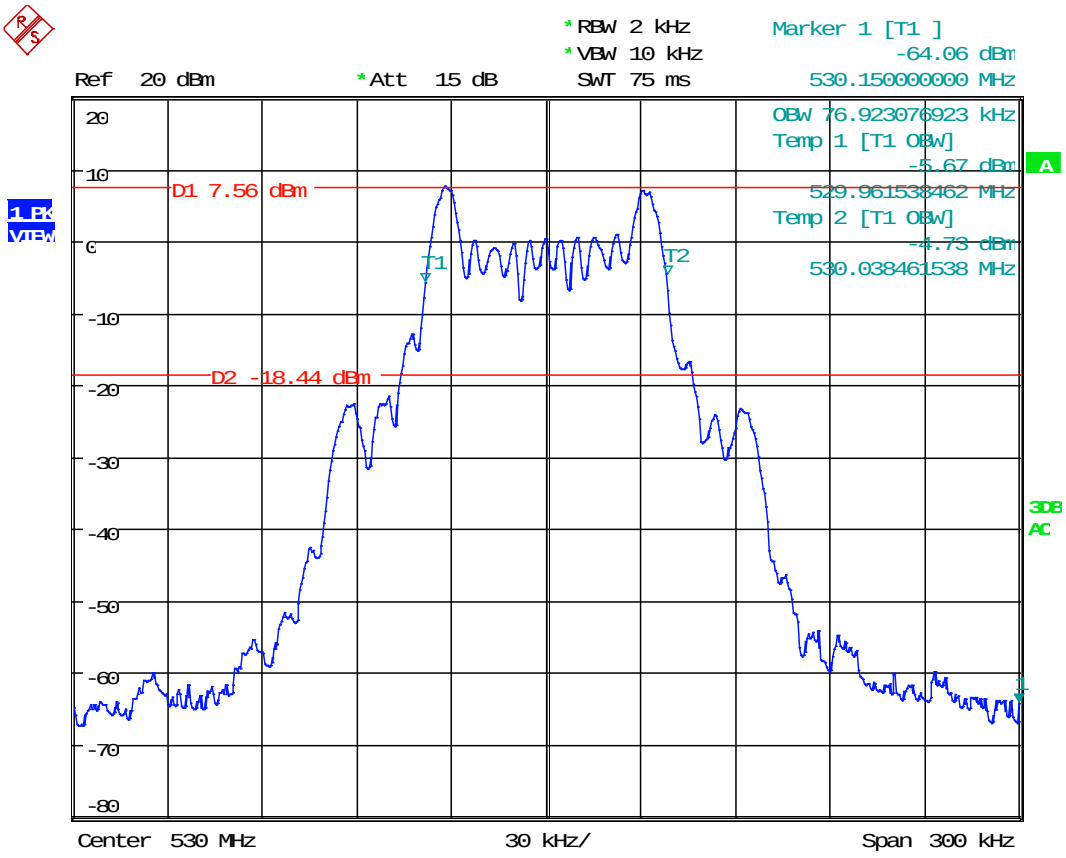
Test Data: 589.975 MHz



Date: 25.OCT.2017 14:03:19

OCCUPIED BANDWIDTH (99%)

