

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 74 SUBPART H REQUIREMENT**

For

Wireless Microphone

MODEL No.: R30D

FCC ID: 2AMEV-R30D

Trademark: N/A

REPORT NO.: ES170605010E

ISSUE DATE: June 12, 2017

Prepared for

NINGBO LISOUND AUDIO EQUIPMENT CO., LTD

No.77 Shipo Bridge Eastern Road, Yuyao Economic Development Zone,
Ningbo, China

Prepared by

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1 TEST RESULT CERTIFICATION

Applicant:	NINGBO LISOUND AUDIO EQUIPMENT CO., LTD No.77 Shipo Bridge Eastern Road, Yuyao Economic Development Zone, Ningbo, China
Manufacturer:	NINGBO LISOUND AUDIO EQUIPMENT CO., LTD No.77 Shipo Bridge Eastern Road, Yuyao Economic Development Zone, Ningbo, China
Product Description:	Wireless Microphone
Model Number:	R30D
File Number:	ES170605010E
Date of Test:	May 15, 2017 to June 9, 2017

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC Part 74.861e: 2016	PASS

The above equipment was tested by EMTEK (SHENZHEN) CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI EIA/TIA 603-D:2010 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 74 Subpart H.

The test results of this report relate only to the tested sample identified in this report

Date of Test : May 15, 2017 to June 9, 2017

Prepared by :

Joanna Jiao

Joanna Jiao /Editor

Reviewer :

Joe Xia

Joe Xia /Supervisor

Approve & Authorized Signer :

[Signature]

Lisa Wang/Manager



2 EUT TECHNICAL DESCRIPTION

Characteristics	Description
Product	Wireless Microphone
Device Type	R30D
Modulation:	FM
Operating Frequency Range(s):	202.9MHz
Number of Channels:	1
Frequency Adjustment	Fixed
Transmit Power Max:	-2.94dBm
Antenna Type	Spring antenna
Antenna Gain	0dBi
Power supply	<input checked="" type="checkbox"/> 3.0Vdc by 2 AA Batteries <input type="checkbox"/> DC 19V from adapter
	<input type="checkbox"/> Adapter:

Note: for more details, please refer to the User's manual of the EUT.

3 SUMMARY OF TEST RESULT

FCC Part Clause	Test Parameter	Verdict	Remark
74.861 e) 1)	Carrier Radiated Power	PASS	
74.861 e) 3)	Modulation Deviation	PASS	
74.861 e) 4)	Frequency Stability	PASS	
74.861 e) 5)	Operating Bandwidth	PASS	
74.861 e) 6)	Unwanted Radiation	PASS	
74.861 d) 3)	Radiated Spurious Emission	PASS	

RELATED SUBMITTAL(S) / GRANT(S):

This submittal(s) (test report) is intended for FCC ID: 2AMEV-R30D filing to comply with FCC Part 74, Subpart H Rules.

4 TEST METHODOLOGY

4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:
 FCC 47 CFR Part 74, Subpart H
 FCC CFR 47 2.1046, 2.1047, 2.1051, 2.1053, 2.1055 and 2.1057
 ANSI EIA/TIA 603-D:2010

4.2 MEASUREMENT EQUIPMENT USED

4.2.1 Radiated Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	05/20/2017
Pre-Amplifier	HP	8447D	2944A07999	05/20/2017
Bilog Antenna	Schwarzbeck	VULB9163	142	05/20/2017
Loop Antenna	ARA	PLA-1030/B	1029	05/20/2017
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	05/20/2017
Horn Antenna	Schwarzbeck	BBHA 9120	D143	05/20/2017
Cable	Schwarzbeck	AK9513	ACRX1	05/20/2017
Cable	Rosenberger	N/A	FP2RX2	05/20/2017
Cable	Schwarzbeck	AK9513	CRPX1	05/20/2017
Cable	Schwarzbeck	AK9513	CRRX2	05/20/2017

4.2.2 Radio Frequency Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.
Spectrum Analyzer	Rohde & Schwarz	FSV40	100967	05/20/2017
Audio Signal Generator	HP	3325A	2561540502	05/20/2017
DC source	Kewell	KGSD-100KW	658000000029	05/20/2017
Temp. / Humidity Chamber	Kingson	THS-M1	242	05/20/2017

Remark: Each piece of equipment is scheduled for calibration once a year.

4.3 DESCRIPTION OF TEST MODES

The EUT (Wireless Microphone) has been tested under normal operating condition.

One channel of EUT have been chosen for testing under Normal Operating condition. In this report, all the measured datum of this channel have been reported. No software used to control the EUT for staying in continuous transmitting mode for testing.

Channel	Frequency(MHz)
1	202.9

5 FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

Bldg 69, Majialong Industry Zone District, Nanshan District, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

5.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

- EMC Lab. :
- Accredited by CNAS, 2016.10.24
The certificate is valid until 2022.10.28
The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006(identical to ISO/IEC17025:2005)
The Certificate Registration Number is L2291.
 - Accredited by TUV Rheinland Shenzhen 2016.5.19
The Laboratory has been assessed according to the requirements ISO/IEC 17025.
 - Accredited by FCC, valid until 2017/07/12
The Certificate Registration Number is 406365
 - A Accredited by Industry Canada, November 24, 2015
The Certificate Registration Number is 46405-4480.

6 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

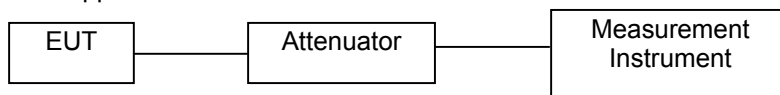
Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Maximum Peak Output Power Test	$\pm 1.0\text{dB}$
Conducted Emissions Test	$\pm 2.0\text{dB}$
Radiated Emission Test	$\pm 2.0\text{dB}$
Occupied Bandwidth Test	$\pm 1.0\text{dB}$
Band Edge Test	$\pm 3\text{dB}$
All emission, radiated	$\pm 3\text{dB}$
Antenna Port Emission	$\pm 3\text{dB}$
Temperature	$\pm 0.5^{\circ}\text{C}$
Humidity	$\pm 3\%$

Measurement Uncertainty for a level of Confidence of 95%

7 SYSTEM TEST CONFIGURATION

7.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.



7.2 EUT EXERCISE

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

7.3 GENERAL TECHNICAL REQUIREMENTS

- a). Section 74.861(e)-1: Maximum Transmitter power less than 50mW
- b). Section 74.861(e)-3: Peak Frequency Deviation less than 75KHz
- c). Section 74.861(e)-4: Frequency Tolerance less than 0.005%
- d). Section 74.861(e)-5: Emission Bandwidth shall less than 200KHz
- e). Section 74.861(e)-6: Unwanted radiation

7.4 SUPPORT EQUIPMENT

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Note
1	/	/	/	/	/
2	/	/	/	/	/

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

8 CARRIER RADIATED POWER & RADIATED SPURIOUS EMISSIONS

Test Requirement: FCC CFR 47 Part 74.861 e) 1) & d) 3)

Test Method: EIA/TIA 603-D:2010 section 2.2,

FCC CFR 47 Part 2.1047 & 1053

Test Requirement:

(d) For low power auxiliary stations operating in the bands other than those allocated for TV broadcasting, the following technical requirements are imposed.

(3) The occupied bandwidth shall not be greater than that necessary for satisfactory transmission and, in any event, an emission appearing on any discrete frequency outside the authorized band shall be attenuated, at least, $43+10 \log_{10}$ (mean output power, in watts) dB below the mean output power of the transmitting unit.

(e) For low power auxiliary stations operating in the bands allocated for TV broadcasting, the following technical requirements apply:

(1) The power of the measured unmodulated carrier power at the output of the transmitter power amplifier (antenna input power) may not exceed the following:

(i) 54–72, 76–88, and 174–216 MHz bands—50 mW

(ii) 470–608 and 614–806 MHz bands—250 mW

Test Procedure:

The procedure used was EIA/TIA 603-D:2010. The receiver was scanned from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes.

Adjust the spectrum analyzer for the following settings:

- 1) Resolution Bandwidth = 10 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1GHz.
- 2) Video Bandwidth = 300 kHz for spurious emissions below 1 GHz, and 3 MHz for spurious emissions above 1 GHz.
- 3) Sweep Speed slow enough to maintain measurement calibration.
- 4) Detector Mode = Positive Peak.

