



## Electromagnetic Compatibility Tests on a Transmitter, Part No. P9T

For : Shure Inc.  
5800 West Touhy Avenue  
Niles, IL 60714

P.O. No. : 4500164699  
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Test Personnel : Richard E. King, Mark E. Longinotti, Brandon Lugo  
Specification : FCC "Code of Federal Regulations"  
Title 47 Part 74  
Industry Canada RSS-123

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**REPORT REVISION HISTORY**

Revision	Date	Description
--	December 19, 2009	Initial release

**Electromagnetic Compatibility Tests on Transmitter, Part No. P9T****1. INTRODUCTION****1.1 Scope of Tests**

This document presents the results of a series of electromagnetic compatibility (EMC) tests performed on a Transmitter, Model No. P9T, (hereinafter referred to as the test item). The test item was manufactured and submitted for testing by Shure Inc. located in Nilus, IL.

The test item is designed to transmit in the following frequency bands using an external ducky antenna:

Group	Frequency (MHz)	Band	Output Power (mW)
A	470 – 506	G6	10, 50, 100
B	506 – 542	G7	10, 50, 100
C	596 – 632	K1	10, 50, 100
D	656 – 692	L6	10, 50, 100
J*	944.125 – 951.875	X1	10, 50, 100

\* - Group J is for FCC only.

**1.2 Purpose**

The test series was performed to determine if the test item would meet selected requirements of the FCC Part 74 for low power auxiliary station bands and Industry Canada RSS-123 Low Power Licensed Radio communication Devices.

**1.3 Deviations, Additions, and Exclusions**

There were no deviations, additions to, or exclusions from the test specification during this test series.

**1.4 EMC Laboratory Identification**

The electromagnetic compatibility tests were performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois.

**1.5 Laboratory Conditions**

The temperature at the time of the test was 22°C and the relative humidity was 21%.

**2. APPLICABLE DOCUMENTS**

The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 74, dated 1 October 2008
- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 2, dated 1 October 2008
- RSS-123, "Radio Standards Specification Low Power Licensed Radio communication Devices" Issue 1, Rev. 2 November 6, 1999
- TIA-603-C-2004, "Land Mobile FM or PM Communications Equipment Measurement and



Performance Standard”

### 3. TEST ITEM SET-UP AND OPERATION

#### 3.1 General Description

The test item is a Transmitter, Model No. P9T. A block diagram of the test item set-up is shown as Figure 1.

##### 3.1.1 Power Input

The test item was powered with 15VDC from a Shure AC Adapter, Model No. PS41US. The AC Adapter was connected to the test item via a 1.8 meter long 2 wire power cord. The AC Adapter was powered with 115V, 60Hz via a 1.8 meter long 2 wire power cord.

##### 3.1.2 Peripheral Equipment

The test item was submitted for testing with a Shure SRH240 headphone via a two meter long 2-wire cord.

##### 3.1.3 Signal Input/Output Leads

The headphone port of the test item was connected to a Shure SRH240 headphone via a two meter long 2-wire cord. The LEFT/CH.1 IN, RIGHT/CH.2 IN, L-LOOP OUT, and R-LOOP OUT ports of the test item each had a separate 1 meter long un-terminated cable connected during testing.

##### 3.1.4 Grounding

The test item was not grounded during testing.

##### 3.1.5 Frequency of Test Item

Per CFR Title 47, Section 2, part 1057, for spurious emissions measurements at the antenna terminal and for spurious radiated emissions measurements, the frequency spectrum shall be investigated up to at least the tenth harmonic of the highest fundamental frequency.

#### 3.2 Operational Mode

All emissions tests were performed separately in the following modes:

Tx @ 488MHz, 10mW; Tx @ 488MHz, 50mW; Tx @ 488MHz 100mW  
Tx @ 524MHz, 10mW; Tx @ 524MHz, 50mW; Tx @ 524MHz 100mW  
Tx @ 614MHz, 10mW; Tx @ 614MHz, 50mW; Tx @ 614MHz 100mW  
Tx @ 656MHz, 10mW; Tx @ 656MHz, 50mW; Tx @ 656MHz 100mW  
Tx @ 674MHz, 10mW; Tx @ 674MHz, 50mW; Tx @ 674MHz 100mW  
Tx @ 948MHz, 10mW; Tx @ 948MHz, 50mW; Tx @ 948MHz 100mW

#### 3.3 Test Item Modifications

No modifications were required for compliance.

### 4. TEST FACILITY AND TEST INSTRUMENTATION

#### 4.1 Shielded Enclosure

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. With the exception of the floor, the reflective surfaces of the shielded chamber are lined with ferrite tiles on the walls and ceiling. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2003 for site attenuation.

#### 4.2 Test Instrumentation

The test instrumentation and auxiliary equipment used during the tests are listed in **Table 10-1**.

#### 4.3 Calibration Traceability

Test equipment is maintained and calibrated on a regular basis. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

#### 4.4 Measurement Uncertainty

All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system.

The measurement uncertainty for these tests is presented below:

Conducted Emission Measurements		
Combined Standard Uncertainty	1.07	-1.07
Expanded Uncertainty (95% confidence)	2.1	-2.1

Radiated Emission Measurements		
Combined Standard Uncertainty	2.26	-2.18
Expanded Uncertainty (95% confidence)	4.5	-4.4

### 5. TEST PROCEDURES

#### 5.1 RF POWER OUTPUT MEASUREMENTS

##### 5.1.1 Requirements

In accordance with paragraph 74.861(e)(1)(ii), for low power auxiliary stations operating in the bands allocated for TV broadcasting, the power of the measured unmodulated carrier power at the output of the transmitter power amplifier (antenna input power) may not exceed 250 milliwatts in the 470-608 and 614-806MHz bands. In accordance with paragraph 74.861(d)(1), for low power auxiliary stations operating in the bands other than those allocated for TV broadcasting, the maximum transmitter power which will be authorized is 1 watt.

For certification to paragraph 6.2 of the Industry Canada's RSS-123 requirement, the RF power output must not exceed 1 watt average power as listed in Table 1.

##### 5.1.2 Procedures

The output from the antenna port of the test item was connected to a power meter. The output power of the each test item was then measured.

##### 5.1.3 Results

The output power measurements are presented on pages 18 through 22. As can be seen from the data, the power output of each transmitter is within the requirements of Part 74.861 and RSS-123.

## 5.2 MODULATION CHARACTERISTICS

### 5.2.1 Requirements

In accordance with paragraph 74.861(e)(3) and paragraph 5.5 of RSS-123, for low power auxiliary stations operating in the bands allocated for TV broadcasting, any form of modulation may be used. A maximum deviation of  $\pm 75\text{kHz}$  is permitted when frequency modulation is employed.

### 5.2.2 Procedures

The output of the antenna port of the test item was connected to a modulation analyzer. An audio signal generator was connected to the audio input port of the test item.

- a) The test item was modulated with a 1000 Hz modulating signal at 60% of the test items rated frequency deviation.
- b) With input level held constant the audio signal generator was varied from 20 Hz to 20 kHz.
- c) The positive and negative peak deviations were recorded and plotted.

The output of the antenna port of the test item was connected to a modulation analyzer. An audio signal generator was connected to the audio input port of the test item.

- a) The modulation response was measured separately for each of five frequencies (100Hz, 500Hz, 2500Hz, 10000Hz and 15000Hz).
- b) The input voltage of the audio signal generator was varied and frequency deviation was observed on the modulation analyzer.
- c) The frequency deviations were recorded and plotted.

### 5.2.3 Results

The plots of the modulation characteristics are presented on pages 23 through 29.

## 5.3 FREQUENCY STABILITY

### 5.3.1 Requirements

In accordance with paragraph 74.861(e)(4) and paragraph 7 of RSS-123 Table 1, for low power auxiliary stations operating in the bands allocated for TV broadcasting, the frequency tolerance of the transmitter shall be 0.005 percent.

### 5.3.2 Procedures

The test item was connected to a frequency counter through the antenna output of each transmitter. The test item was then placed in a humidity temperature chamber.

- a) The nominal frequency of the transmitter was measured and recorded.
- b) The temperature chamber was then set to  $-30^{\circ}\text{C}$ .
- c) Once the temperature had reached  $-30^{\circ}\text{C}$  the test item was allowed to soak for 30 minutes.
- d) After soaking at  $-30^{\circ}\text{C}$  for thirty minutes the test item was turned on and the transmit frequency was measured and recorded.
- e) Steps (b) through (d) were repeated for each temperature in  $10^{\circ}\text{C}$  steps from  $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ .
- f) The test item was then removed from the temperature chamber and allowed to adjust to nominal room temperature ( $22^{\circ}\text{C}$ ).
- g) The input voltage was checked and adjusted to the nominal level. The frequency was measured and recorded.



- h) The input voltage was then varied to 85% of its nominal level. The frequency was measured and recorded.
- i) The input voltage was then varied to 115% of its nominal level. The frequency was measured and recorded.

### 5.3.3 Results

The frequency stability measurements are presented on pages 30 and 31. As can be seen from the data the test frequency deviation was within the 0.005 percent limit. A photograph of the test set-up is shown in Figure 2.

## 5.4 OCCUPIED BANDWIDTH MEASUREMENTS

### 5.4.1 Requirements

In accordance with paragraph 74.861(e)(5) and (6), for low power auxiliary stations operating in the bands allocated for TV broadcasting, the following technical requirements apply:

- a) The operating bandwidth shall not exceed 200 kHz.
- b) 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 25 dB;
  - 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 35 dB;
  - 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.

For certification to the RSS-123 paragraph 6.3.1, the power of unwanted emissions shall be attenuated below the mean transmitter power in accordance with the following schedule:

- a) On any frequency removed from the carrier frequency by more than 50% up to and including 100% of the authorized bandwidth: at least 25 dB.
- b) On any frequency removed from the carrier frequency by more than 100% up to and including 250% of the authorized bandwidth: at least 35 dB.
- c) On any frequency removed from the carrier frequency by more than 250% of the authorized bandwidth: at least  $55 + 10 \log(P)$  dB.

### 5.4.2 Procedures

- a) The test item was connected to a spectrum analyzer through 40 dB of attenuation. The unmodulated carrier signal level was measured and recorded.
- b) The test item was modulated with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of the rated system deviation.
- c) The test item was modulated with a 15 kHz sine wave at an input level necessary to produce 85% of the rated system deviation.
- d) Steps (a) through (c) were repeated separately for each of the remaining 11 transmitters. The bandwidth of the spectrum analyzer was set to 2kHz (1% of Authorized BW).

### 5.4.3 Results

The plots of the occupied bandwidth measured are presented on pages 32 through 76. The limits, shown on the plots, are referenced to the power measured from the un-modulated carrier, the power when

modulated with a 2500 Hz sine wave at an input 16dB greater than that necessary to produce 50% of the rated deviation and a 15 kHz sine wave at 85% of the maximum deviation.

The operating bandwidth was determined using Carson's rule:

$B_n = 2M + 2DK$  where  $B_n$  = bandwidth,  $M$  = Maximum modulating frequency and  $D$  = Peak Deviation. With  $K = 1$ ,  $M = 12\text{kHz}$  and  $D = 47\text{kHz}$  resulting in an operating bandwidth of 118kHz.

The maximum Industry Canada 99% bandwidth measurement was 126.25kHz.

As can be seen from the data, the test items met all occupied bandwidth requirements. . A photograph of the test set-up is shown in Figure 2.

## 5.5 SPURIOUS EMISSIONS AT ANTENNA TERMINAL

### 5.5.1 Requirements

This test determines whether the test item produces excessive spurious emissions.

In accordance with paragraph 74.861(e)(6)(iii), on any frequency remove from the operating frequency by more than 250 percent of the authorized bandwidth shall attenuated by at least  $43 + 10 \log (P)$  dB which is equivalent to -13 dBm. The emissions shall be measured from 30MHz up to the 10th harmonic of the fundamental frequency.

In accordance with RSS-123 paragraph 6.3.1(3) on any frequency remove from the operating frequency by more than 250 percent of the authorized bandwidth: at least  $55 + 10 \log (P)$  dB which is equivalent to -25 dBm. The emissions shall be measured from the fundamental minus 500 kHz up to the 5th harmonic of the fundamental frequency.

### 5.5.2 Procedures

A spectrum analyzer was connected to the output of the test item through 40 dB of external attenuation. The out of band emissions were measured.

The spectrum analyzer was adjusted accordingly.

For the FCC measurements - the resolution bandwidth was set to 100kHz for spurious emissions below 1GHz and 1MHz for spurious emissions above 1GHz.

For the RSS-123 measurements - the resolution bandwidth was set to 30 kHz.

For the FCC measurements - the test item was modulated with a 2500 Hz sine wave at an input level 16dB greater than that necessary to produce 50% of rated system deviation

For the RSS-123 measurements – the test item was modulated with signals representative of those encountered in a real system operation (2500Hz at 80% rated deviation)

The plots of the spectrum analyzer screens were recorded.

### 5.5.3 Results

The plots of the antenna conducted output measurements for FCC part 74 are presented on pages 77 through 106. As can be seen from the data, the test item did not produce spurious emissions in excess of the limit.

The plots of the antenna conducted output measurements for Industry Canada RSS-123 are presented on pages 107 through 130. As can be seen from the data, the test item did not produce spurious emissions in excess of the limit.

## 5.6 FIELD STRENGTH OF SPURIOUS EMISSIONS

### 5.6.1 Requirements

In accordance with paragraph 74.861 of CFR 47, the power of any emission on any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth shall be attenuated by at least  $43 + 10 \log (P)$  dB.

In accordance with RSS-123 paragraph 6.3.1, the power of any emission on any frequency removed from the carrier frequency by more than 250% of the authorized bandwidth shall be attenuated by at least  $55 + 10 \log (P)$  dB.

### 5.6.2 Procedures

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4 2003 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

1. Preliminary radiated measurements were performed to determine the frequencies where the significant emissions might be found. With the test item at one set position and the measurement antenna at a set height (i.e. without maximizing), the radiated emissions were measured using a peak detector and automatically plotted. The broadband measuring antenna was positioned at a 3 meter distance from the test item. This data was then automatically plotted. All preliminary tests were performed separately with the test item operating in the modes listed in Para. 3.2.
2. All significant broadband and narrowband signals found in the preliminary sweeps were then measured using a peak detector at a test distance of 3 meters. The measurements were made with a bilog antenna over the frequency range of 30MHz to 1GHz, and a double ridged waveguide antenna was used for frequencies above 1GHz.
3. To ensure that maximum emission levels were measured, the following steps were taken:
  - a. The test item was rotated so that all of its sides were exposed to the receiving antenna.
  - b. Since the measuring antennas are linearly polarized, both horizontal and vertical field components were measured.
  - c. The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, another antenna was set in place of the test item and connected to a calibrated signal generator. (A tuned dipole was used for all measurements below 1GHz and a double ridged waveguide antenna was used for all measurements above 1GHz.) The output of the signal generator was adjusted to match the received level at the spectrum analyzer. The signal level was recorded. The reading was corrected to compensate for cable loss, as required, and for frequencies above 1GHz, increased by the gain of the waveguide.