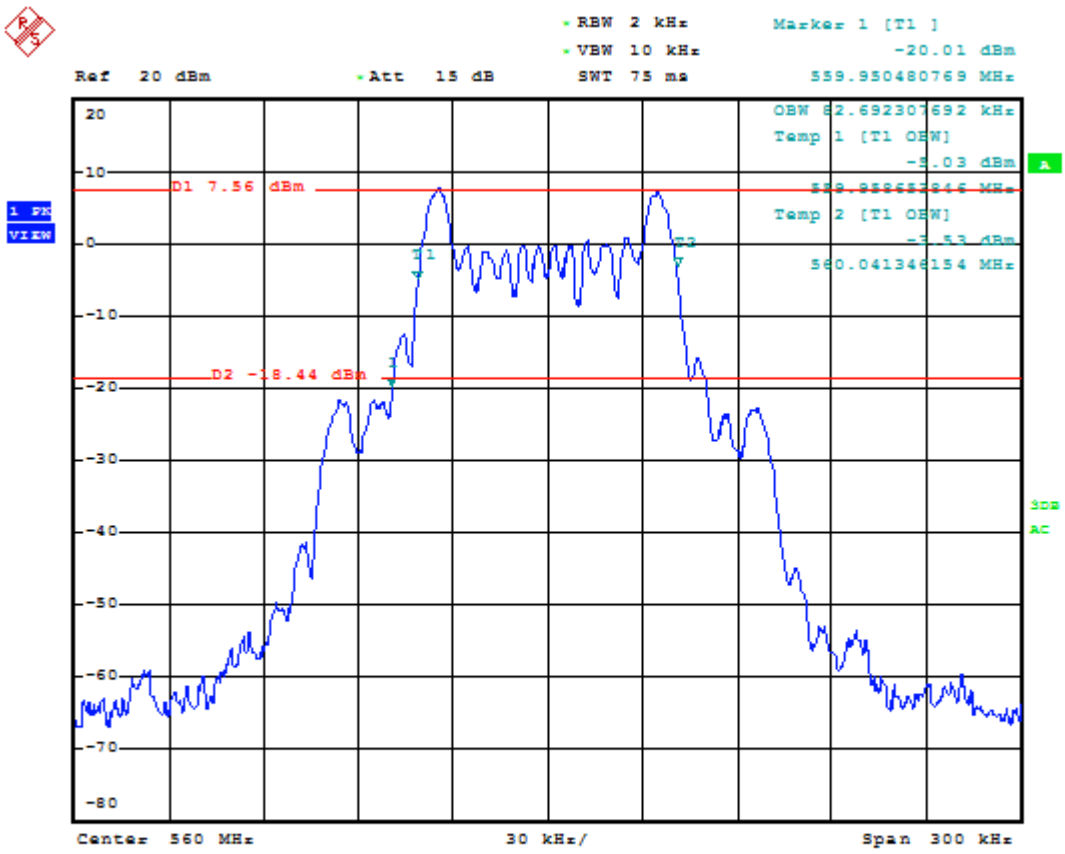
Test Data: 530 MHz



Date: 25.OCT.2017 13:59:27

OCCUPIED BANDWIDTH PLOT (99%)