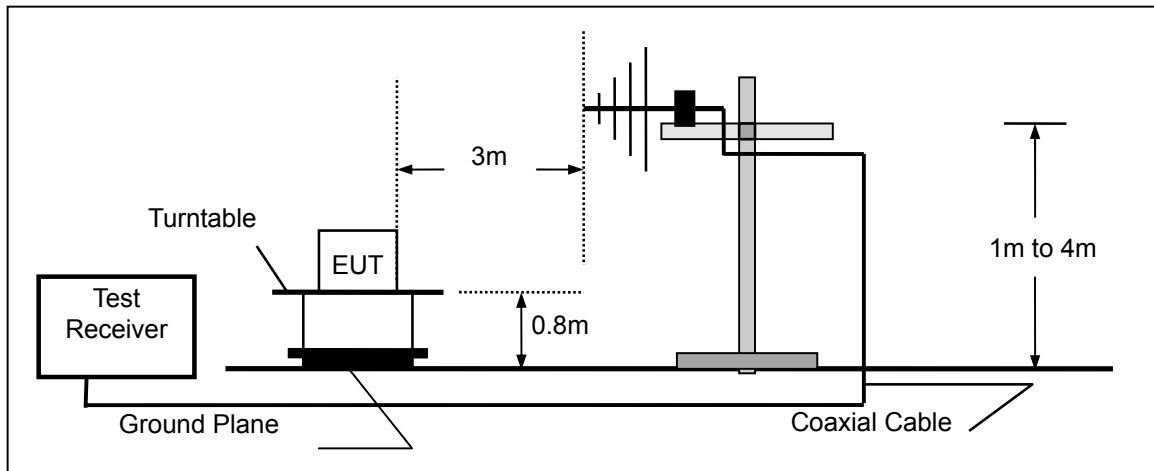
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier.

The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

An initial pre-scan was performed in the 3m chamber using the spectrum analyzer in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bilog antenna with 2 orthogonal polarities

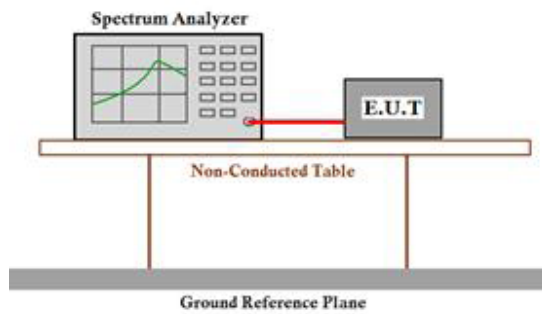
Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the Carrier Radiated Power and spurious emissions were measured by the substitution.



Conducted output power:

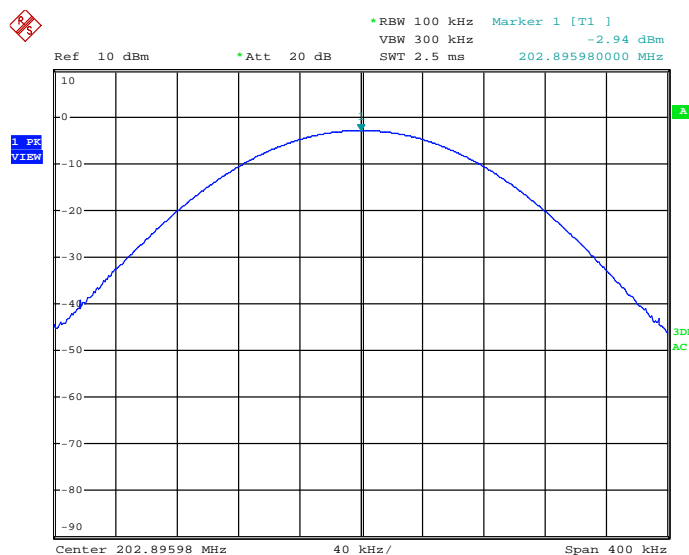
Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.

Set the spectrum analyzer: RBW = 100 kHz. VBW \geq RBW. Span=400KHz, Sweep = auto; Detector Function = Peak (Max. hold).



Conducted output power:

Carrier Frequency (MHz)	Conducted output power(dBm)	Limit in 74.861 e)1)
202.9	-2.94	17 dBm



Date: 4.JUN.2017 11:38:08

Radiated spurious emissions:

Fundamental emission:

Freq. (MHz)	Ant.Pol. H/V	Reading (dBm)	Correct Factor (dB)	Measurement (dBm)	Limit (dBm)	Margin (dB)
202.9	H	19.30	-22.34	-3.04	17	-20.04
202.9	V	19.40	-22.34	-2.98	17	-19.98

Note:

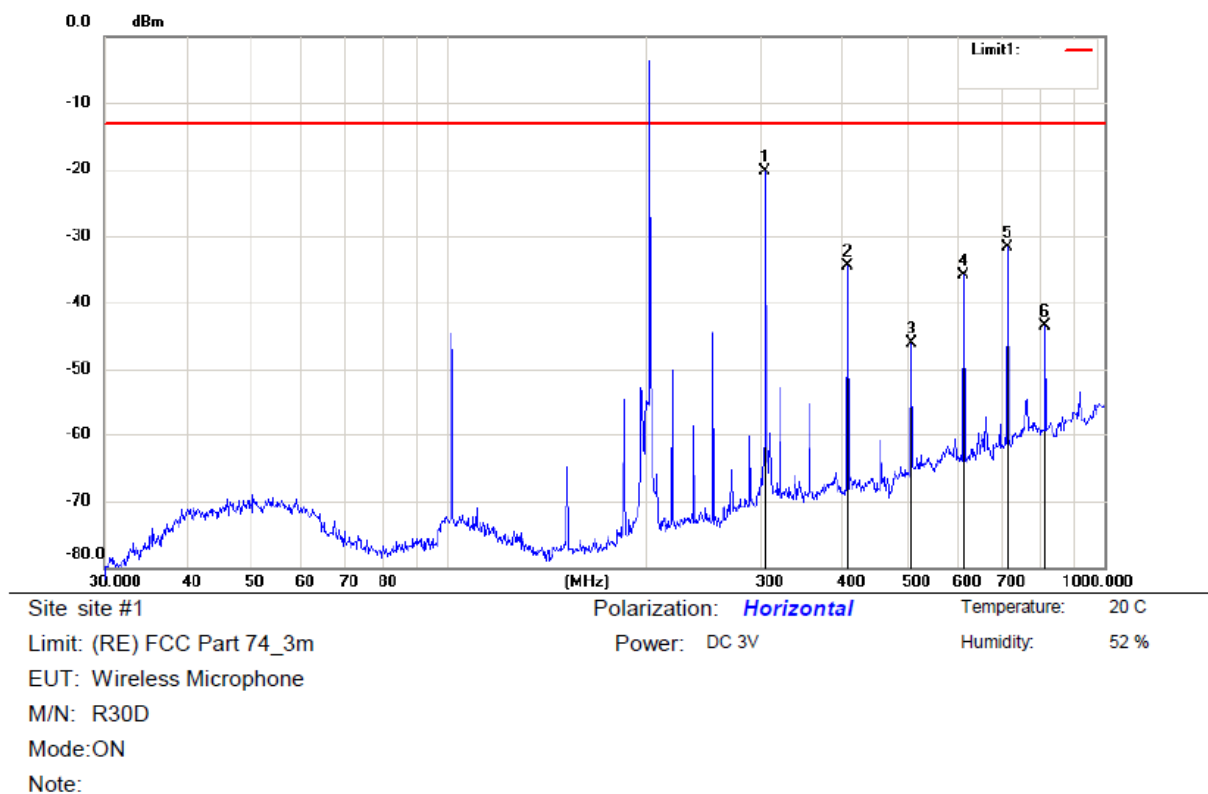
The Factual Level is ERP value.

Limit = -13 dBm, and the Fundamental limit = 17 dBm (i.e. 50 mW)

Emission Level= Reading Level+Correct Factor +Cable Loss.