### 5.6.3 Results

The preliminary plots peak levels are presented on pages 131 through 190. Factors for the antennas and cables were added to the data before it was plotted. This data is only presented for a reference, and is not used as official data. All significant radiated emissions were subsequently measured using



the substitution method.

The final radiated levels are presented on pages 191 through 205. The radiated emissions were measured through the 10th harmonic. All emissions measured from the test item were within the specification limits. . Photographs of the test set-up are shown in Figure 3 and Figure 4.

## **6. OTHER TEST CONDITIONS**

### **6.1 Test Personnel and Witnesses**

All EMC tests were performed by qualified personnel from Elite Electronic Engineering Incorporated. The test series was partially witnessed by Shure Inc. personnel.

### **6.2 Disposition of the Test Item**

The test item and all associated equipment were returned to Shure Inc. upon completion of the tests.

## **7. CONCLUSION**

It was found that the Shure Inc., model P9T Transmitter, did comply with the RF power output, the occupied bandwidth, the frequency stability, the spurious emissions at antenna terminal, and the field strength of spurious emissions requirements of FCC Part 74 for low power auxiliary station bands and Industry Canada RSS-123 Low Power Licensed Radio communication Devices.

## **8. CERTIFICATION**

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specification. The data presented in this test report pertains only to the test item at the test date. Any electrical or mechanical modification made to the test item subsequent to the specified test date will serve to invalidate the data and void this certification.

## **9. ENDORSEMENT DISCLAIMER**

This report must not be used to claim product endorsement by NVLAP or any agency of the US Government.



## 10. EQUIPMENT LIST

Table 10-1

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
ETD0	ENV Chambers For Auto Dept Use Only	Thermotron	S-8	15461	-70 to 150 degrees C	Note 1	
ETDA	HONEYWELL CHART RECORDER	HONEYWELL	DR45AT-1100	0825Y878133300009	PROGRAMMABLE	10/17/2008	12/7/2009
ETDC	Temperature Controller	Thermotron	2800	753726	Programmable	Note 1	
GRE0	SIGNAL GENERATOR	AGILENT TECHNOLOGIES	E4438C	MY42083127	250KHZ-6GHZ	1/12/2009	1/12/2010
GWH2	DDS FUNCTION GENERATOR	WAVETEK	29	079190	0.0001HZ-10MHZ	9/8/2009	9/8/2010
GWH4	DDS FUNCTION GENERATOR	WAVETEK	29	053233	0.0001HZ-10MHZ	3/5/2009	3/5/2010
GXA1	MXG MW ANALOG SIGNAL GENERATOR	AGILENT TECHNOLOGIES	N5183A	MY47420353	250KHz-40GHz	2/5/2009	2/5/2010
MDBN	MULTIMETER (B. LUGO)	FLUKE CORPORATION	177	84990070		1/20/2009	1/20/2010
MFC0	MICROWAVE FREQ. COUNTER	HEWLETT PACKARD	5343A	2133A00591	10HZ-26GHZ	7/13/2009	7/13/2010
MPC2	DUAL POWER METER	HEWLETT PACKARD	EPM-442A	US37480150	0.1MHZ-50GHZ	1/8/2009	1/8/2010
MPCC	POWER SENSOR	HEWLETT PACKARD	8482A	2652A13499	0.1-4200MHZ	5/14/2009	5/14/2010
NDQ0	TUNED DIPOLE ANTENNA	EMCO	3121C-DB4	311	400-1000MHZ	3/12/2009	3/12/2010
NTA0	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL6112	2057	0.03-2GHZ	11/14/2008	12/14/2009
NWF0	RIDGED WAVE GUIDE	EMCO	3105	2035	1-12.4GHZ	12/5/2009	12/5/2010
NWH0	RIDGED WAVE GUIDE	SENSOR	4105	2081	1-12.4GHZ	8/11/2009	8/11/2010
RBA0	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB26	100145	20HZ-26.5GHZ	2/18/2009	2/18/2010
RBB0	EMI TEST RECEIVER 20HZ TO 40 GHZ.	ROHDE & SCHWARZ	ESIB40	100250	20 HZ TO 40GHZ	3/11/2009	3/11/2010
RBE0	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESU26	100095	20Hz-26GHz	4/1/2009	4/1/2010
RYE0	MODULATION ANALYZER	HEWLETT PACKARD	8901B	3104A03410	0.15-1300MHZ	5/23/2009	5/23/2010
SAA1	AC POWER SOURCE/ANALYZER	HEWLETT PACKARD	6813A	3524A-00446	0-300VRMS, 1750VA	NOTE 1	
T2S3	20DB 25W ATTENUATOR	WEINSCHEL	46-20-34	BV3544	DC-18GHZ	1/22/2009	1/22/2010
T2S4	20DB 25W ATTENUATOR	WEINSCHEL	46-20-24	BV1393	DC-18GHZ	1/22/2009	1/22/2010

I/O: Initial Only

N/A: Not Applicable

Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

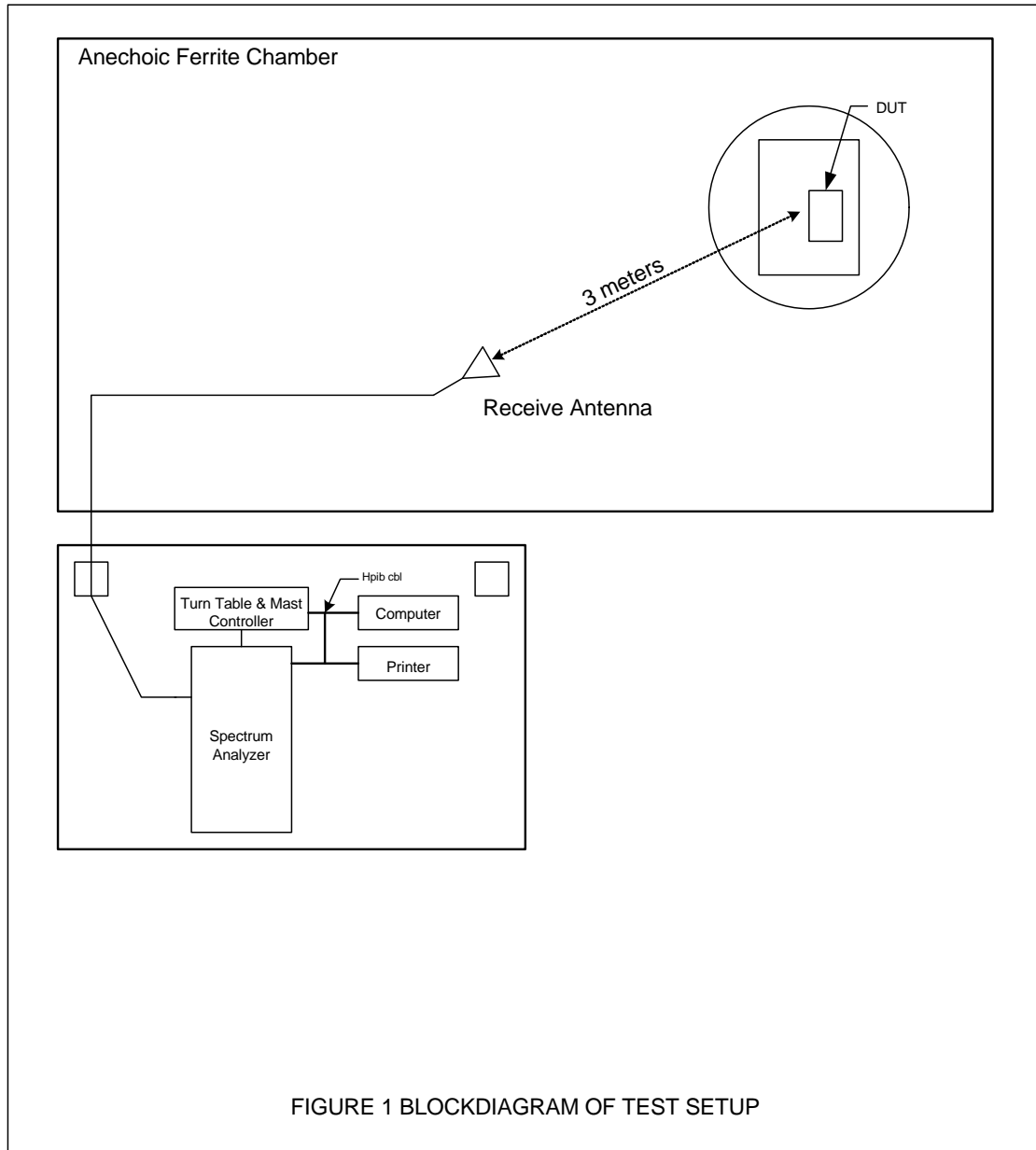




Figure 2



Test Set-up for Frequency Stability Test

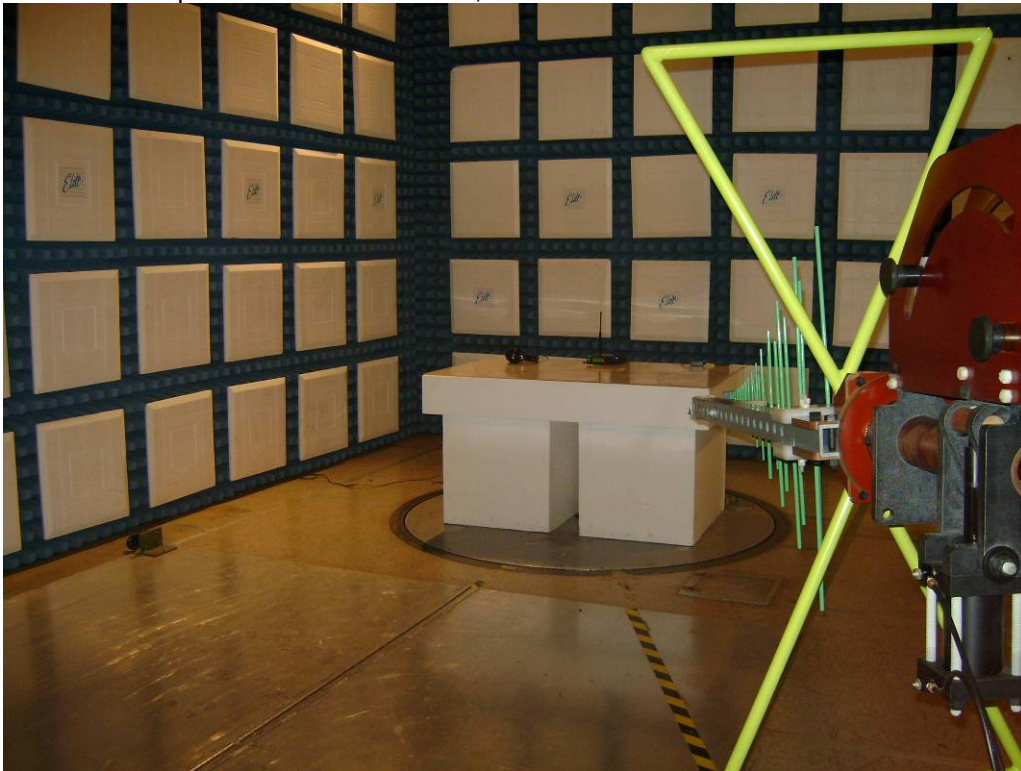


Test Set-up for Occupied Bandwidth Test

Figure 3



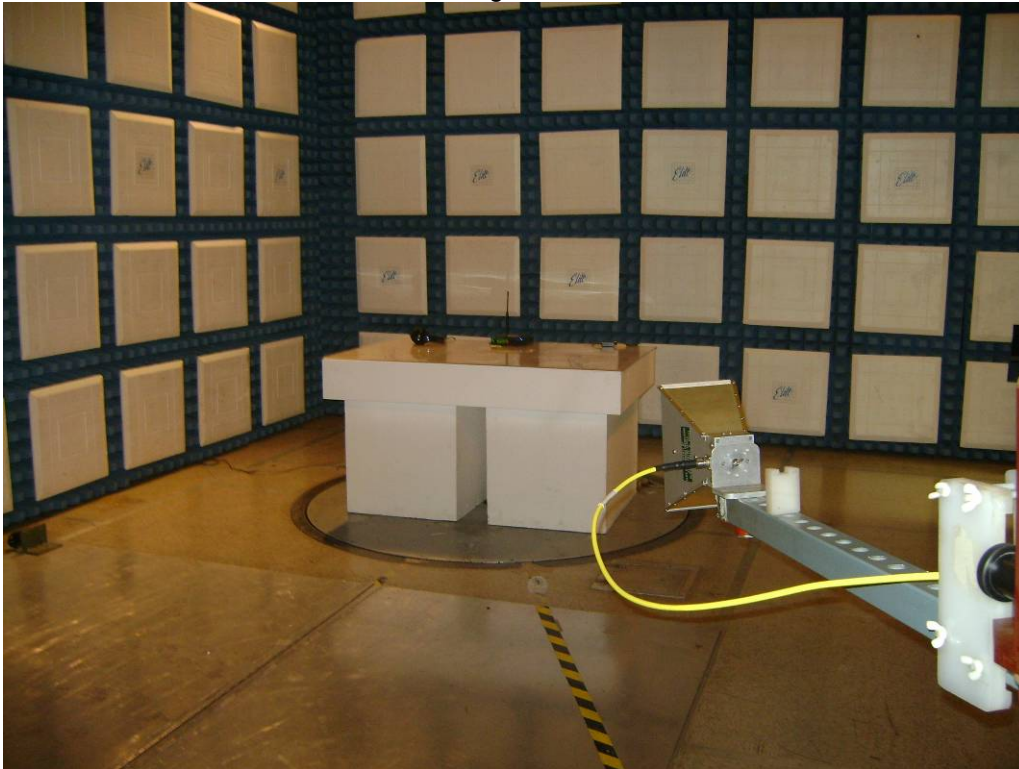
Test Set-up for Radiated Emissions, 30MHz to 1GHz – Horizontal Polarization



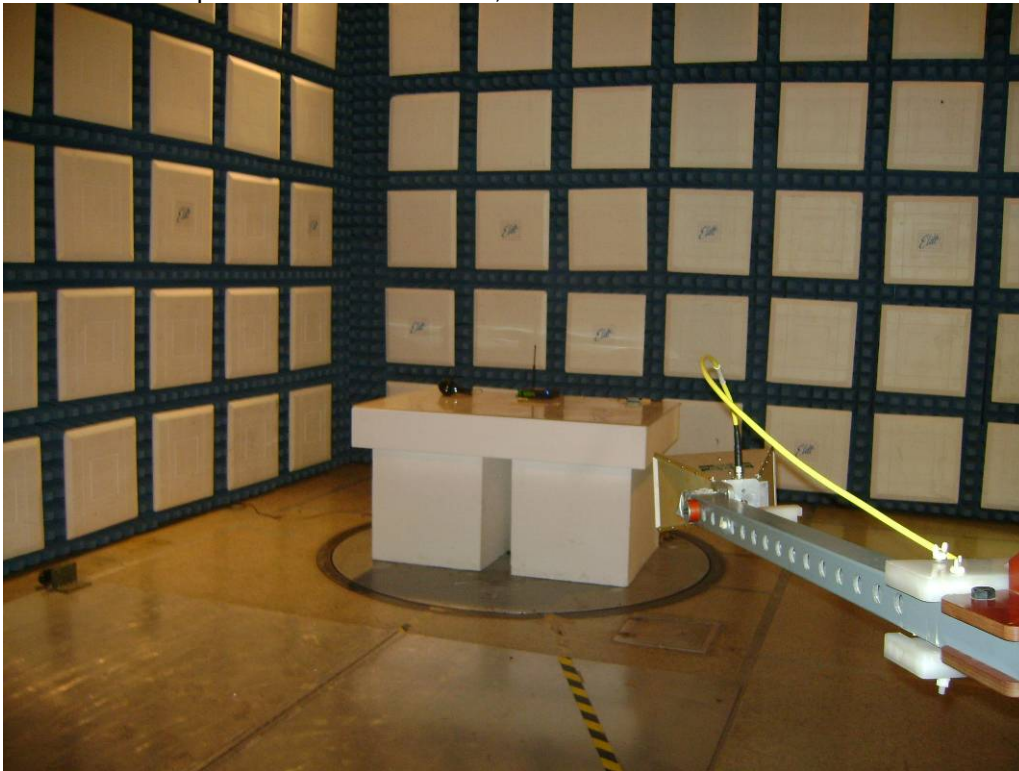
Test Set-up for Radiated Emissions, 30MHz to 1GHz – Vertical Polarization