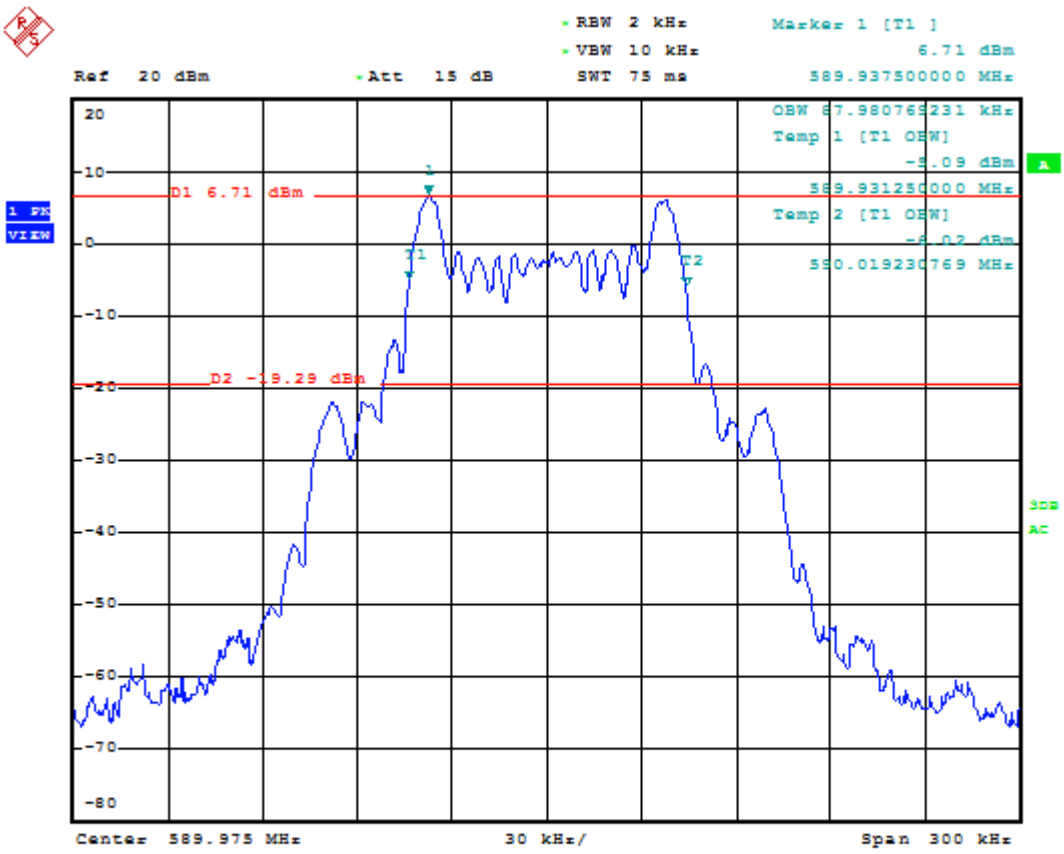
Test Data: 560 MHz



Date: 25.OCT.2017 13:58:16

OCCUPIED BANDWIDTH PLOT (99%)

Test Data: 598.975 MHz



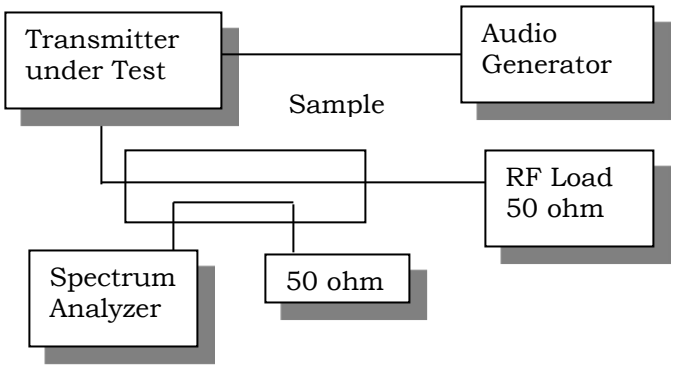
Date: 25.OCT.2017 14:03:45

OCCUPIED BANDWIDTH

Rules Part No.: FCC Part 15.236 (g)

Requirements: 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 V1.4.2 (2011-08), *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*.

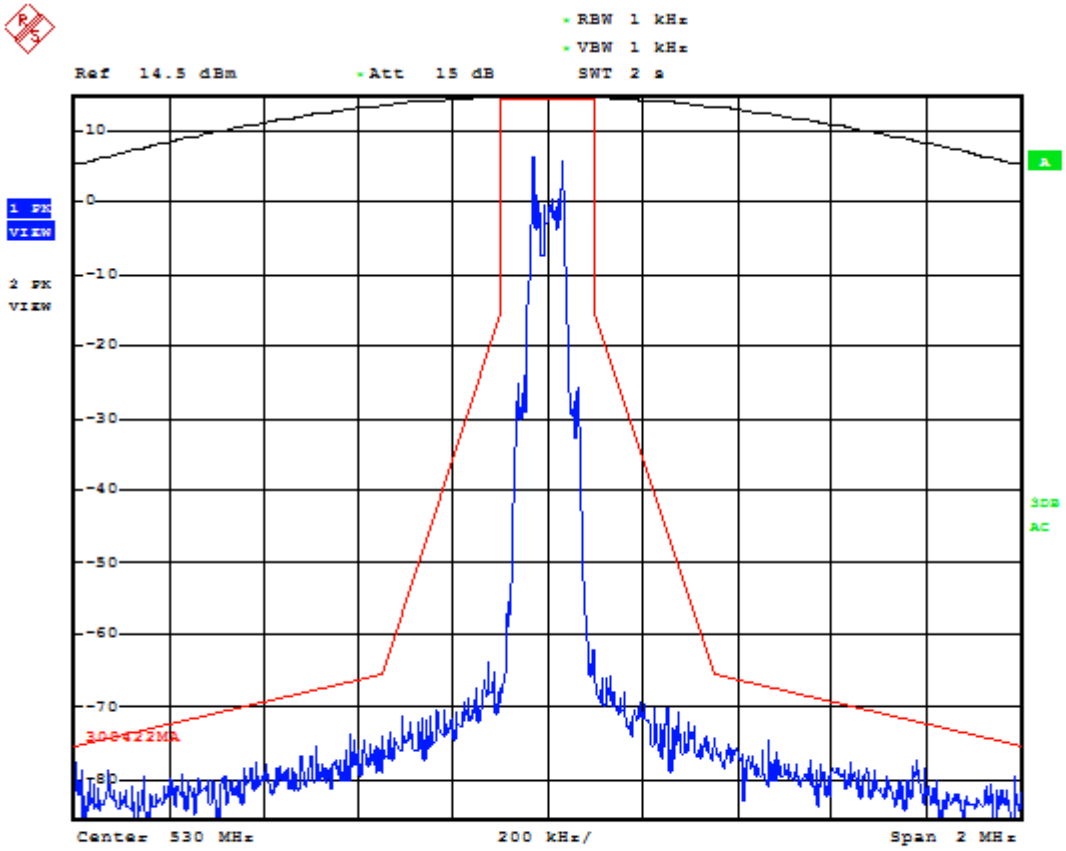
Emissions outside of this band shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 V1.4.2 (2011-08).