Correct Factor= Ant_F + Cab_L – Preampl

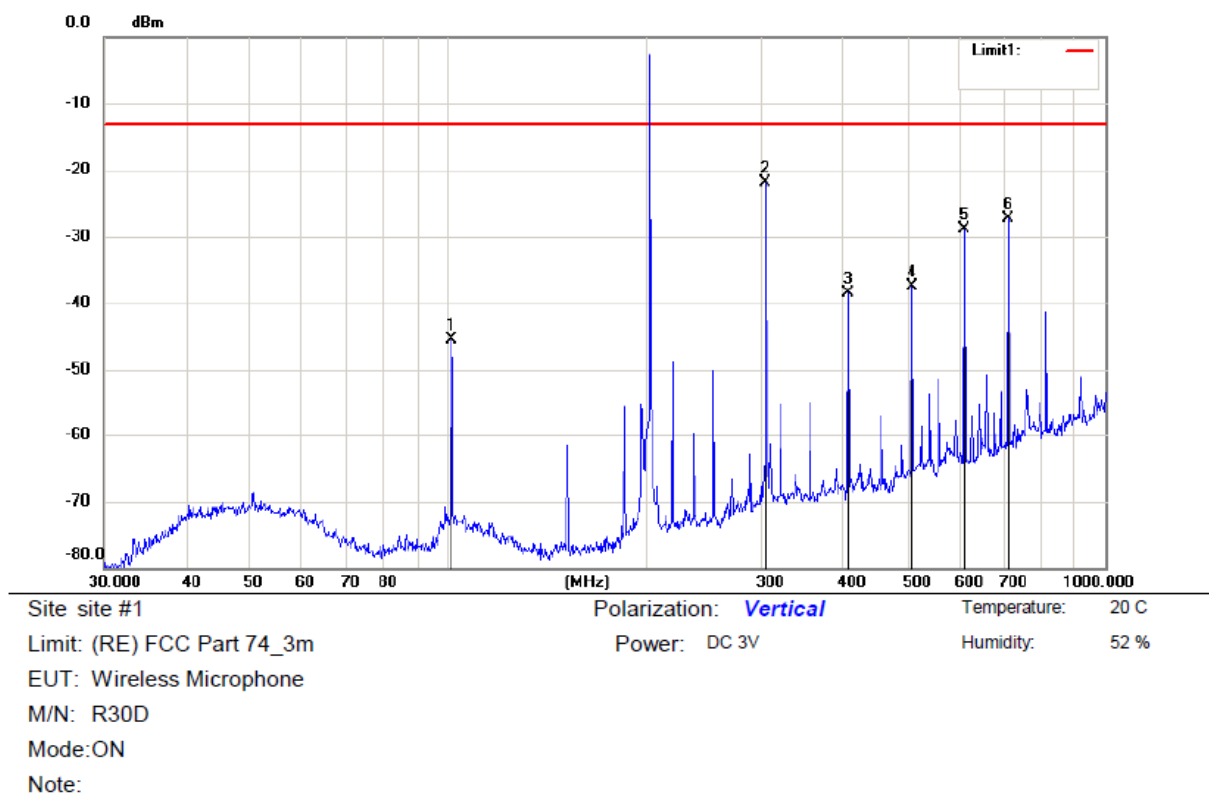
Other emissions:



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Over dB	Antenna Height cm	Table Degree degree	Comment
1	*	304.6100	-1.44	-18.88	-20.32	-13.00	-7.32	QP		
2		406.0880	-17.47	-17.01	-34.48	-13.00	-21.48	QP		
3		508.2582	-31.89	-14.21	-46.10	-13.00	-33.10	QP		
4		609.9217	-22.95	-12.98	-35.93	-13.00	-22.93	QP		
5		711.6734	-21.45	-10.21	-31.66	-13.00	-18.66	QP		
6		813.1115	-34.92	-8.49	-43.41	-13.00	-30.41	QP		

*:Maximum data x:Over limit !:over margin

Operator: KK



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Over dB	Antenna Height cm	Table Degree degree	Comment
1		101.2885	-24.56	-20.98	-45.54	-13.00	-32.54	QP		
2	*	304.6100	-2.98	-18.88	-21.86	-13.00	-8.86	QP		
3		406.0880	-21.40	-17.01	-38.41	-13.00	-25.41	QP		
4		508.2582	-23.33	-14.21	-37.54	-13.00	-24.54	QP		
5		609.9217	-15.85	-12.98	-28.83	-13.00	-15.83	QP		
6		711.6734	-17.14	-10.21	-27.35	-13.00	-14.35	QP		

*:Maximum data x:Over limit !:over margin

Operator: KK

Above 1GHz:

Temperature:	24℃	Test Date:	June 5, 2017
Humidity:	53 %	Test By:	King Kong
Test mode:	ON	Frequency:	Channel 1

Freq. (MHz)	Ant.Pol. H/V	Reading Level(dBm)	Correct Factor(dB)	Level (dBm)	Limit Line (dBm)	Margin (dB)	Detector
1013.874	V	-39.08	-4.92	-44.00	-13.00	-31.00	peak
1115.678	V	-43.50	-4.18	-47.68	-13.00	-34.68	peak
1217.409	V	-37.61	-2.44	-40.05	-13.00	-27.05	peak
1318.288	V	-33.83	-2.20	-36.03	-13.00	-23.03	peak
1419.897	V	-40.65	-0.57	-41.22	-13.00	-28.22	peak
1623.430	V	-45.65	2.53	-43.12	-13.00	-30.12	peak

Freq. (MHz)	Ant.Pol. H/V	Reading Level(dBm)	Correct Factor(dB)	Level (dBm)	Limit Line (dBm)	Margin (dB)	Detector
1013.874	H	-42.22	-4.92	-47.14	-13.00	-34.14	peak
1115.678	H	-40.38	-4.18	-44.56	-13.00	-31.56	peak
1217.409	H	-40.26	-2.44	-42.70	-13.00	-29.70	peak
1318.288	H	-39.23	-2.20	-41.43	-13.00	-28.43	peak
1623.430	H	-44.81	2.53	-42.28	-13.00	-29.28	peak
1724.631	H	-43.74	1.87	-41.87	-13.00	-28.87	peak

9 OCCUPIED BANDWIDTH

Test Requirement: FCC CFR 47 Part 74.e) 5) & 6)

Test Method: FCC CFR 47 Part 2.1049 f) 2)

Requirements:

(e) For low power auxiliary stations operating in the bands allocated for TV broadcasting, the following technical requirements apply:

(5) The operating bandwidth shall not exceed 200 kHz.

(6) The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

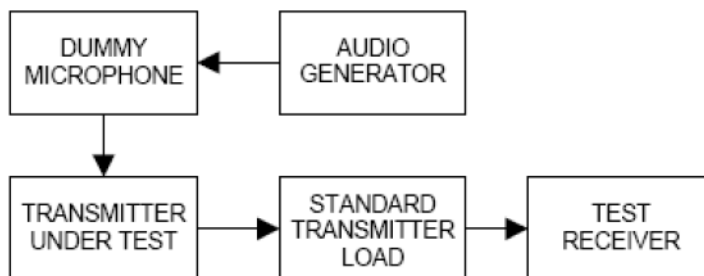
(i) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25dB;

(ii) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35dB;

(iii) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\log_{10}$ (mean output power in watts) dB.