Figure 4



Test Set-up for Radiated Emissions, Above 1GHz – Horizontal Polarization



Test Set-up for Radiated Emissions, Above 1GHz – Vertical Polarization



MANUFACTURER : Shure Inc.  
MODEL : P9T Transmitter  
SERIAL NO. : 1  
SPECIFICATION : FCC-74 and RSS-123 RF Power Output  
DATE : October 26, 2009  
MODE : Transmit at 488MHz  
UNIT : A  
EQUIPMENT USED : MPC2, MPCC

Frequency MHz	Nominal Power dB	Nominal Power mW	Measured Power dBm	Measured Power mW	FCC-74 Limit mW	RSS-123 Limit mW
488	10	10	9.72	9.36	250	1000
488	17	50	16.72	47.0	250	1000
488	20	100	19.66	92.5	250	1000

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MANUFACTURER : Shure Inc.  
MODEL : P9T Transmitter  
SERIAL NO. : 1  
SPECIFICATION : FCC-74 and RSS-123 RF Power Output  
DATE : October 26, 2009  
MODE : Transmit at 524MHz  
UNIT : B  
EQUIPMENT USED : MPC2, MPCC

Frequency MHz	Nominal Power dB	Nominal Power mW	Measured Power dBm	Measured Power mW	FCC-74 Limit mW	RSS-123 Limit mW
524	10	10	9.99	9.98	250	1000
524	17	50	16.97	49.7	250	1000
524	20	100	19.74	94.2	250	1000

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MANUFACTURER : Shure Inc.  
MODEL : P9T Transmitter  
SERIAL NO. : 1  
SPECIFICATION : FCC-74 and RSS-123 RF Power Output  
DATE : October 26, 2009  
MODE : Transmit at 614MHz  
UNIT : C  
EQUIPMENT USED : MPC2, MPCC

Frequency MHz	Nominal Power dB	Nominal Power mW	Measured Power dBm	Measured Power mW	FCC-74 Limit mW	RSS-123 Limit mW
614	10	10	9.84	9.69	250	1000
614	17	50	16.8	47.8	250	1000
614	20	100	19.66	92.3	250	1000

Checked By: MARK E. LONGINOTTI  
Mark E. Longinotti



MANUFACTURER : Shure Inc.  
MODEL : P9T Transmitter  
SERIAL NO. : 2  
SPECIFICATION : FCC-74 and RSS-123 RF Power Output  
DATE : October 26, 2009  
MODE : Transmit at 674MHz  
UNIT : D  
EQUIPMENT USED : MPC2, MPCC

Frequency MHz	Nominal Power dB	Nominal Power mW	Measured Power dBm	Measured Power mW	FCC-74 Limit mW	RSS-123 Limit mW
674	10	10	10.4	11.0	250	1000
674	17	50	17.03	50.5	250	1000
674	20	100	19.8	95.5	250	1000

Checked By: MARK E. LONGINOTTI  
Mark E. Longinotti



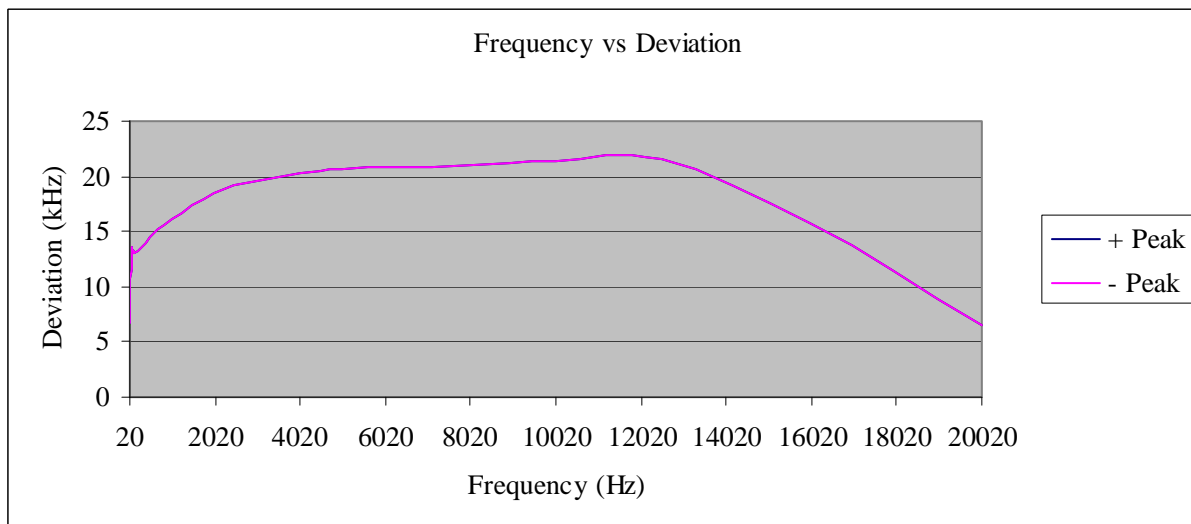
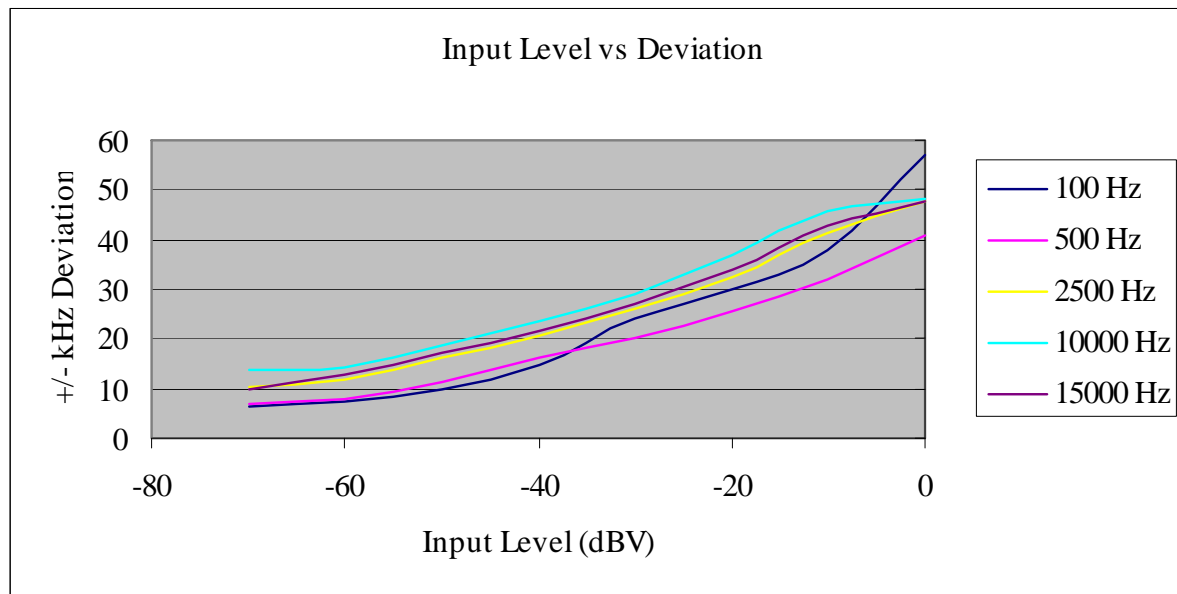
MANUFACTURER : Shure Inc.  
MODEL : P9T Transmitter  
SERIAL NO. : 1  
SPECIFICATION : FCC-74 RF Power Output  
DATE : October 26, 2009  
MODE : Transmit at 948MHz  
UNIT : J  
EQUIPMENT USED : MPC2, MPCC

Frequency MHz	Nominal Power dB	Nominal Power mW	Measured Power dBm	Measured Power mW	FCC-74 Limit mW
948	10	10	9.52	8.95	1000
948	17	50	16.51	44.7	1000
948	20	100	19.32	85.5	1000

Checked By: MARK E. LONGINOTTI  
Mark E. Longinotti

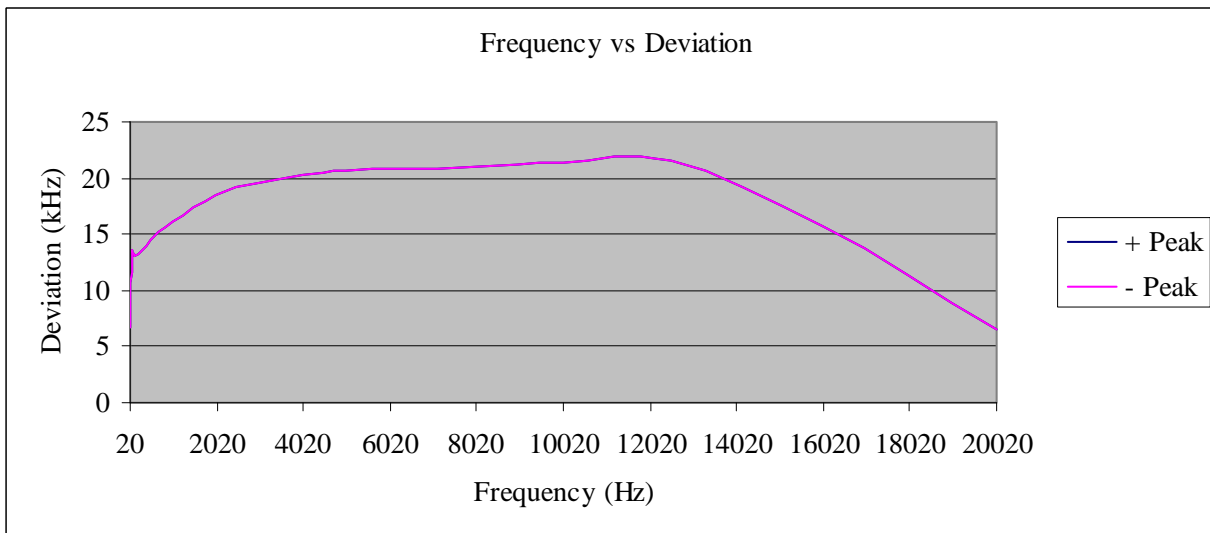
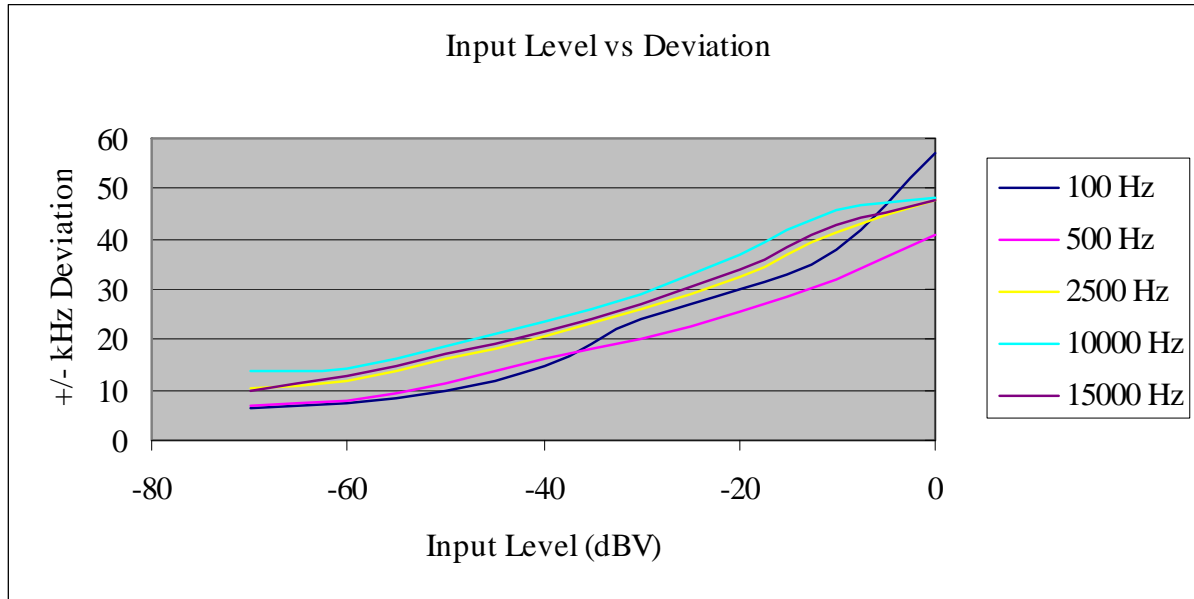


MANUFACTURER : Shure Inc.  
MODEL : P9T Transmitter  
SERIAL NO. : 2  
SPECIFICATION : FCC-74 and RSS-123 Modulation Characteristics  
DATE : December 7, 2009  
MODE : Transmit at 488MHz, 10mW  
UNIT : A  
EQUIPMENT USED : RYE0, GWH2