OCCUPIED BANDWIDTH MEASUREMENT

OCCUPIED BANDWIDTH PLOT

Test Data: Low End of Band

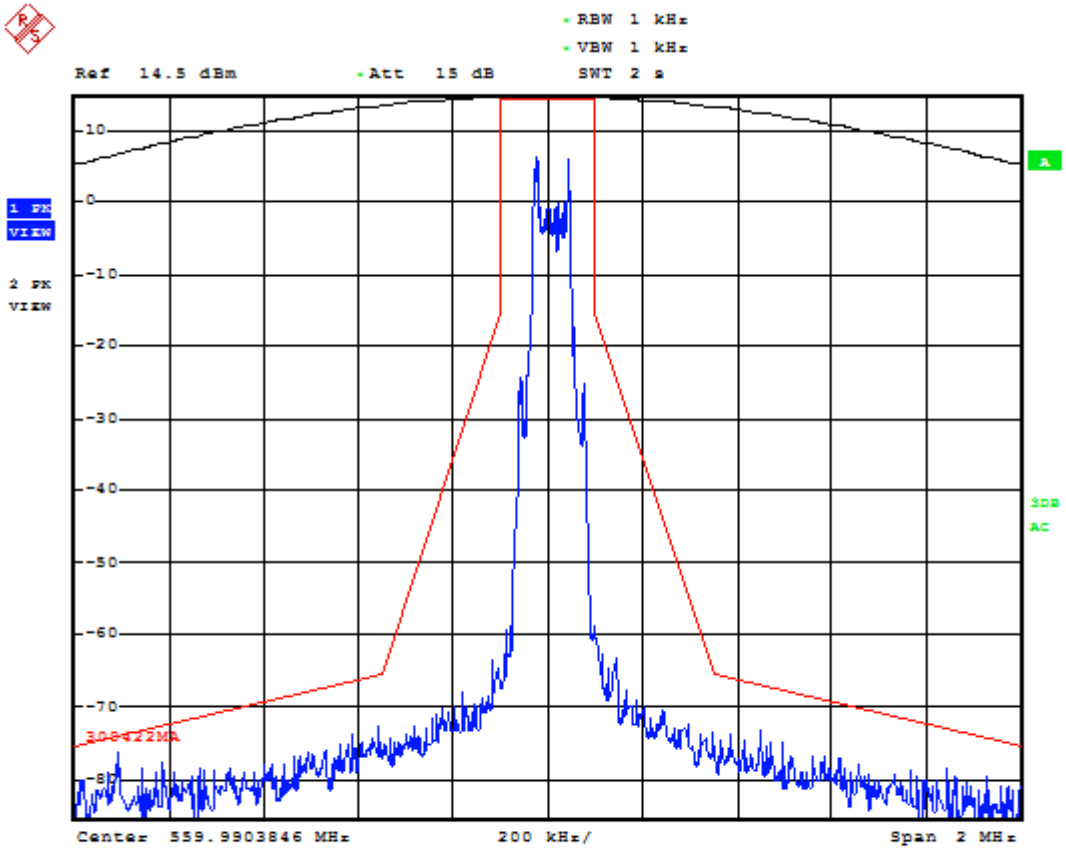


Date: 25.OCT.2017 14:13:23

Result: Meets Requirements

OCCUPIED BANDWIDTH PLOT

Test Data: Middle of Band

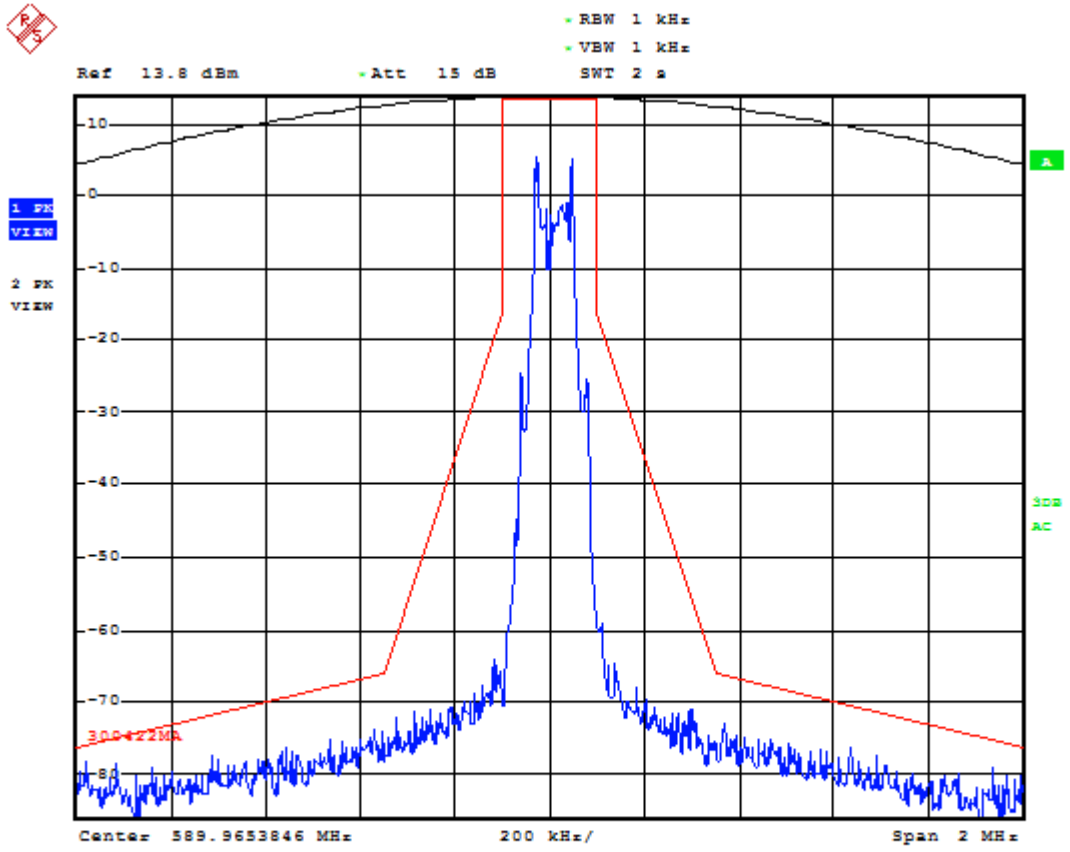


Date: 25.OCT.2017 14:12:44

Result: Meets Requirements

OCCUPIED BANDWIDTH PLOT

Test Data: High End of Band



Date: 25.OCT.2017 14:11:26

Result: Meets Requirements

FIELD STRENGTH OF SPURIOUS EMISSIONS

Rules Part No.: FCC Part 15.236 (g)

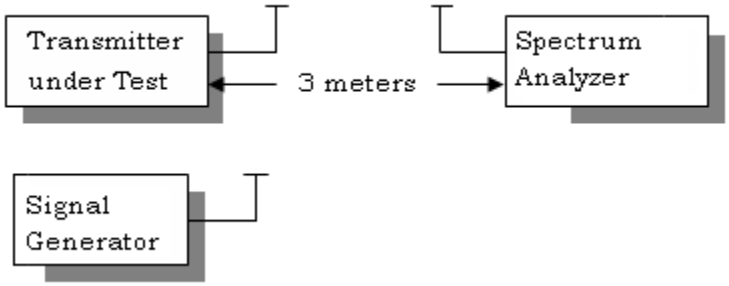
Requirements: Emissions outside of this band shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 V1.4.2 (2011-08).

State	Frequency		
	47 MHz to 74 MHz 87,5 MHz to 137 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other Frequencies below 1 000 MHz	Frequencies above 1 000 MHz
Operation	4 nW	250 nW	1 µW
Standby	2 nW	2 nW	20 nW

METHOD OF MEASUREMENTS: The measuring receiver, as defined in table 4, shall be tuned over the frequency range 25 MHz to 4 GHz for equipment operating on frequencies below 1 GHz or in the frequency range of 25 MHz to 12,75 GHz for equipment operating on frequencies above 1 GHz.