Test Procedure

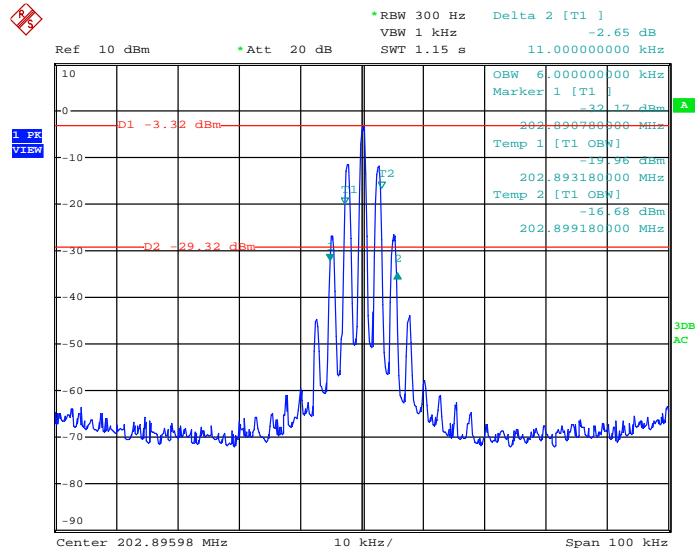
Setup



The emission bandwidth was determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency with a 2.5KHz tone modulated across the carrier. The points are 26dB down relative to the maximum level of the modulated carrier. A spectrum analyzer using a peak detector with no video filtering was used with a resolution bandwidth equal to approximately 1-3% percent of the emission bandwidth of the EUT

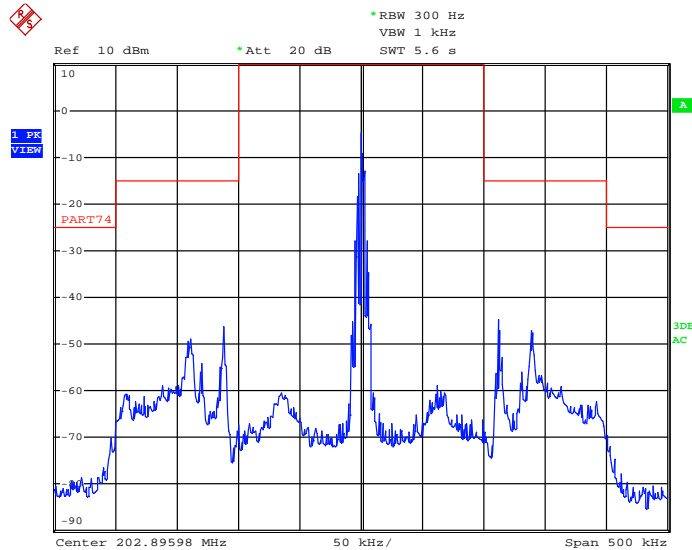
Test Result:

frequency	Bandwith(KHz)	Limit(KHz)
202.9	6	<200



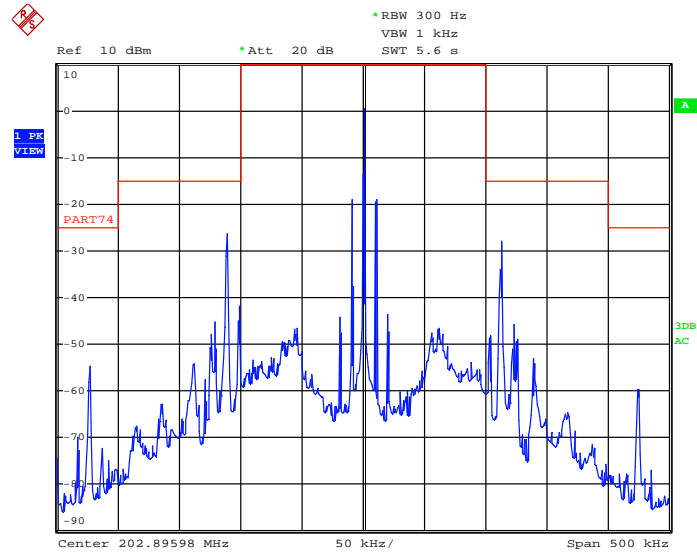
Date: 4.JUN.2017 11:36:56

Emission Mask: input with 2.5 KHz



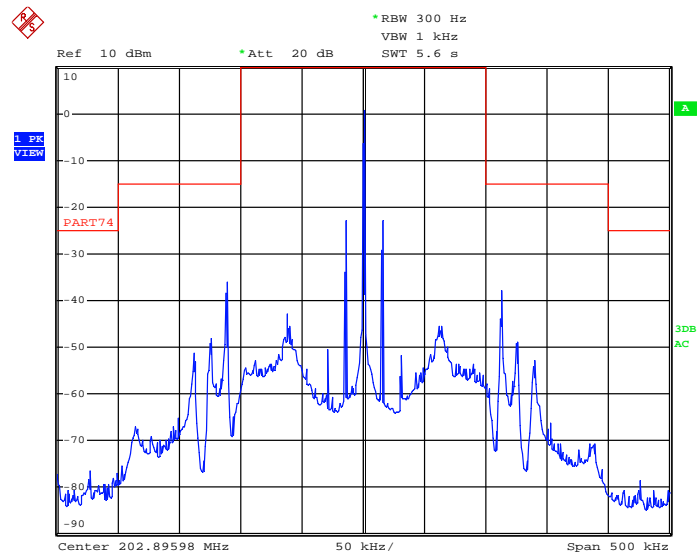
Date: 4.JUN.2017 11:34:27

Input with 10 KHz



Date: 4.JUN.2017 13:15:36

Input with 15 KHz



Date: 4.JUN.2017 13:18:02

10 FREQUENCY STABILITY

Test Requirement: FCC CFR 47 Part 74.e) 4)

Test Method: FCC CFR 47 Part 2.1055

Requirements: +/-50 ppm

(e) For low power auxiliary stations operating in the bands allocated for TV broadcasting, the following technical requirements apply:

(4) The frequency tolerance of the transmitter shall be 0.005 percent.

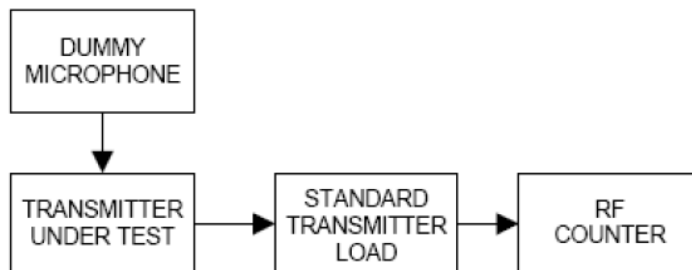
Test Procedure:

Frequency stability versus Environmental Temperature

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber. After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter.

Frequency Stability versus Input Voltage

At room temperature ($25 \pm 5^{\circ}\text{C}$), an external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115%, 100% and 85% of the nominal operating input voltage. For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



Test Result:

Environment Temperature(°C)	Power Supplied (Vdc)	Assigned Value(MHz)	Measured Value(MHz)	Error (ppm)	Limit (ppm)	Result
+50	3.00	202.89604	202.9	19.52	50	Pass
+40	3.00	202.89590	202.9	20.21	50	Pass
+30	3.00	202.89604	202.9	19.52	50	Pass
+20	3.00	202.89590	202.9	20.21	50	Pass
+10	3.00	202.89604	202.9	19.52	50	Pass
0	3.00	202.89604	202.9	19.52	50	Pass
-10	3.00	202.89604	202.9	19.52	50	Pass
-20	3.00	202.89604	202.9	19.52	50	Pass
-30	3.00	202.89604	202.9	19.52	50	Pass
25	3.45	202.89590	202.9	20.21	50	Pass
25	3.00	202.89590	202.9	20.21	50	Pass
25	2.55	202.89604	202.9	19.52	50	Pass
25	2.40	202.89604	202.9	19.52	50	Pass

Note:The EUT end point: 2.4Vdc

11 MODULATION CHARACTERISTICS

Test Requirement: FCC CFR 47 Part 74.e) 3)

Test Method: FCC CFR 47 Part 2.1047

Requirements:

(e) For low power auxiliary stations operating in the bands allocated for TV broadcasting, the following technical requirements apply:

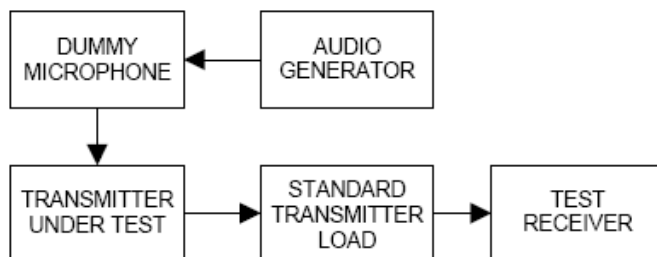
(3) Any form of modulation may be used. A maximum deviation of ± 75 kHz is permitted when frequency modulation is employed.