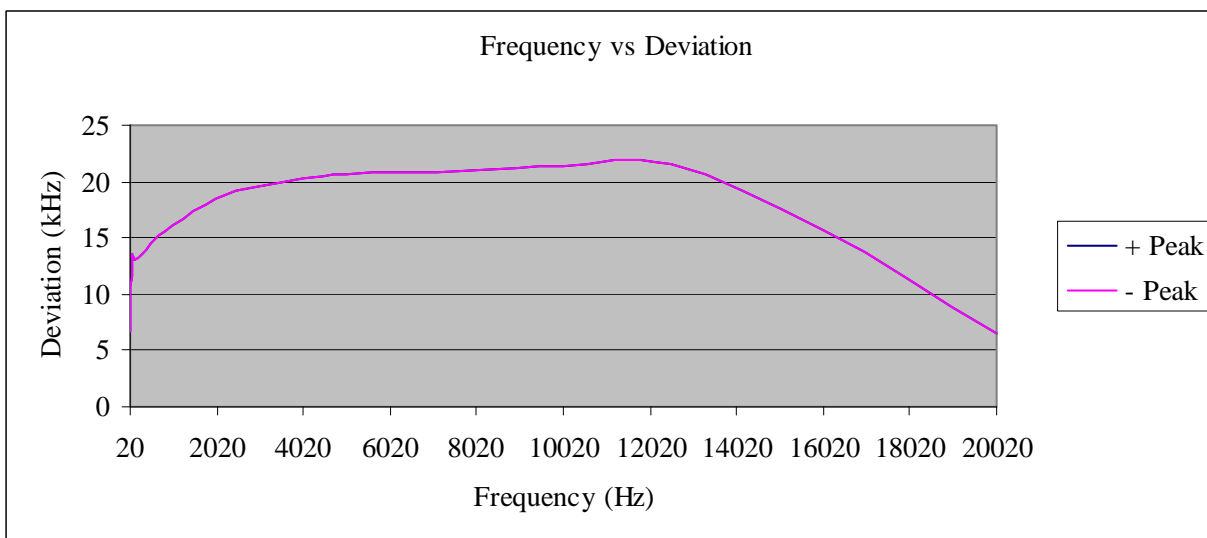
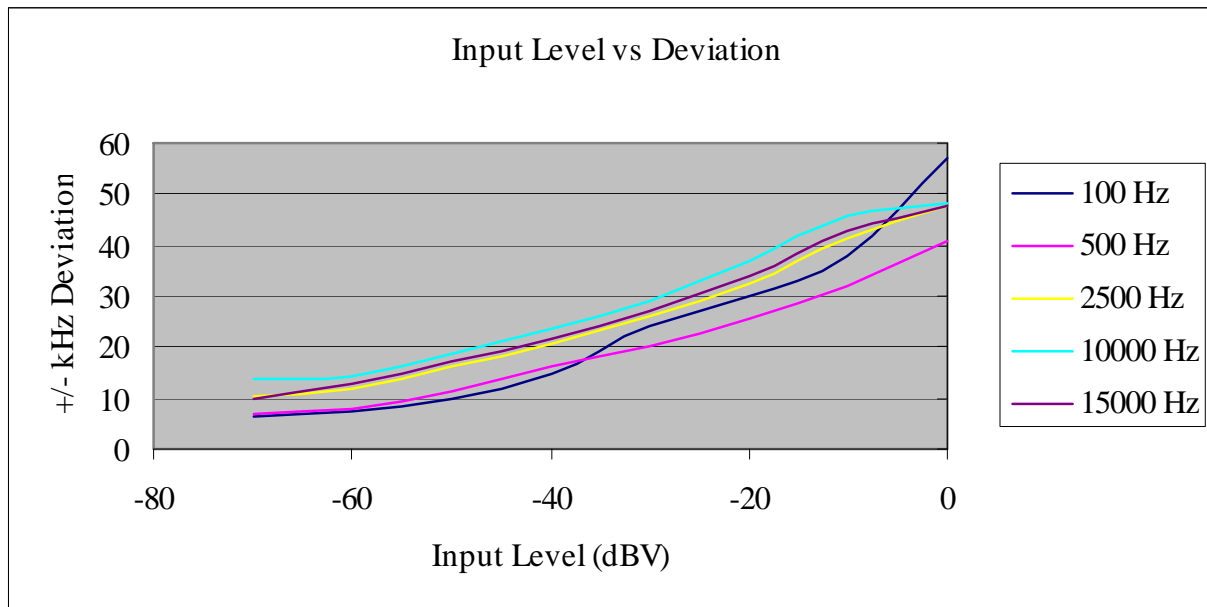
MANUFACTURER : Shure Inc.  
MODEL : P9T Transmitter  
SERIAL NO. : 2  
SPECIFICATION : FCC-74 and RSS-123 Modulation Characteristics  
DATE : December 7, 2009  
MODE : Transmit at 488MHz, 50mW  
UNIT : A  
EQUIPMENT USED : RYE0, GWH2



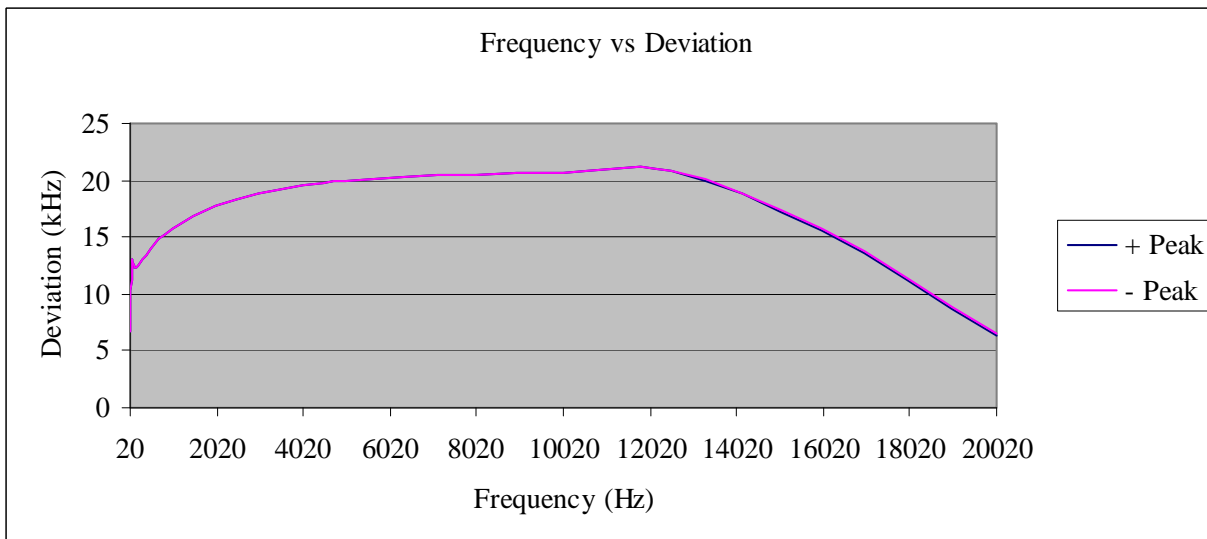
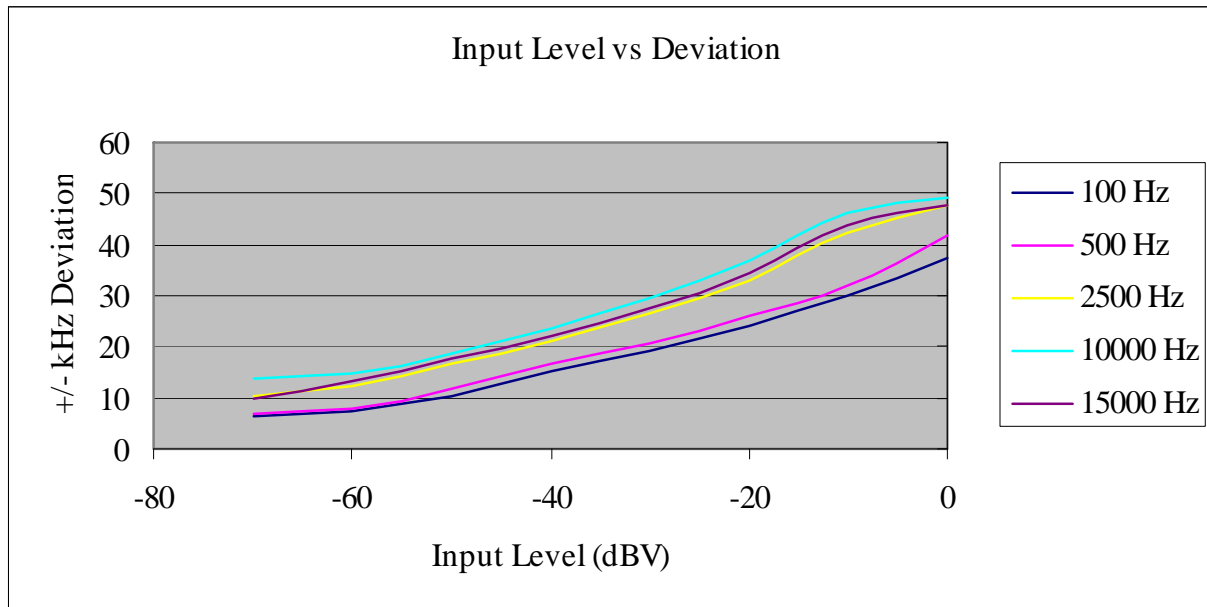




MANUFACTURER : Shure Inc.  
MODEL : P9T Transmitter  
SERIAL NO. : 2  
SPECIFICATION : FCC-74 and RSS-123 Modulation Characteristics  
DATE : December 7, 2009  
MODE : Transmit at 488MHz, 100mW  
UNIT : A  
EQUIPMENT USED : RYE0, GWH2

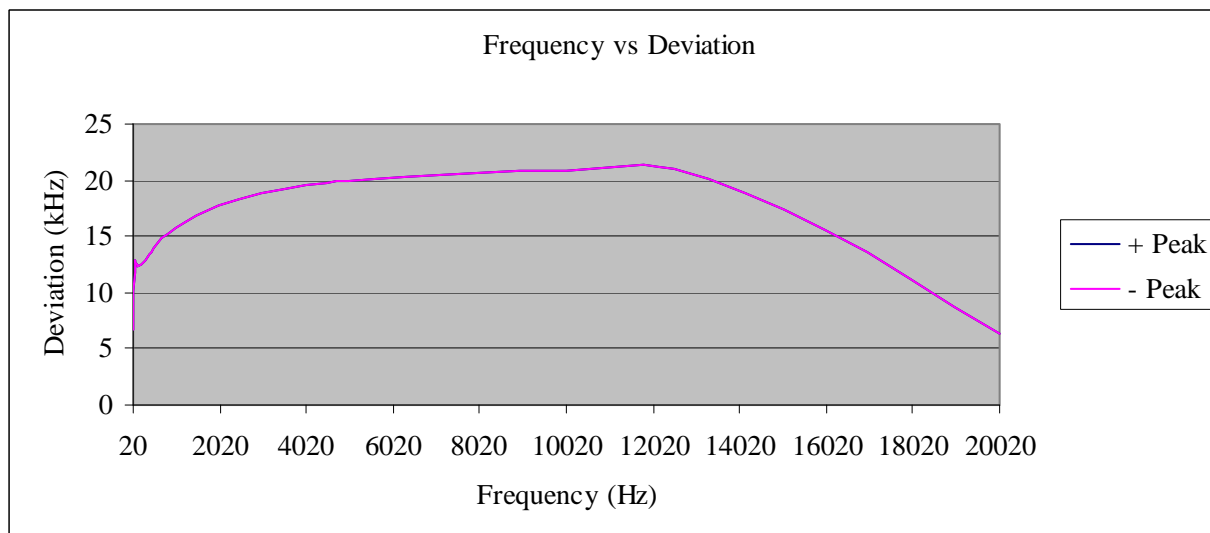
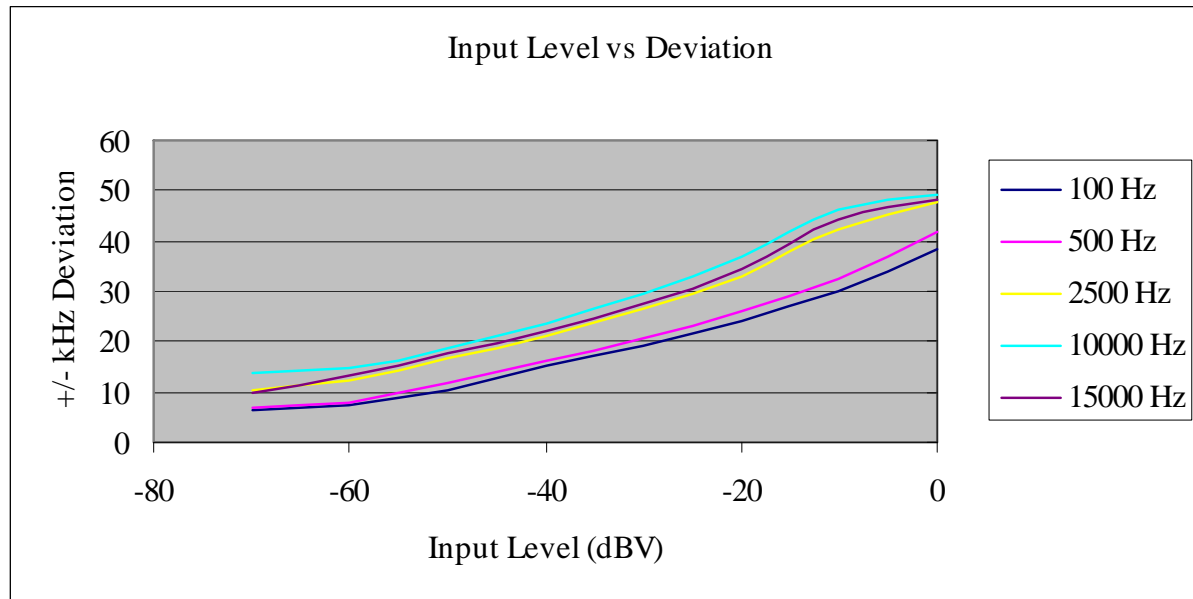


MANUFACTURER : Shure Inc.  
 MODEL : P9T Transmitter  
 SERIAL NO. : 2  
 SPECIFICATION : FCC-74 and RSS-123 Modulation Characteristics  
 DATE : December 7, 2009  
 MODE : Transmit at 524MHz, 100mW  
 UNIT : B  
 EQUIPMENT USED : RYE0, GWH2