Measurements were made at the test site of **Timco Engineering, Inc. located at 849 NW State Road 45, Newberry, FL 32669.**

Test Setup Diagram:



FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data:

Tuned Freq MHz	Emission Frequency MHz	Antenna Polarity	erp (dBm)	Margin
530.00	1682.60	H	-42.3285	18.36
530.00	1836.50	V	-35.9272	11.96
530.00	2225.90	H	-31.5787	7.61
560.00	2414.46	H	-28.4328	4.46
560.00	2817.30	V	-27.6182	3.65
589.98	1384.60	H	-38.4595	14.49
589.98	2427.80	V	-25.7294	1.76

Result: Meets Requirements

FREQUENCY STABILITY

Rule Parts. No.: Part 2.1055, Part 74.861

Requirements: Temperature and voltage tests were performed to verify that the frequency remains within the .0050%,(50 ppm)

Method of Measurements: ANSI/TIA 603-C: 2004.

The test was conducted as follows: The transmitter was placed in the temperature chamber at 25 ºC and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15-second intervals. The worst case number used in the table below. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -20 ºC after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15-second intervals. The worst-case number was again used in the table below. This procedure was repeated in 10-degree increments up to + 50 ºC.

Test Data:

Temperature	Frequency MHz	Hz	PPM
25°C (reference)	589.97402		
-30°C	589.97432	300	0.508
-20°C	589.9743	280	0.475
-10°C	589.97405	30	0.051
0°C	589.97401	-10	-0.017
10°C	589.97405	30	0.051
20°C	589.97402	0	0.000
30°C	589.97399	-30	-0.051
40°C	589.97399	-30	-0.051
50°C	589.97397	-50	-0.085
Battery Voltage	Frequency	Hz	PPM
-15%	589.97397	-50	-0.085
15%	589.97419	170	0.288

Result: Meets Requirements

STATE OF THE MEASUREMENT UC

The data and results referenced in this document are true and accurate. The measurement uncertainty was calculated for all measurements listed in this test report according To CISPR 16–4 or ENTR 100-028 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: "Uncertainty in EMC Measurements" and is documented in the Timco Engineering, Inc. quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.
Hereafter the best measurement capability for Timco Engineering, Inc. is reported:

Test Items	Measurement Uncertainty	Notes
RF Frequency Accuracy	± 49.5 Hz	(1)
RF Conducted Power	±0.93dB	(1)
Conducted spurious emission of transmitter valid up to 40GHz	±1.86dB	
Occupied Bandwidth	±2.65%	
Audio Frequency Response	±1.86dB	
Modulation limiting	±1.88%	
Radiated RF Power	±1.4dB	
Maximum frequency deviation: Within 300 Hz and 6kHz of audio freq. Within 6kHz and 25kHz of audio Freq.	 ±1.88% ±2.04%	
Rad Emissions Sub Meth up to 26.5GHz	±2.14dB	
Adjacent channel power	±1.47dB	(1)
Transient Frequency Response	±1.88%	
Temperature	±1.0°C	(1)
Humidity	±5.0%	

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Antenna: Biconical 1096	Eaton	94455-1	1096	08/01/17	08/01/19
Antenna: Log-Periodic 1122	Electro-Metrics	LPA-25	1122	07/26/17	07/26/19
Temperature Chamber LARGE	Tenney Engineering	TTRC	11717-7	09/01/16	09/01/18
Frequency Counter	HP	5385A	2730A03025	11/08/17	11/08/18
CHAMBER	Panashield	3M	N/A	04/25/16	12/31/17
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren	3117	00041534	03/01/17	03/01/19
Software: Field Strength Program	Timco	N/A	Version 4.10.7.0	N/A	N/A
Antenna: Active Loop	ETS-Lindgren	6502	00062529		
Type K J Thermometer	Martel	303	080504494	11/06/17	11/06/19
Modulation Analyzer	HP	8901A	3050A05856	04/13/17	04/13/19
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	04/01/16	04/01/18
Coaxial Cable - Chamber 3 cable set (Primary)	Micro-Coax	Chamber 3 cable set (Primary)	KMKM-0244-01; KMKM-0670-00; KFKF-0198-01	08/09/16	08/09/18
Function Generator	Standford	DS340	25200	02/02/16	02/02/18
Bore-sight Antenna Positioning Tower	Sunol Sciences	TLT2	N/A	N/A	N/A

***EMI RECEIVER SOFTWARE VERSION**

The receiver firmware used was version 4.43 Service Pack 3

End of REPORT