Test Procedure:

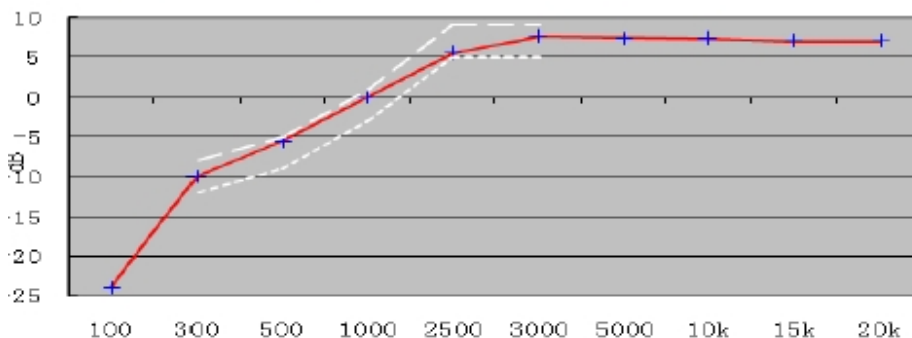
Audio Frequency Response

The RF output of the transceiver was connected to the input of FSV40 with FM deviation module through sufficient attenuation so as not to overload the meter or distort the reading. An audio signal generator was connected to the audio input of microphone.

The audio signal input level was adjusted to obtain **20% of the maximum rated system deviation at 1 kHz**, and recorded as *DEV REF*. With the audio signal generator level unchanged, set the generator frequency between 100 to 5000 Hz. The transmitter deviations (*DEV FREQ*) were measured and the audio frequency response was calculated as $20\log_{10} [DEV FREQ / DEV REF]$

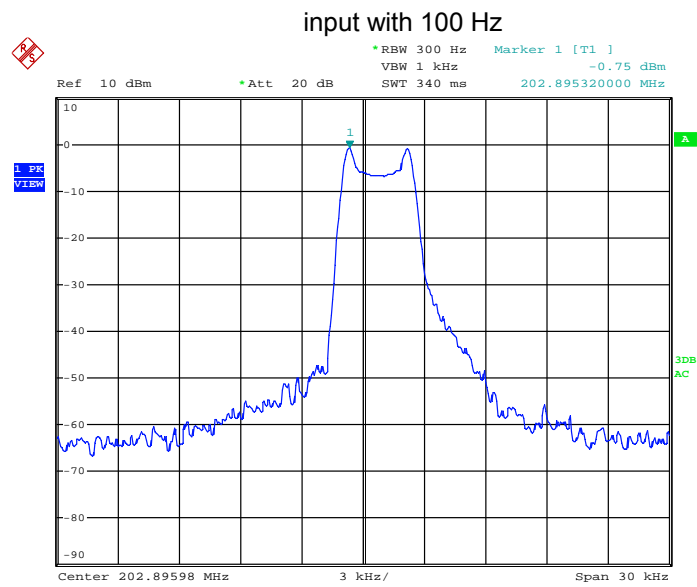


The plot(s) of Audio Frequency Response is presented hereinafter as reference.

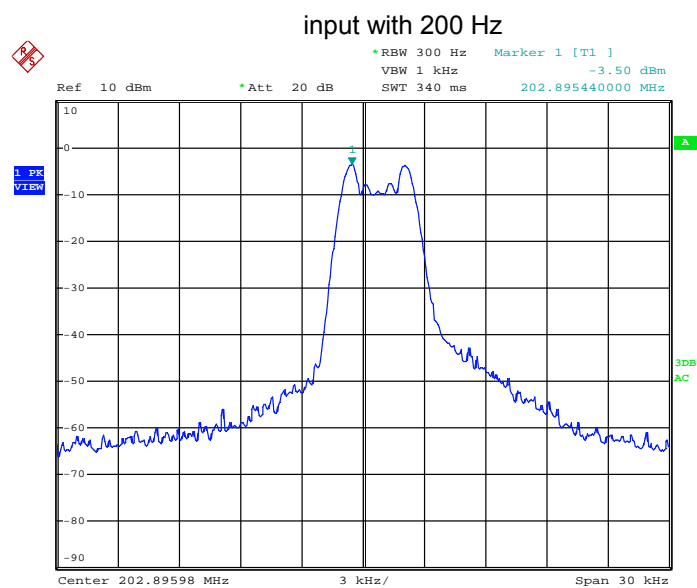


Audio Frequency Response:

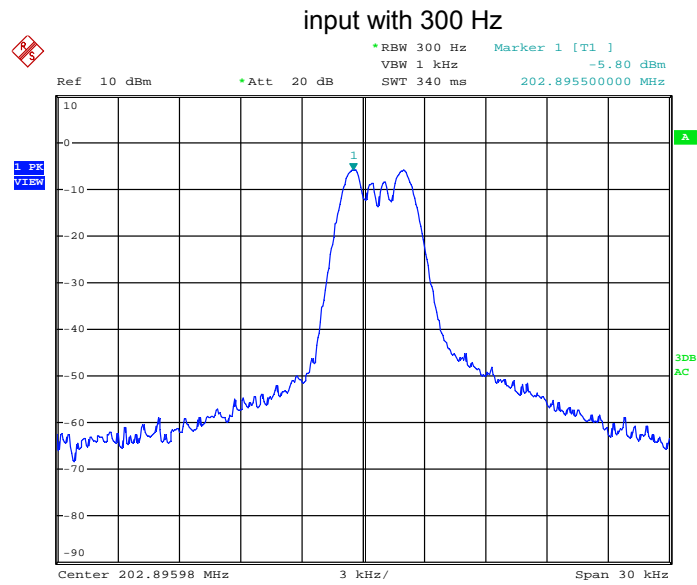
Frequency(Hz)	Deviation(KHz)
100	4.68
200	4.56
300	4.50
400	4.38
500	4.26
600	4.44
700	3.96
800	4.08
900	4.20
1000	4.26
1200	2.16
1400	3.36
1600	3.30
1800	3.30
2000	3.36
2400	3.36
2800	3.36
3200	3.36
3600	3.36
4000	3.36
4500	3.36
5000	3.36



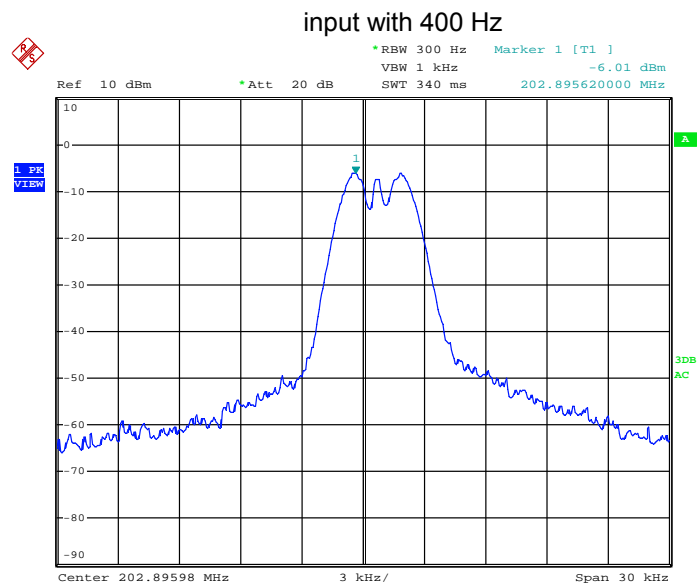
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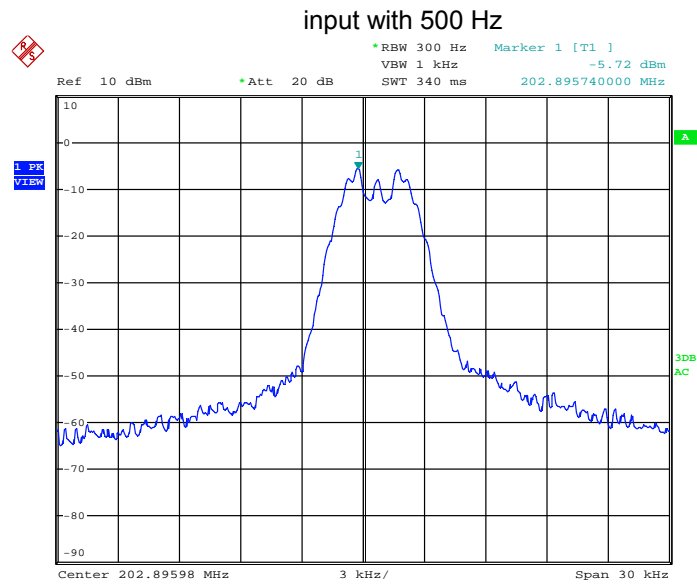
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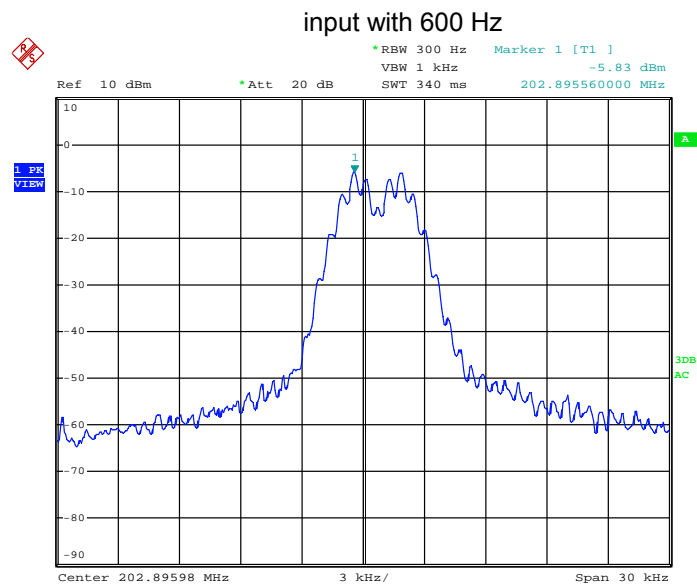
Date: 4.JUN.2017 13:23:25