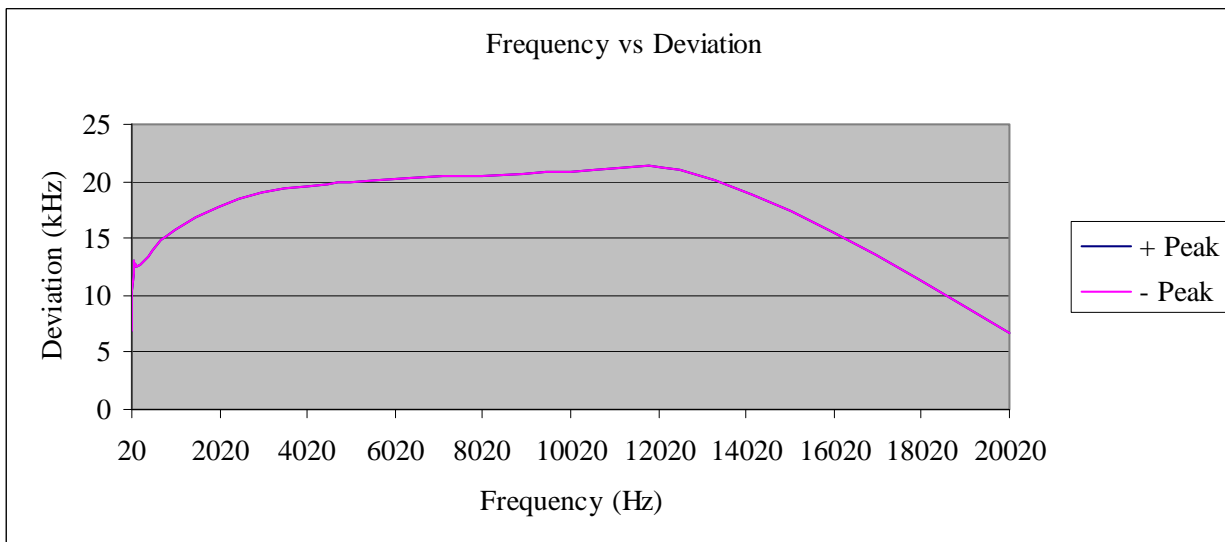
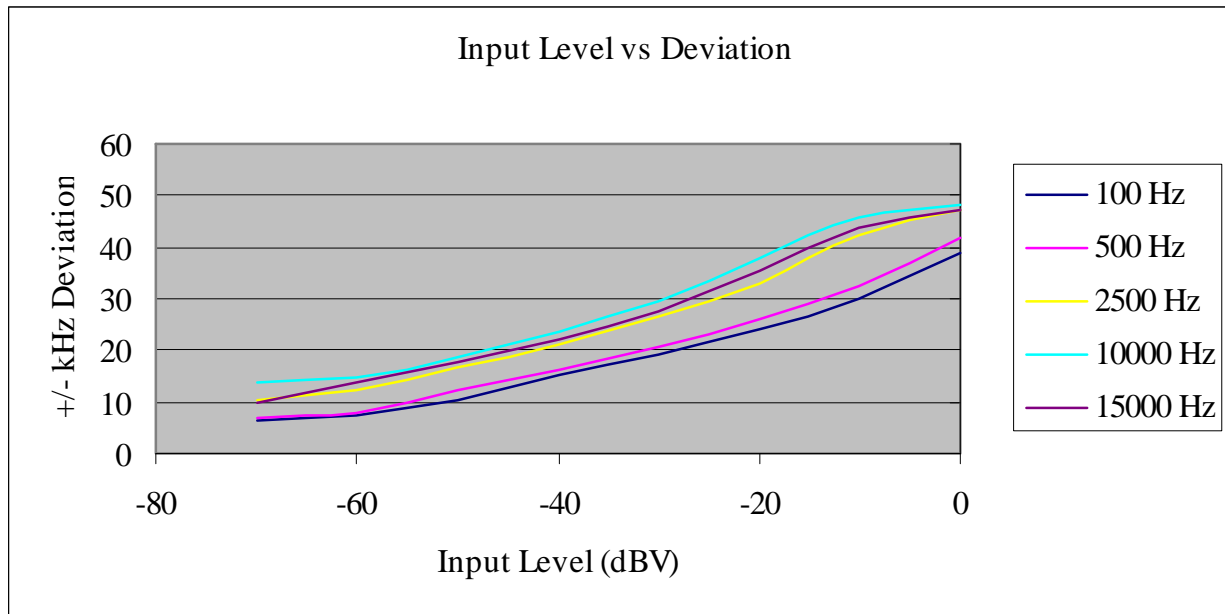


MANUFACTURER : Shure Inc.  
MODEL : P9T Transmitter  
SERIAL NO. : 2  
SPECIFICATION : FCC-74 and RSS-123 Modulation Characteristics  
DATE : December 7, 2009  
MODE : Transmit at 614MHz, 100mW  
UNIT : C  
EQUIPMENT USED : RYE0, GWH2



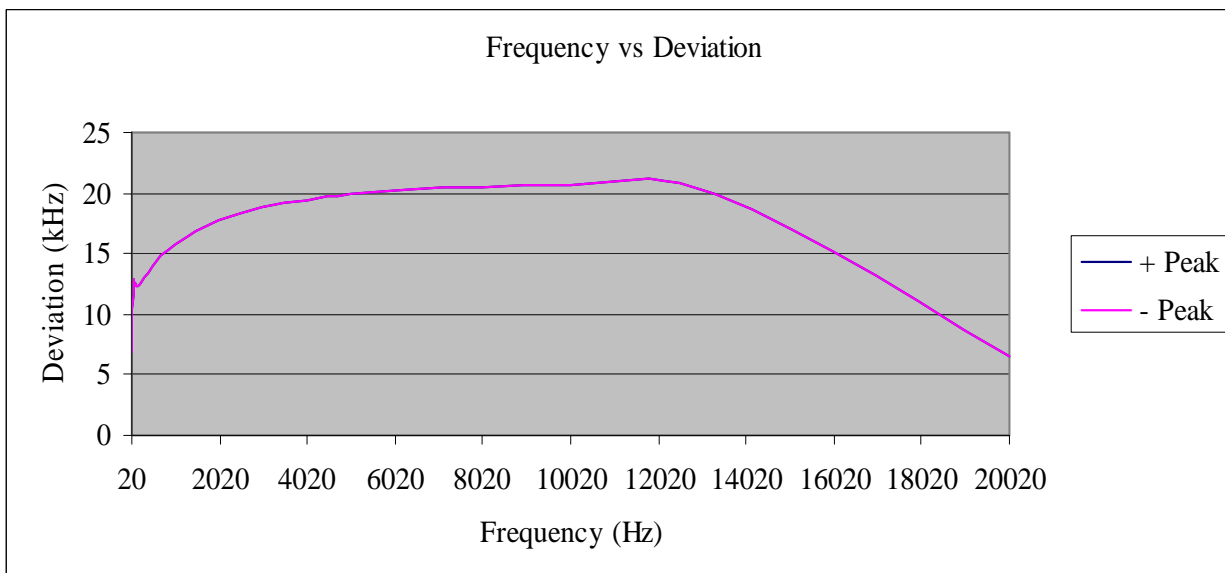
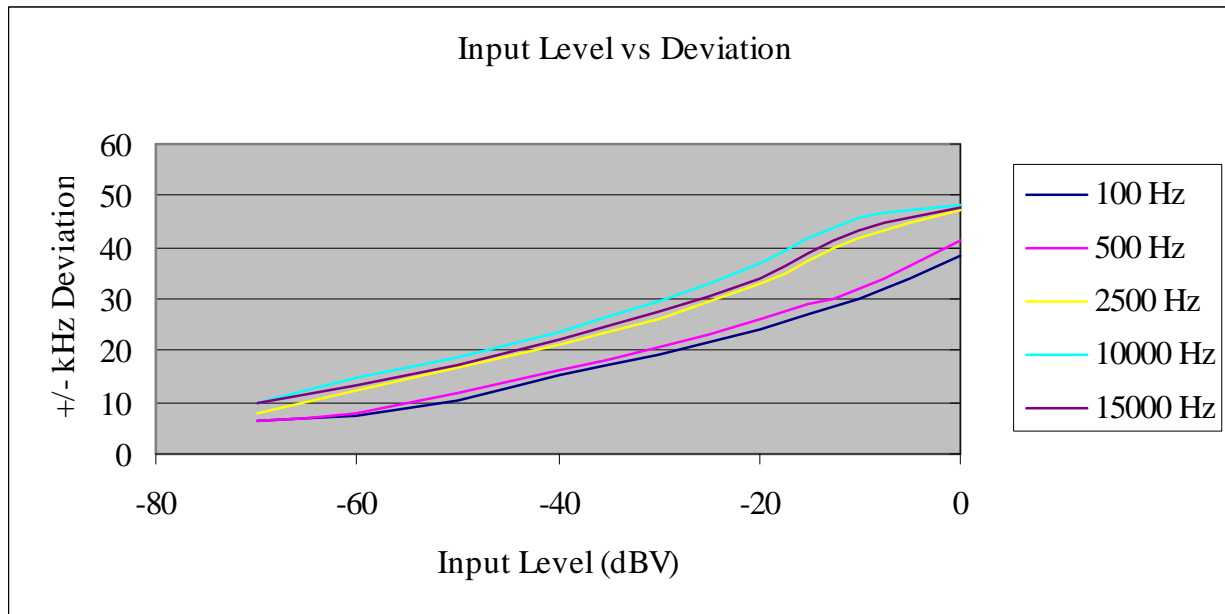


MANUFACTURER : Shure Inc.  
MODEL : P9T Transmitter  
SERIAL NO. : 1  
SPECIFICATION : FCC-74 and RSS-123 Modulation Characteristics  
DATE : December 7, 2009  
MODE : Transmit at 674MHz, 100mW  
UNIT : D  
EQUIPMENT USED : RYE0, GWH2





MANUFACTURER : Shure Inc.  
MODEL : P9T Transmitter  
SERIAL NO. : 2  
SPECIFICATION : FCC-74 and RSS-123 Modulation Characteristics  
DATE : December 7, 2009  
MODE : Transmit at 948MHz, 100mW  
UNIT : J  
EQUIPMENT USED : RYE0, GWH2





MANUFACTURER : Shure Inc.  
MODEL : P9T Transmitter  
SERIAL NO. : 1  
SPECIFICATION : FCC-74 and RSS-123 Frequency Stability vs. Temperature  
DATE : November 25, 2009  
MODE : Transmit at 674MHz, 100mW  
UNIT : D  
EQUIPMENT USED : ETD0, ETDC, ETDA, MFC0, SAA1, MDBN

Temperature °C	Nominal Frequency MHz	Measured Frequency MHz	Deviation %	Deviation Limit %	Deviation Hz	Limit Hz
-30	673.99992 2	673.999959	0.0000055	0.005	37.000000	33699.9961
-20	673.99992 2	673.999700	-0.0000329	0.005	-222.000000	33699.9961
-10	673.99992 2	673.999904	-0.0000027	0.005	-18.000000	33699.9961
0	673.99992 2	674.000020	0.0000145	0.005	98.000000	33699.9961
10	673.99992 2	674.000050	0.0000190	0.005	128.000000	33699.9961
20	673.99992 2	674.000004	0.0000122	0.005	82.000000	33699.9961
30	673.99992 2	673.999997	0.0000111	0.005	75.000000	33699.9961
40	673.99992 2	673.999937	0.0000022	0.005	15.000000	33699.9961
50	673.99992 2	673.999920	-0.0000003	0.005	-2.000000	33699.9961

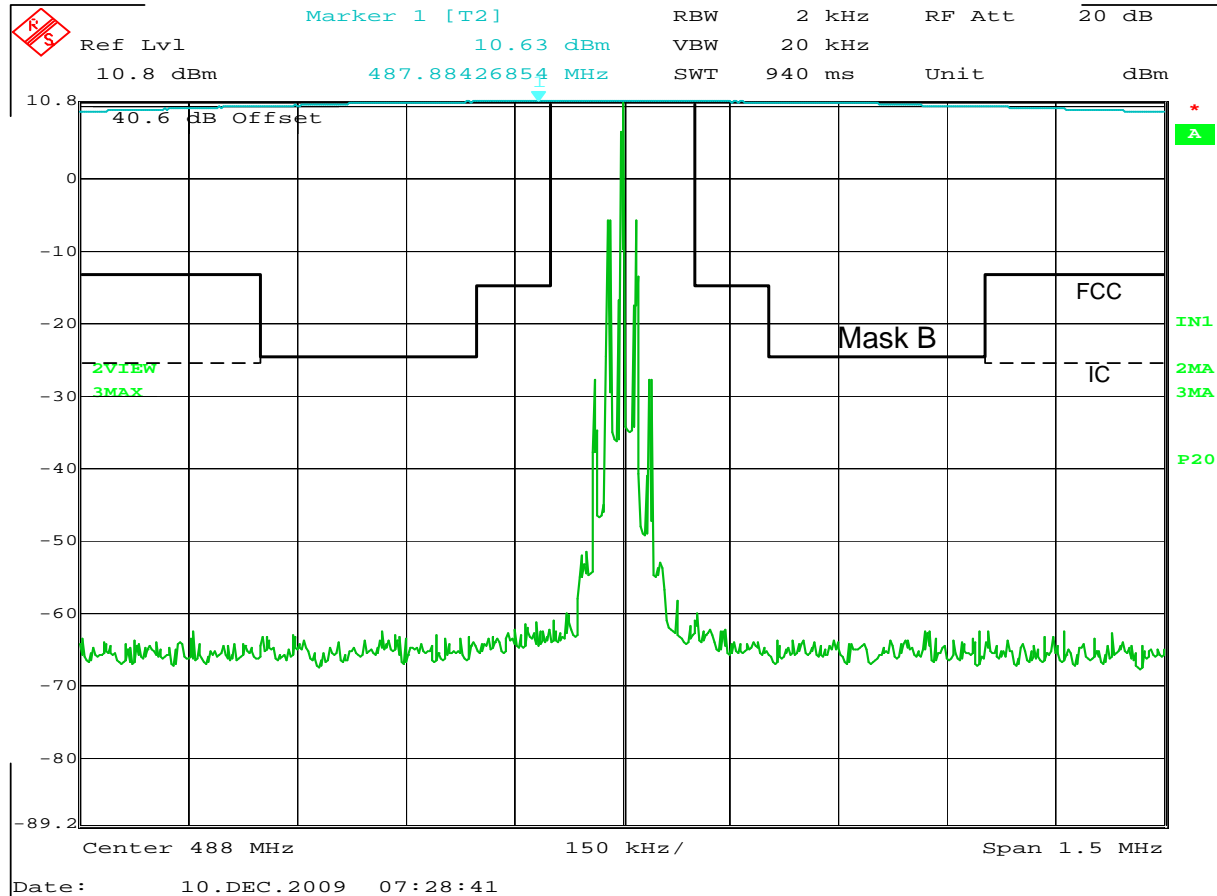
Checked By: MARK E. LONGINOTTI  
For Brandon Lugo



MANUFACTURER : Shure Inc.  
MODEL : P9T Transmitter  
SERIAL NO. : 1  
SPECIFICATION : FCC-74 and RSS-123 Frequency Stability vs. Voltage  
DATE : November 25, 2009  
MODE : Transmit at 674MHz, 100mW  
UNIT : D  
EQUIPMENT USED : ETD0, ETDC, ETDA, MFC0, SAA1, MDBN

Input Voltage VAC	Nominal Frequency MHz	Measured Frequency MHz	Deviation %	Deviation Limit %	Deviation Hz	Limit Hz
115	673.99992 2	673.999922	0.0000000	0.005	0.000000	33699.9961
97.7(85%)	673.99992 2	673.999893	-0.0000043	0.005	-29.000000	33699.9961
132.25(115% )	673.99992 2	673.999956	0.0000050	0.005	34.000000	33699.9961

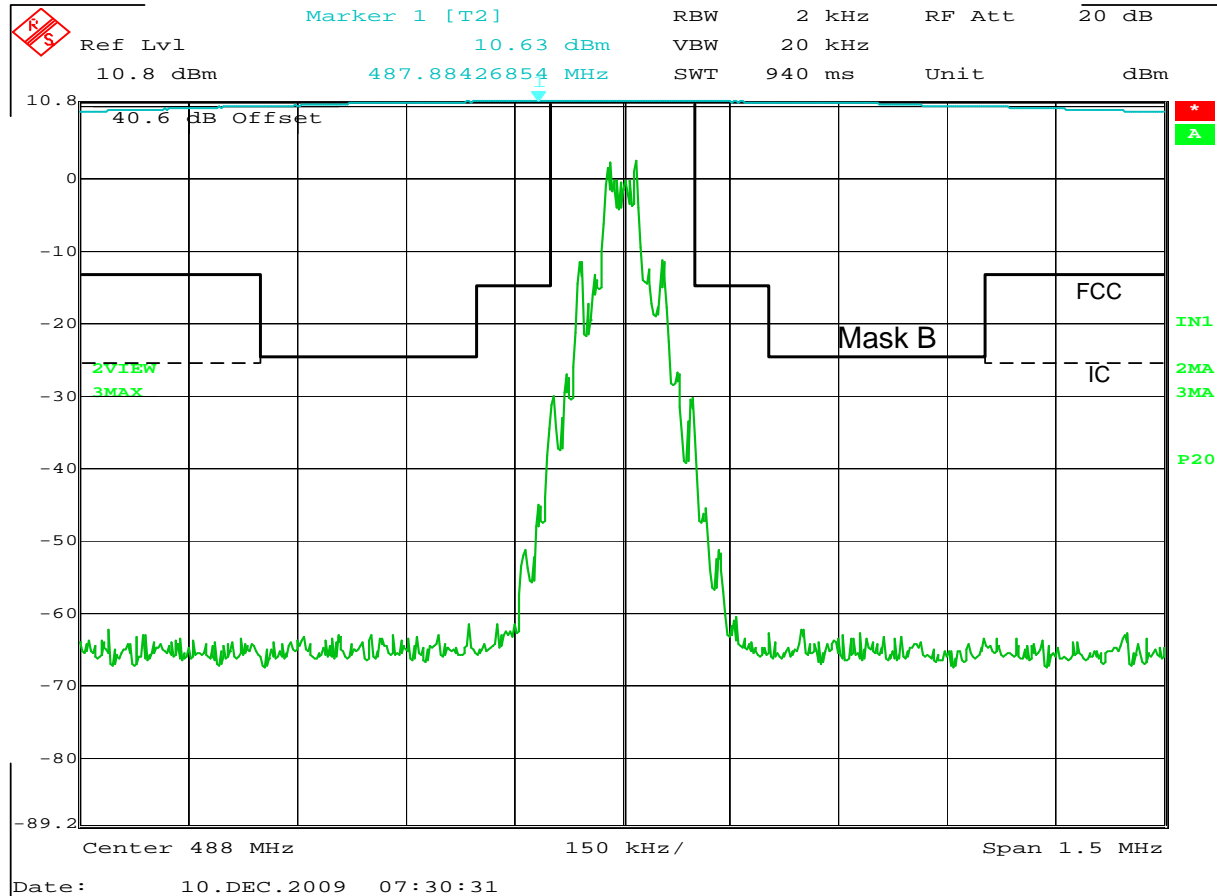
Checked By: MARK E. LONGINOTTI  
For Brandon Lugo



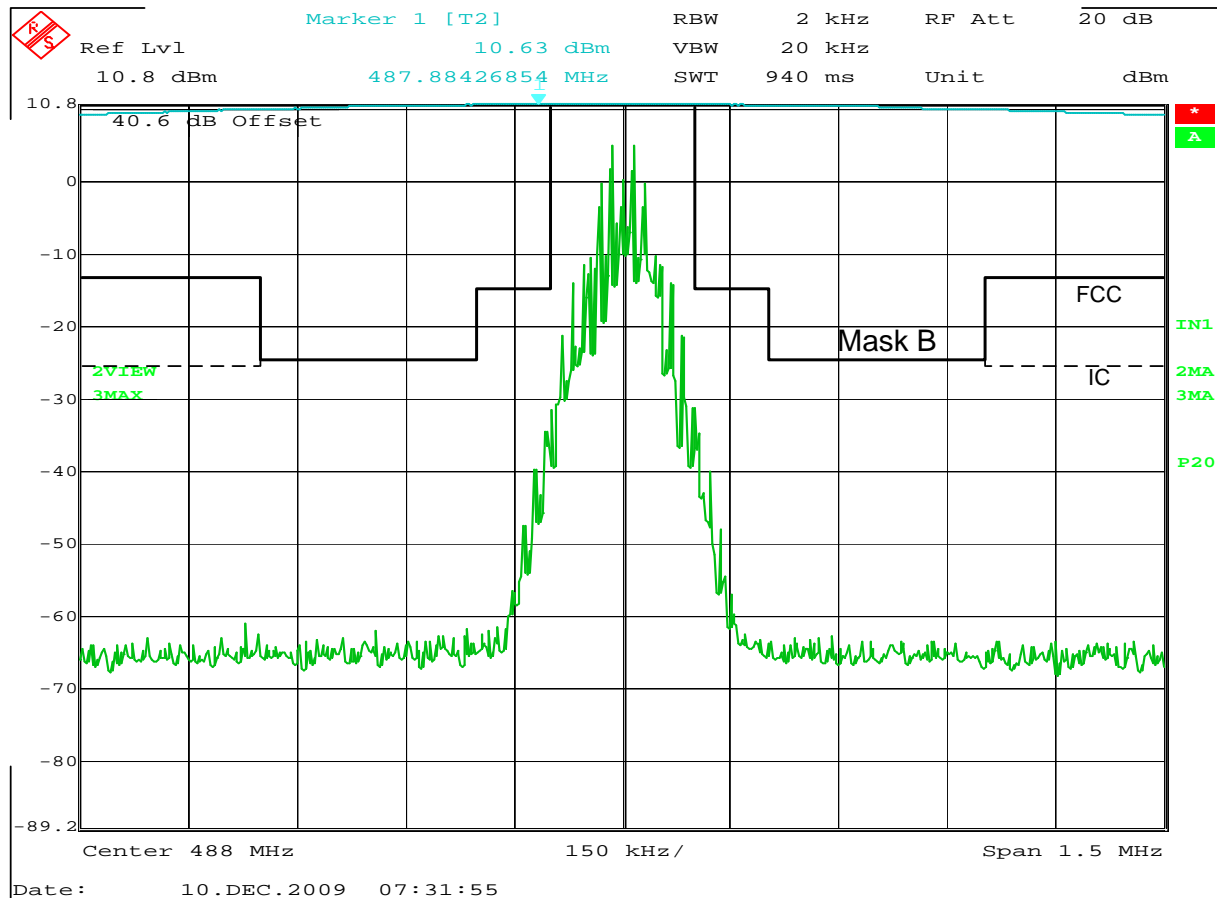
### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 470MHz to 506MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 488MHz  
TEST POWER : 10mW  
NOTES : un-modulated carrier  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0



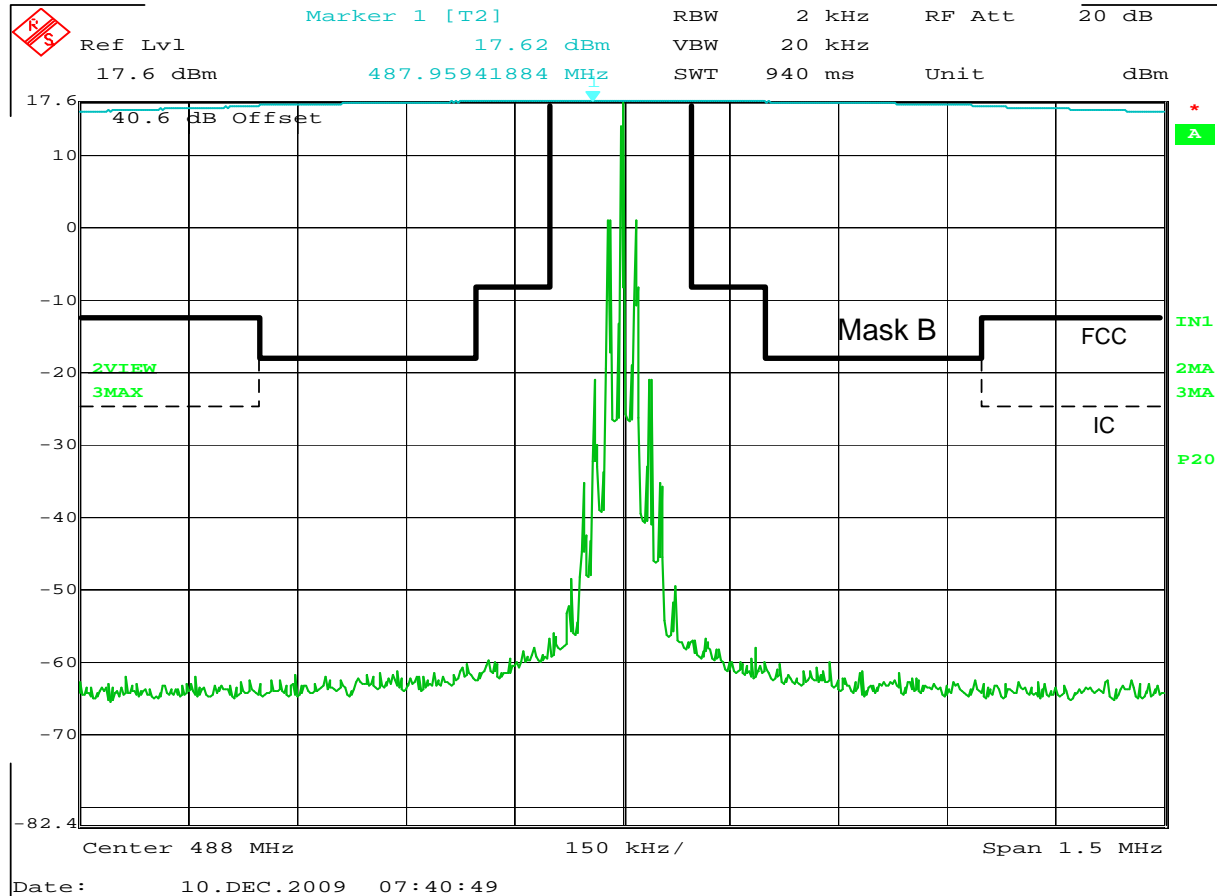
**IC/FCC Occupied Bandwidth**

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 470MHz to 506MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 488MHz  
TEST POWER : 10mW  
NOTES : 2500 at 16dB over 50%  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0



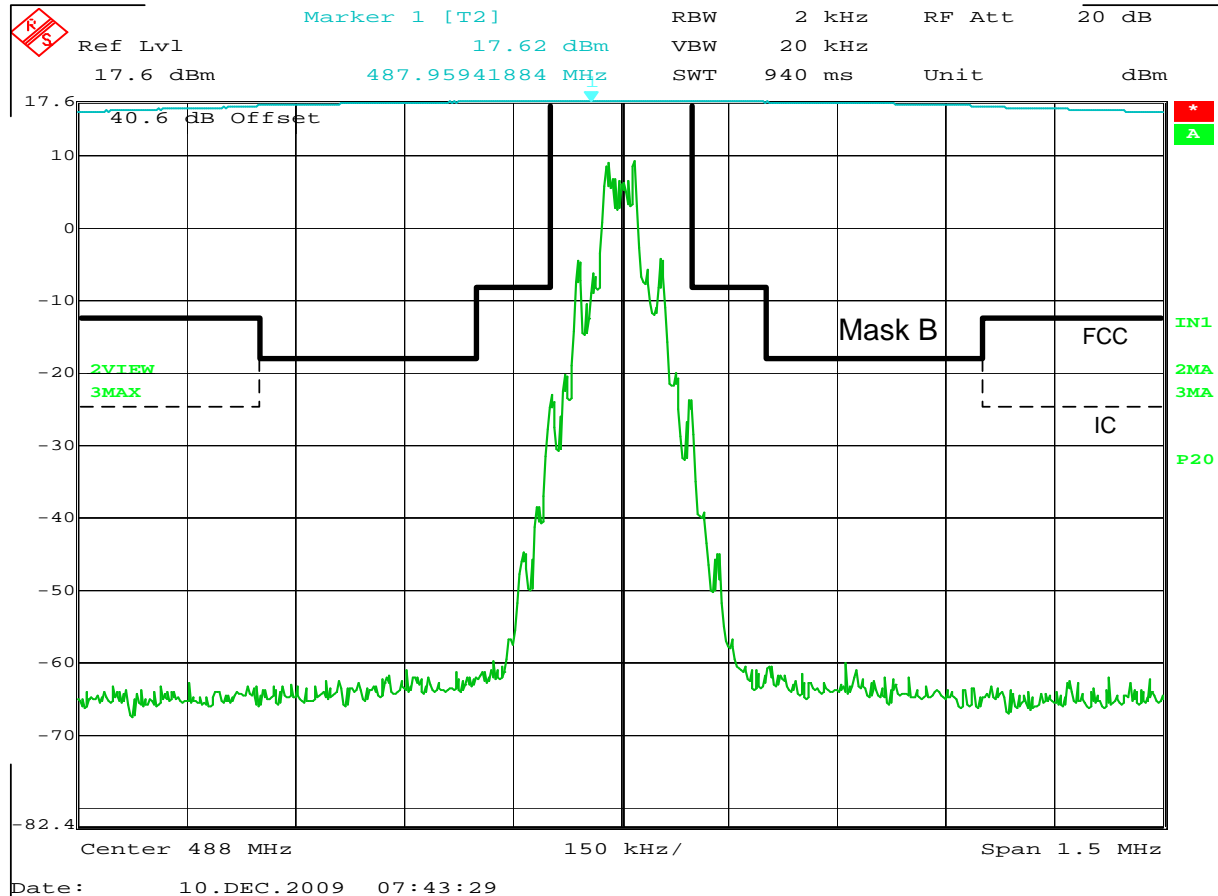
### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 470MHz to 506MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 488MHz  
TEST POWER : 10mW  
NOTES : 15kHz @ 85% Modulation  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0



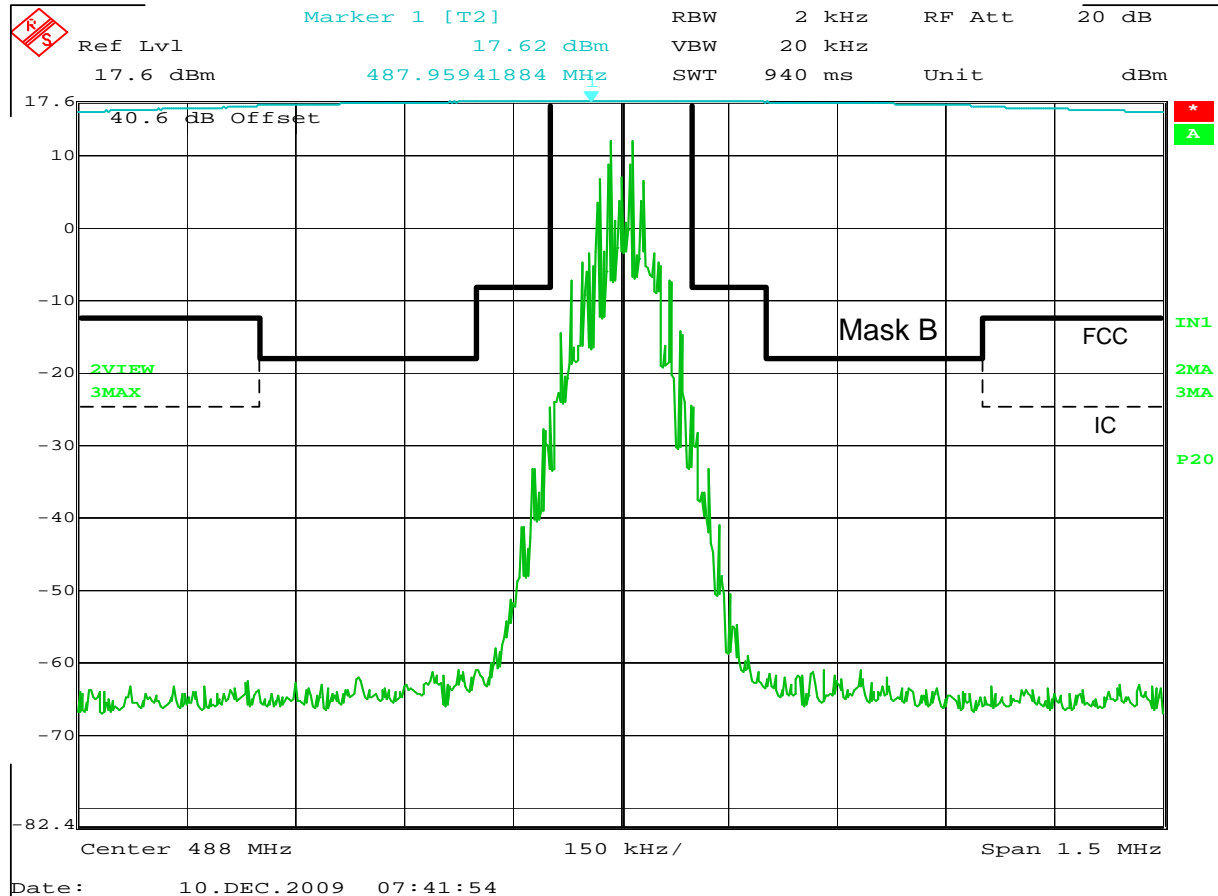
### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 470MHz to 506MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 488MHz  
TEST POWER : 50mW  
NOTES : un-modulated carrier  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, RYE0