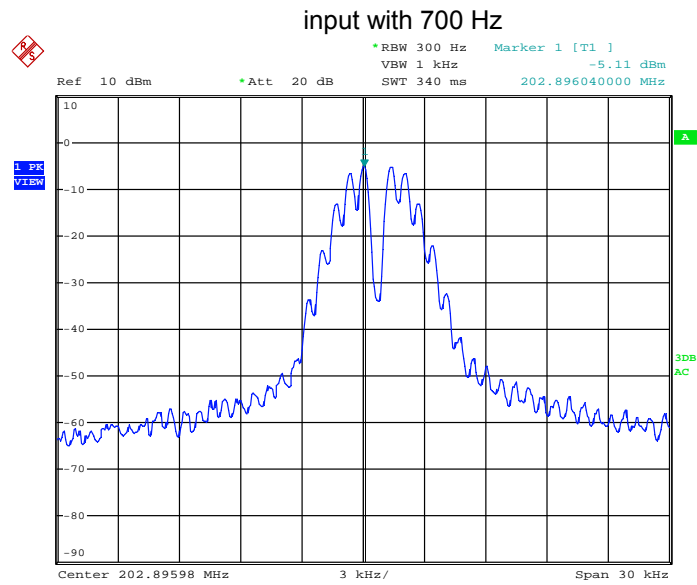
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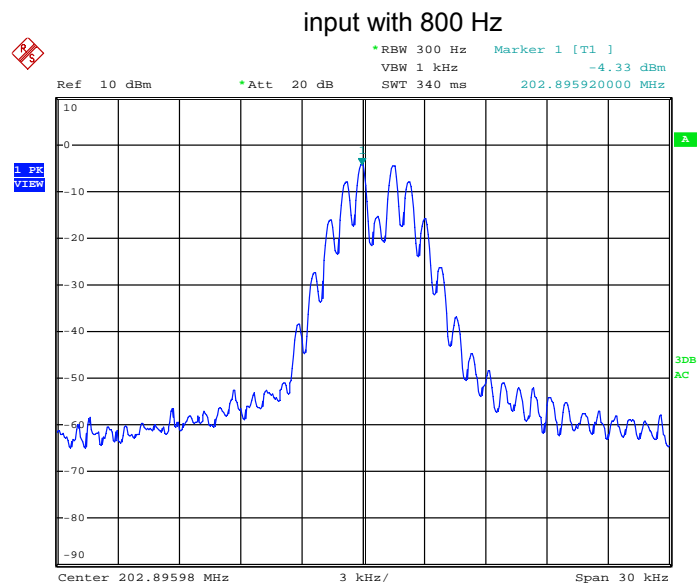
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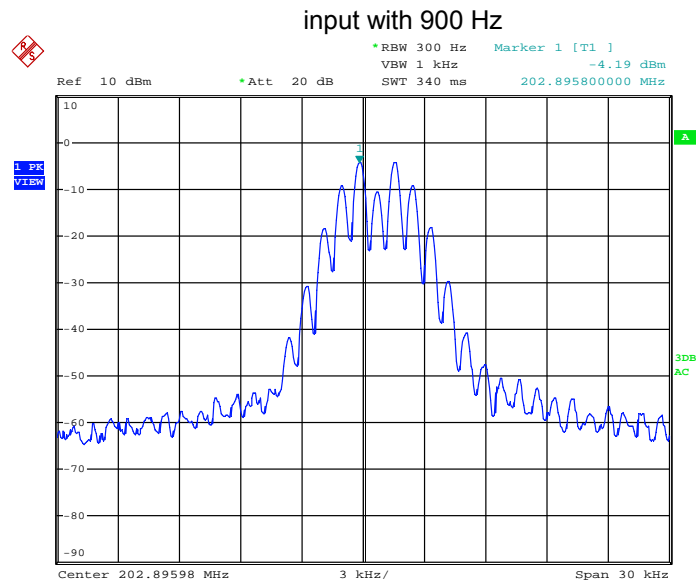
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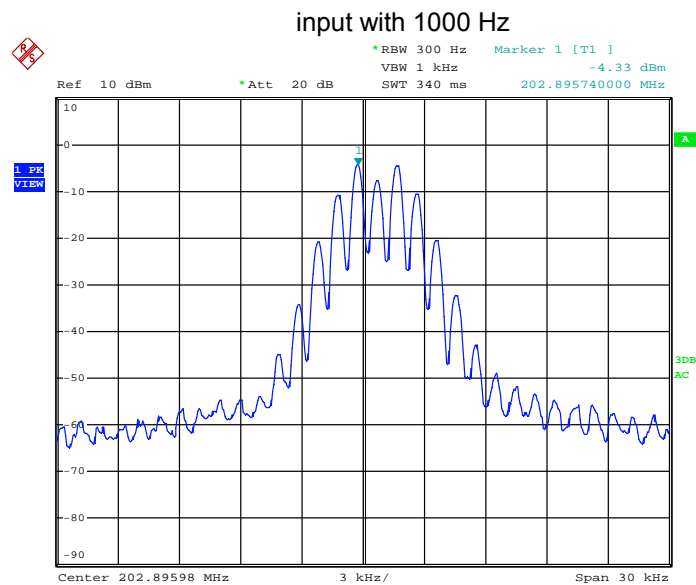
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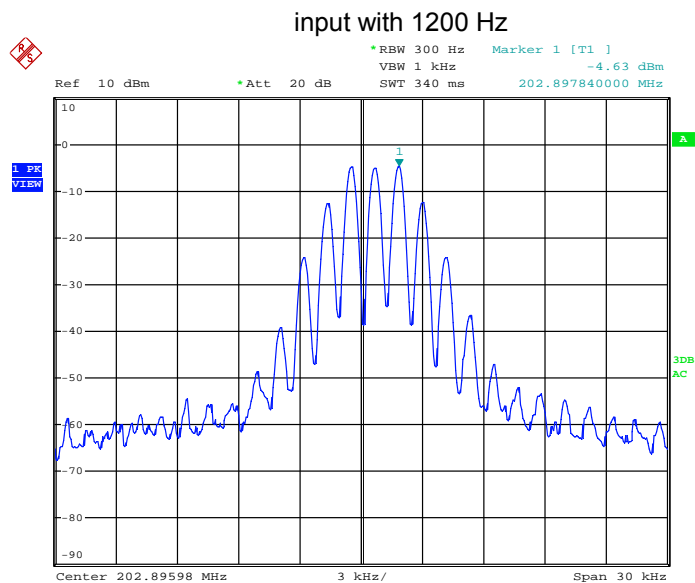
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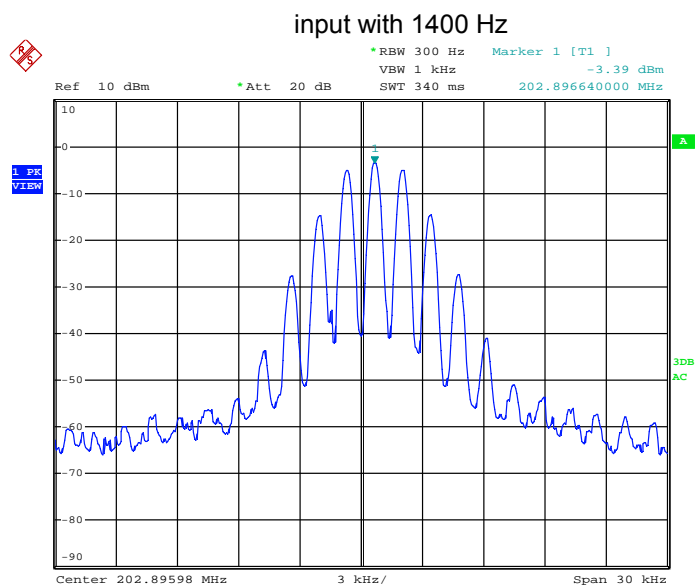