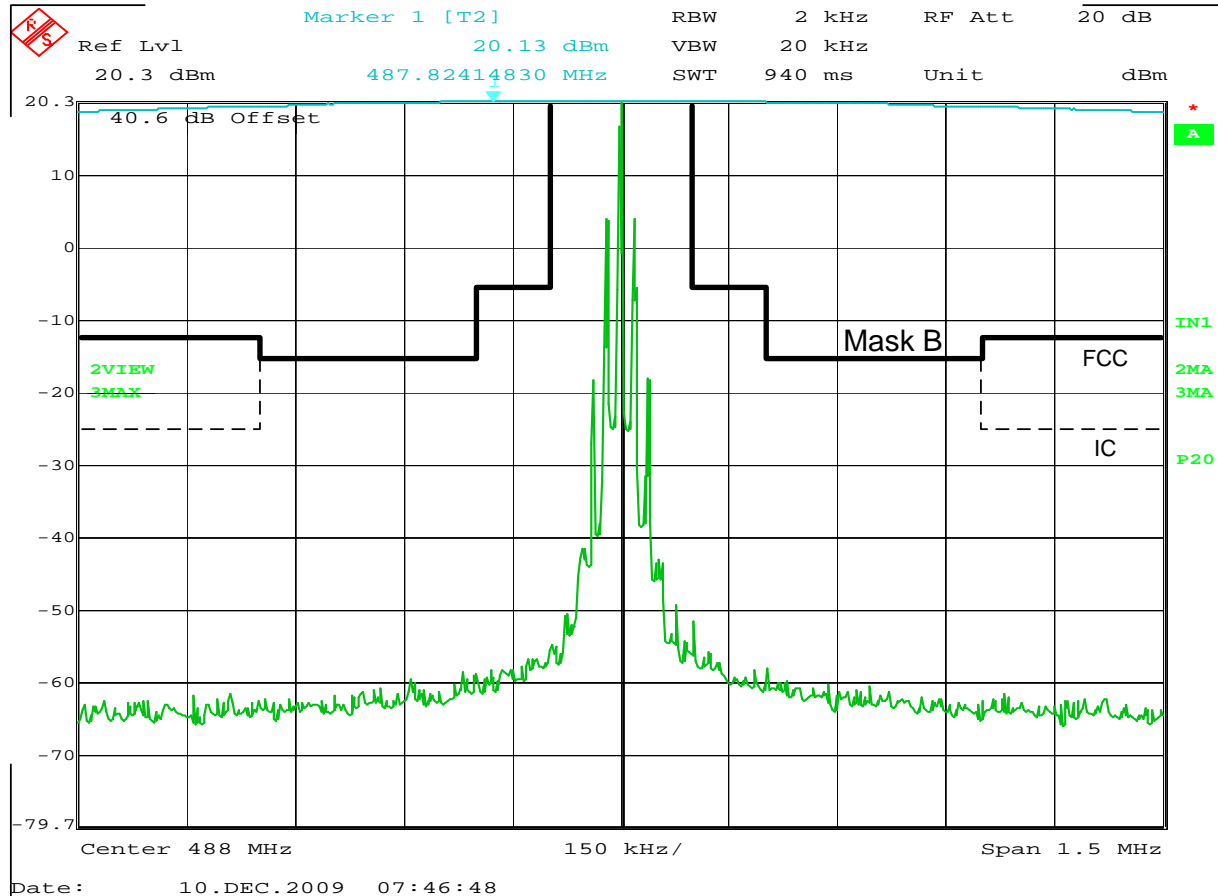
### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 470MHz to 506MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 488MHz  
TEST POWER : 50mW  
NOTES : 2500 at 16dB over 50%  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, RYE0



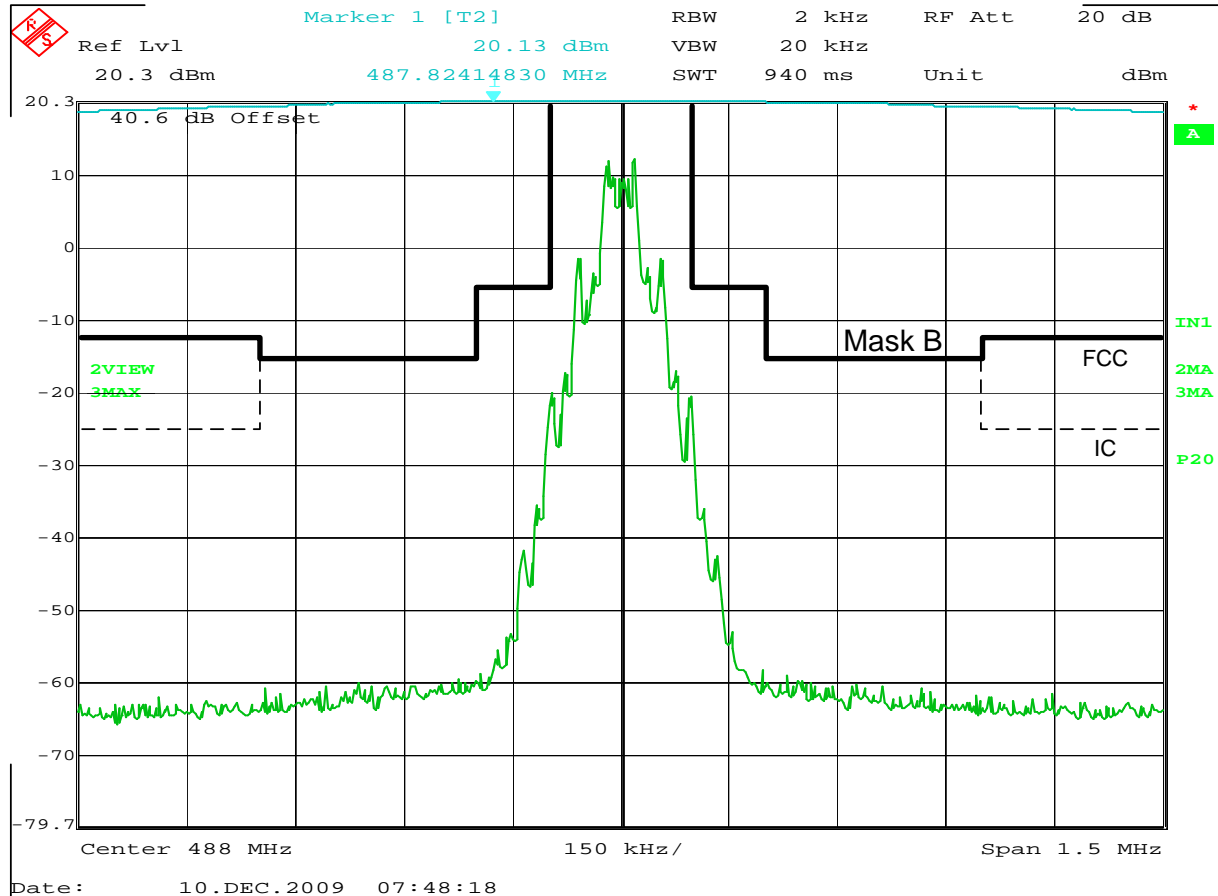
### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 470MHz to 506MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 488MHz  
TEST POWER : 50mW  
NOTES : 15kHz @ 85% Modulation  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, RYE0



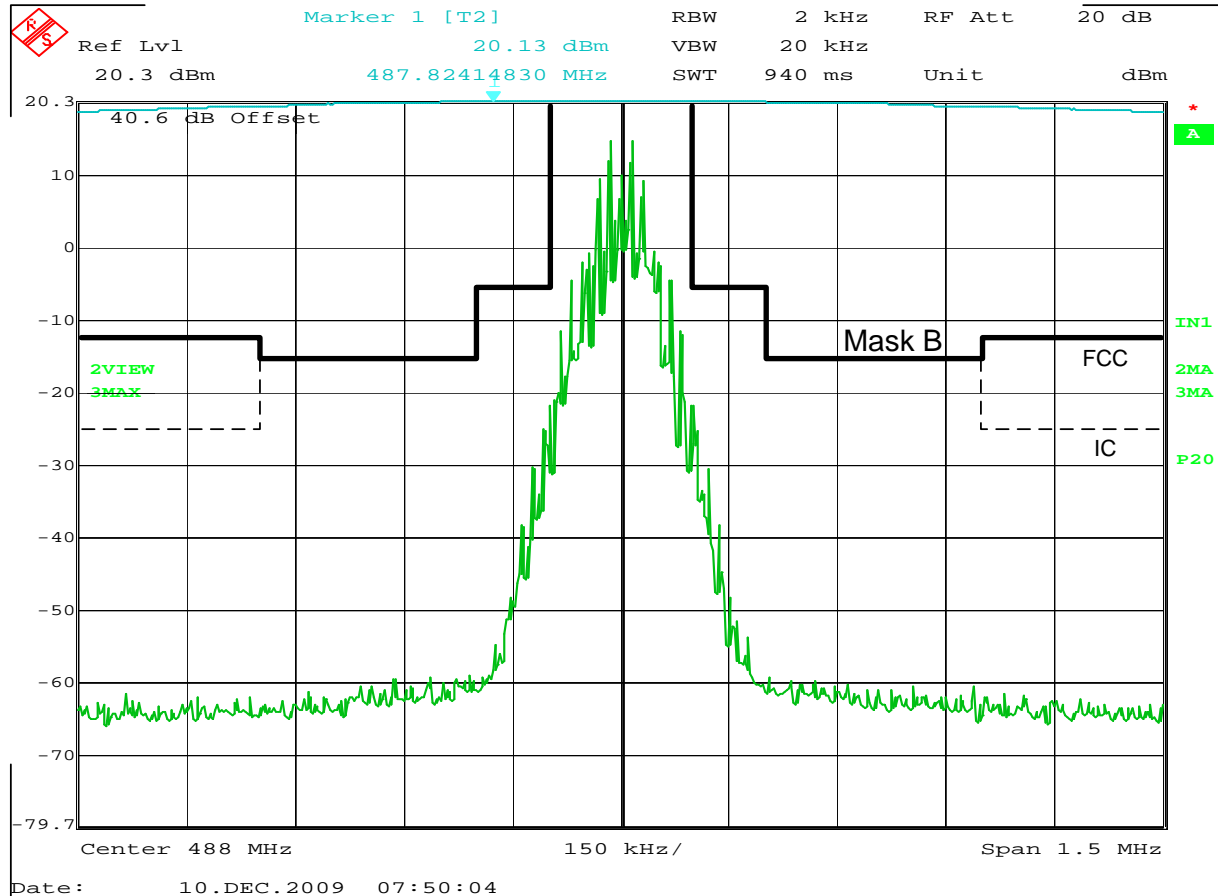
#### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 470MHz to 506MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 488MHz  
TEST POWER : 100mW  
NOTES : un-modulated carrier  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, RYE0



### IC/FCC Occupied Bandwidth

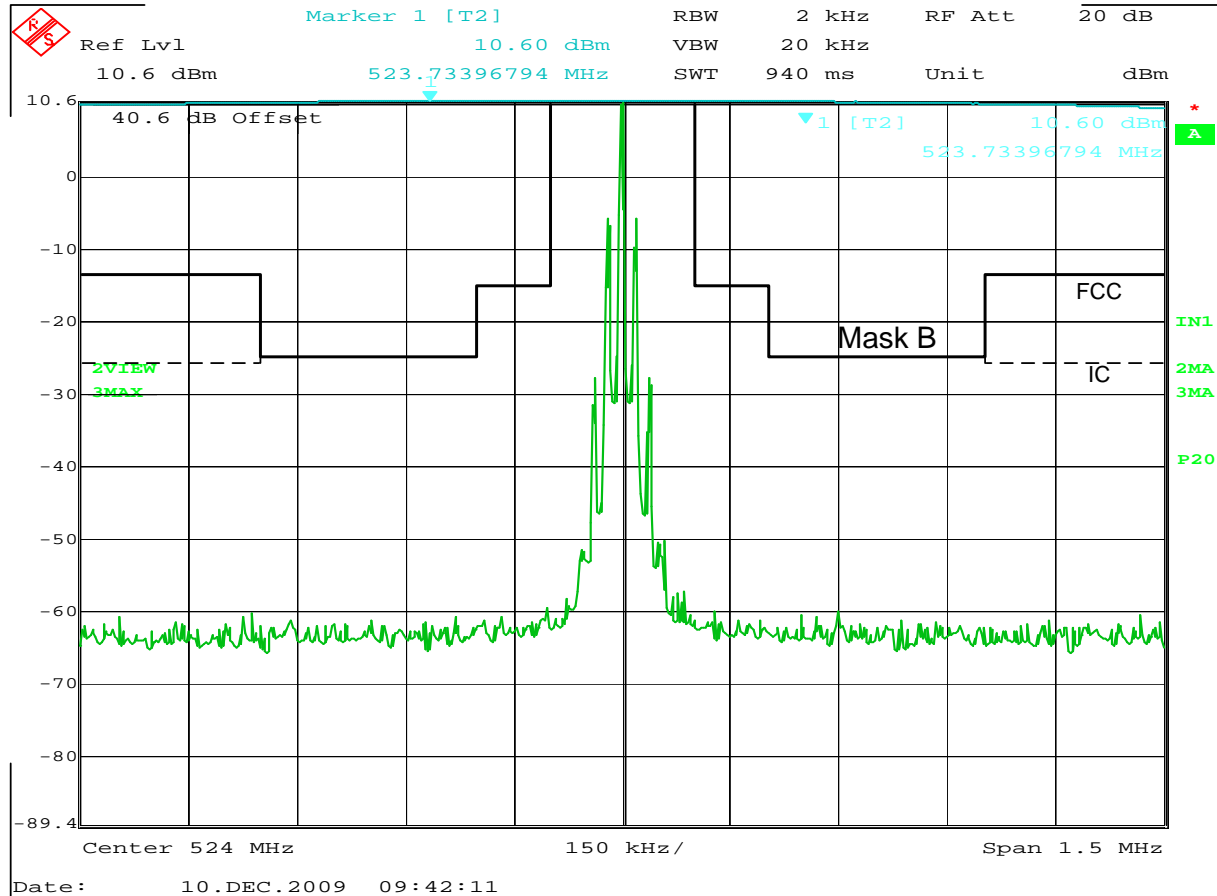
MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 470MHz to 506MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 488MHz  
TEST POWER : 100mW  
NOTES : 2500 at 16dB over 50%  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, RYE0