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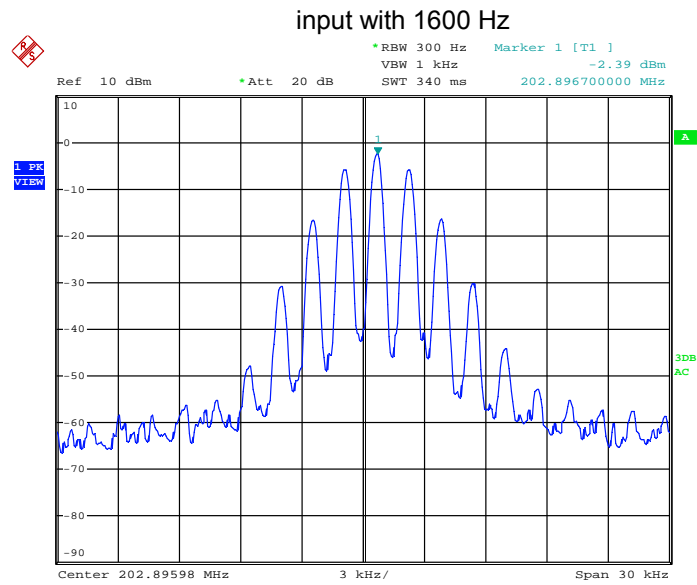
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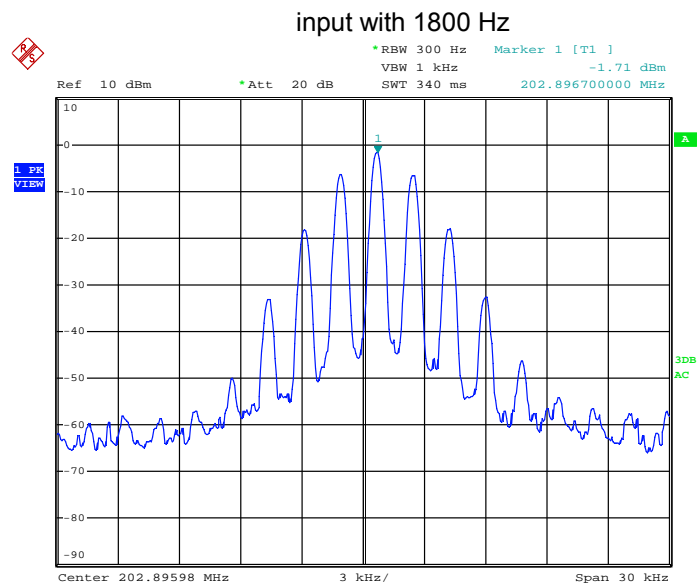
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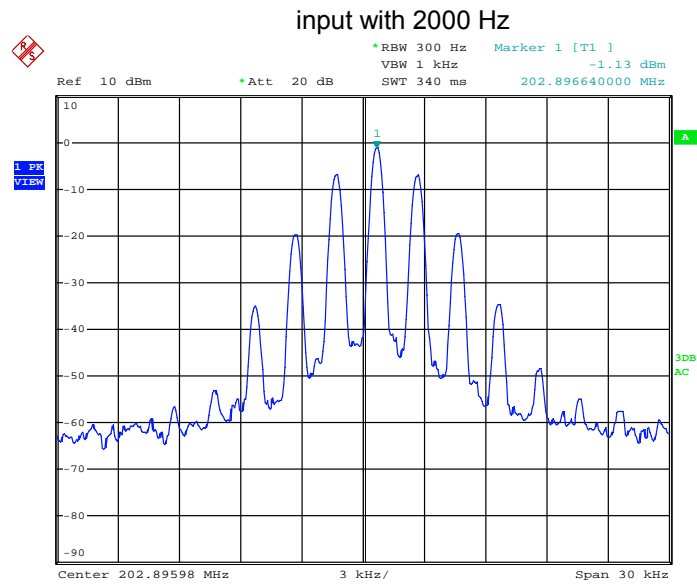
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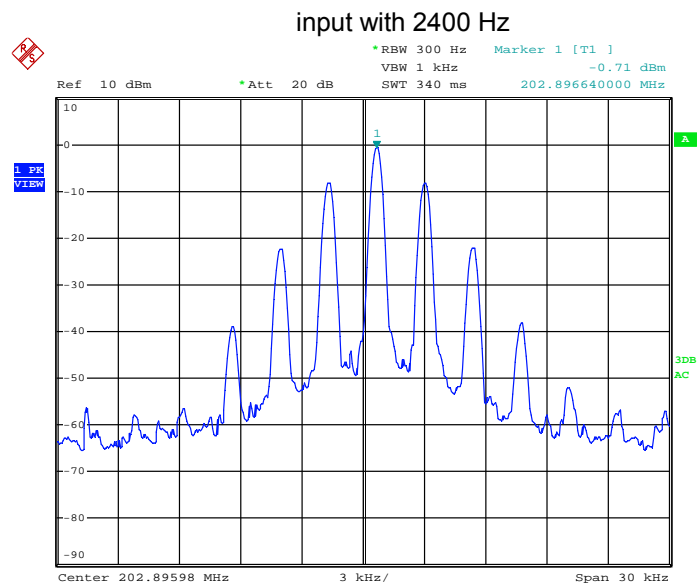
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Date: 4.JUN.2017 13:30:43

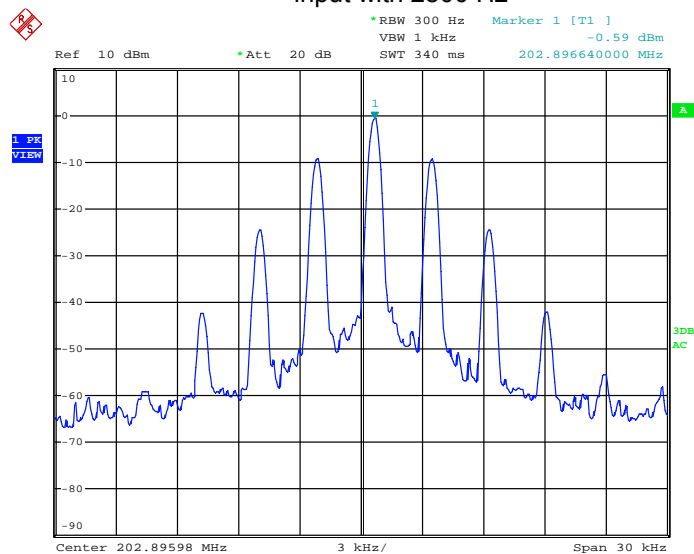


Date: 4.JUN.2017 13:31:07



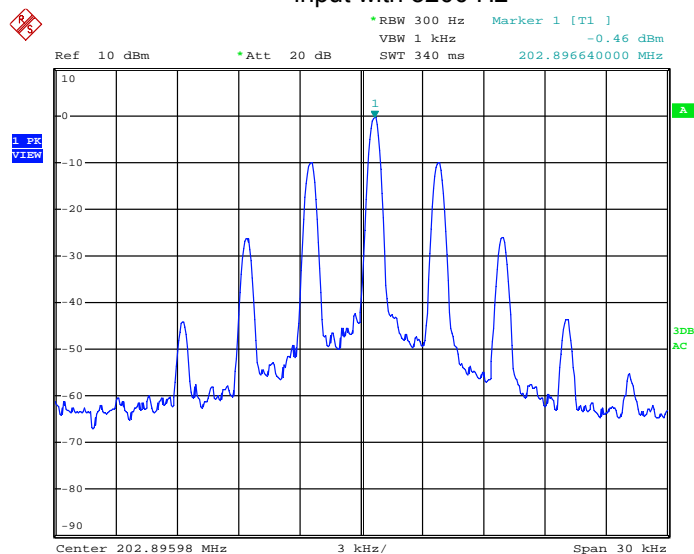
Date: 4.JUN.2017 13:31:36

input with 2800 Hz

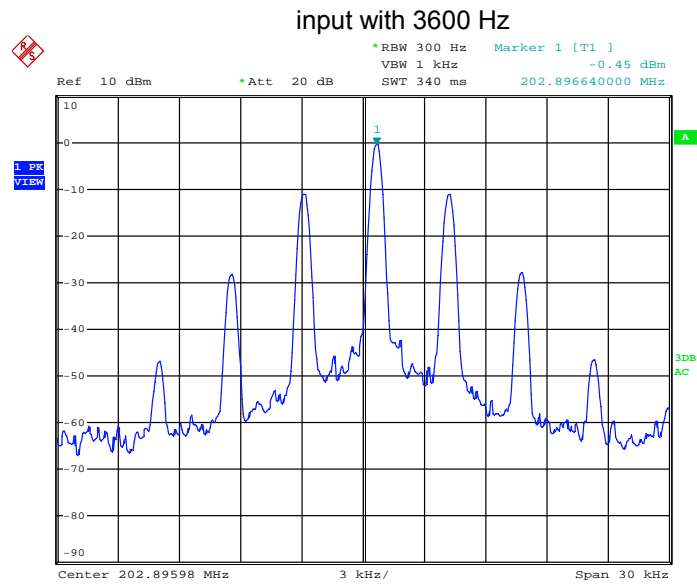


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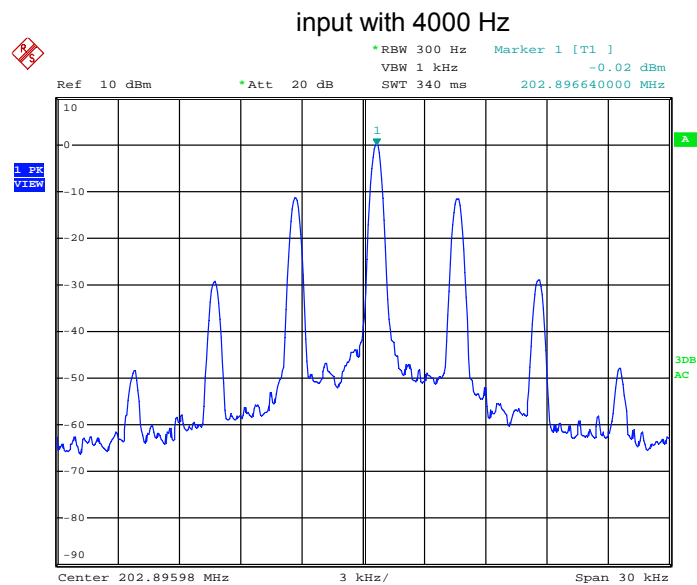
input with 3200 Hz



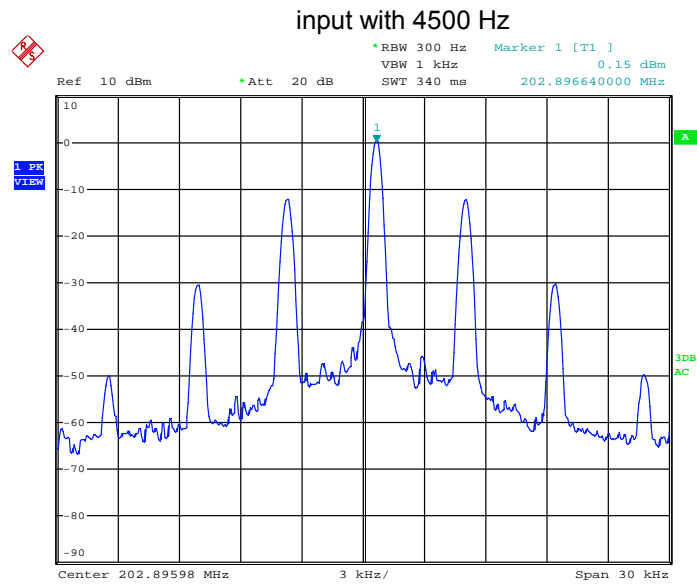
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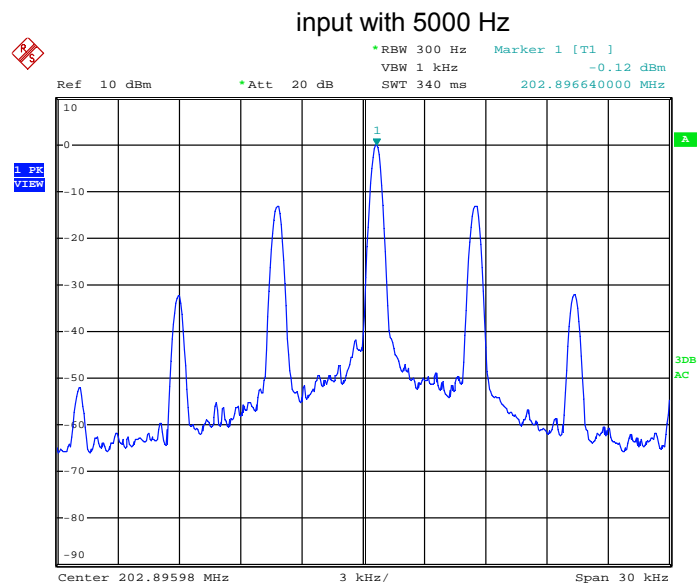
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Date: 4.JUN.2017 13:36:27



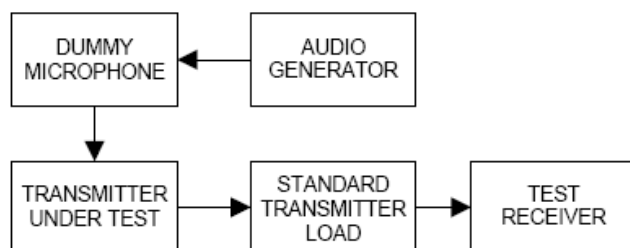
Date: 4.JUN.2017 13:36:55



Date: 4.JUN.2017 13:37:40

Modulation Limiting

- Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
- Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤ 0.25 Hz to $\geq 15,000$ Hz. Turn the de-emphasis function off.
- Apply a **1000 Hz** modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain **60% of full rated system deviation**.
- Increase the level from the audio frequency generator by 20 dB in one step (rise time between the 10% and 90% points shall be 0.1 second maximum).
- Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level.
- With the level from the audio frequency generator held constant at the level obtained in step e), slowly vary the audio frequency from 300 to 3000 Hz and observe the steady-state deviation. Record the maximum deviation.



Test at five different modulating frequencies (300Hz, 500Hz, 1KHz, 2kHz, 3kHz), the output level of the audio generator was varied up to 1V and the FM deviation level was recorded.

Modulation (dB)		-20	-10	0	5	15	20
300Hz	kHz	6.1	8.7	10.2	10.5	12.5	13.8
500Hz	kHz	6.2	8.9	10.6	10.7	12.7	14.3
1000Hz	kHz	6.3	9.3	10.7	10.9	13.1	14.6
2000Hz	kHz	6.1	9.7	10.7	11.2	13.3	15.2
3000Hz	kHz	6.4	9.8	10.9	11.3	13.5	16.8

Maximum Deviation:

Reading:	16.8kHz
Limit:	75kHz

---The End---