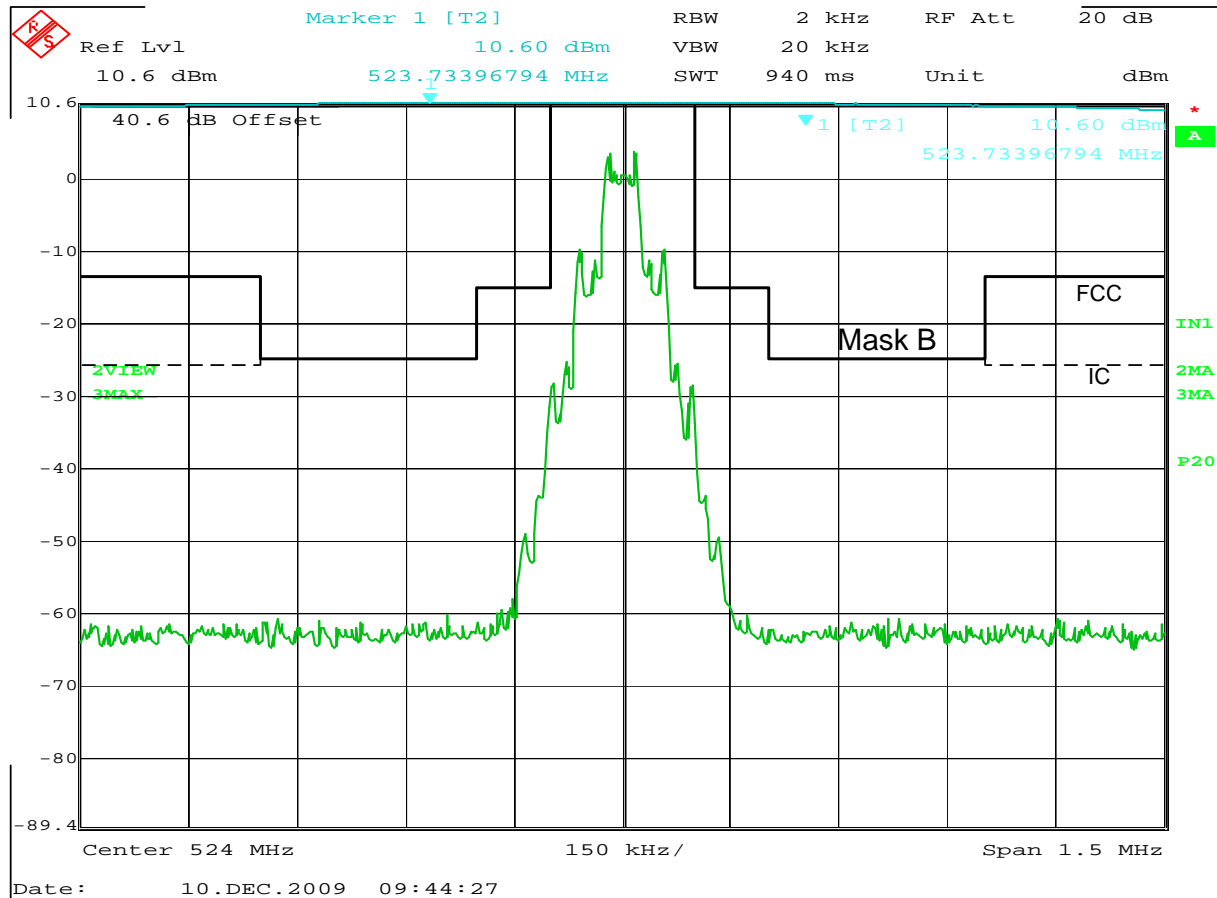
### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 470MHz to 506MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 488MHz  
TEST POWER : 100mW  
NOTES : 15kHz @ 85% Modulation  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, RYE0

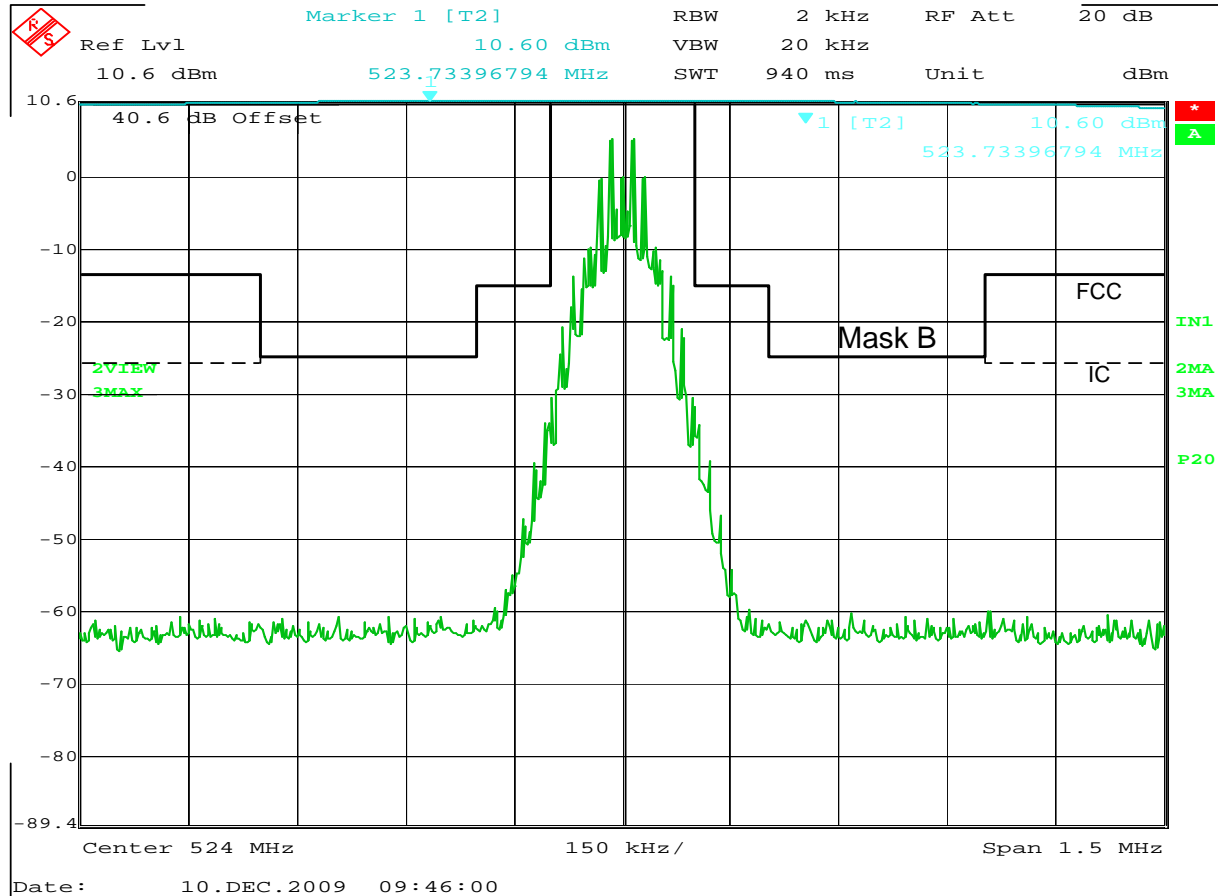


**IC/FCC Occupied Bandwidth**

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 506MHz to 542MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 524MHz  
TEST POWER : 10mW  
NOTES : CW  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0

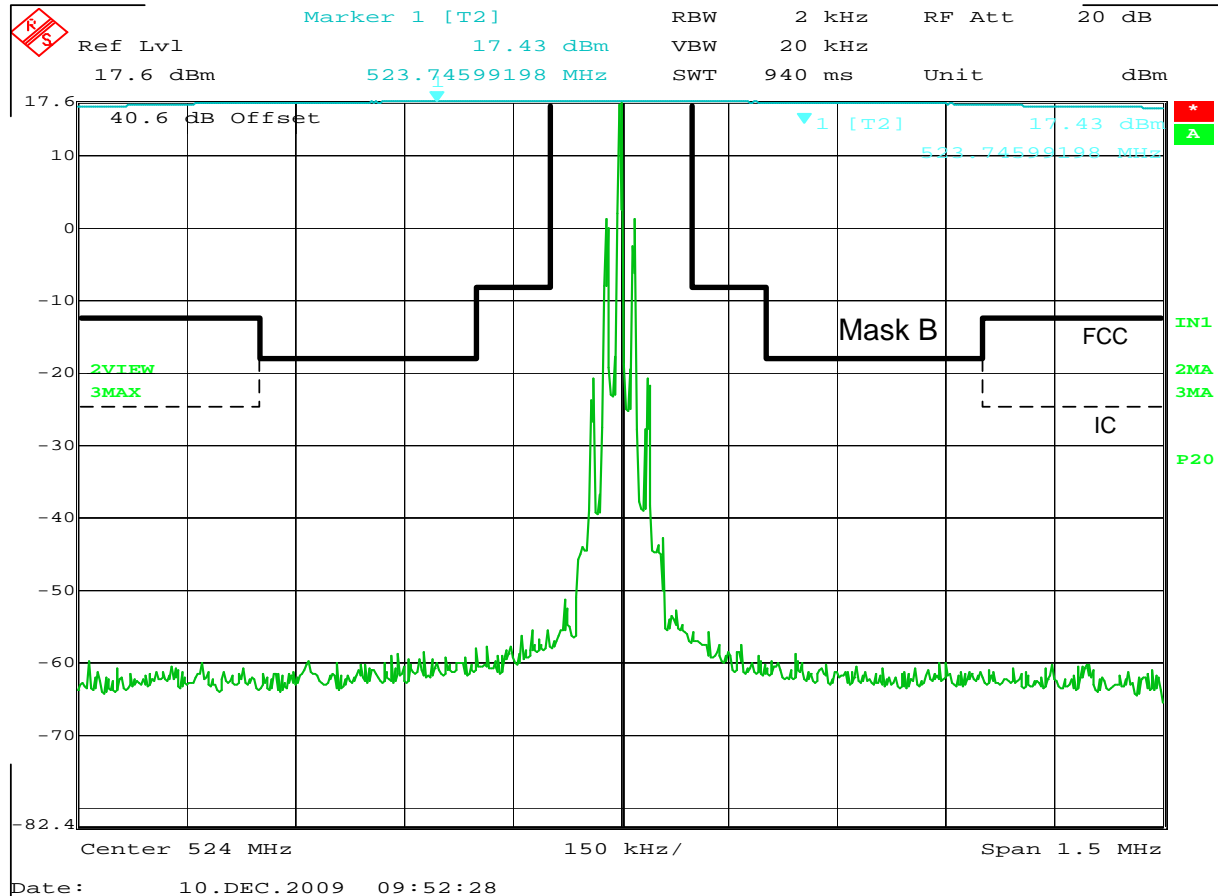
**IC/FCC Occupied Bandwidth**

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 506MHz to 542MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 524MHz  
TEST POWER : 10mW  
NOTES : 2500Hz at 16dB over 50%  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0



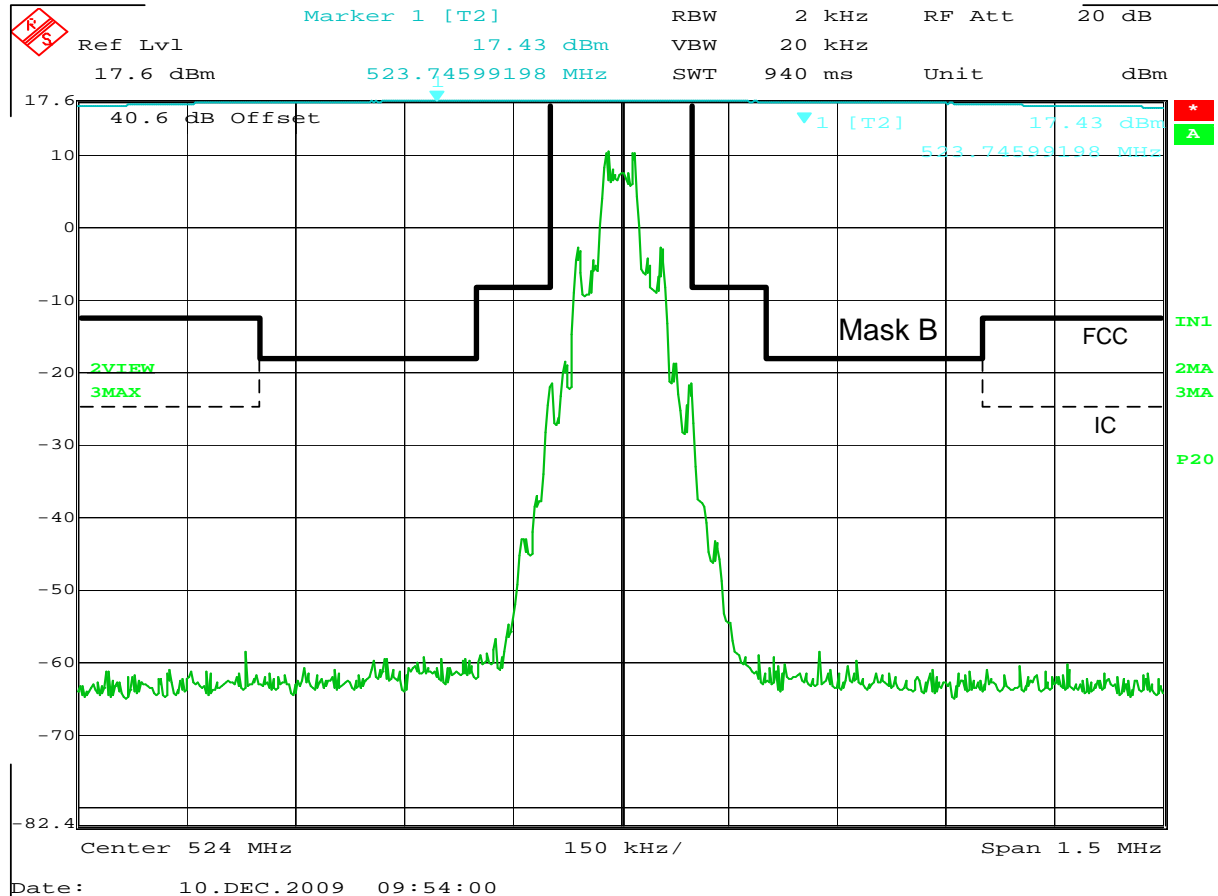
### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 506MHz to 542MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 524MHz  
TEST POWER : 10mW  
NOTES : 15kHz at 85%  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0



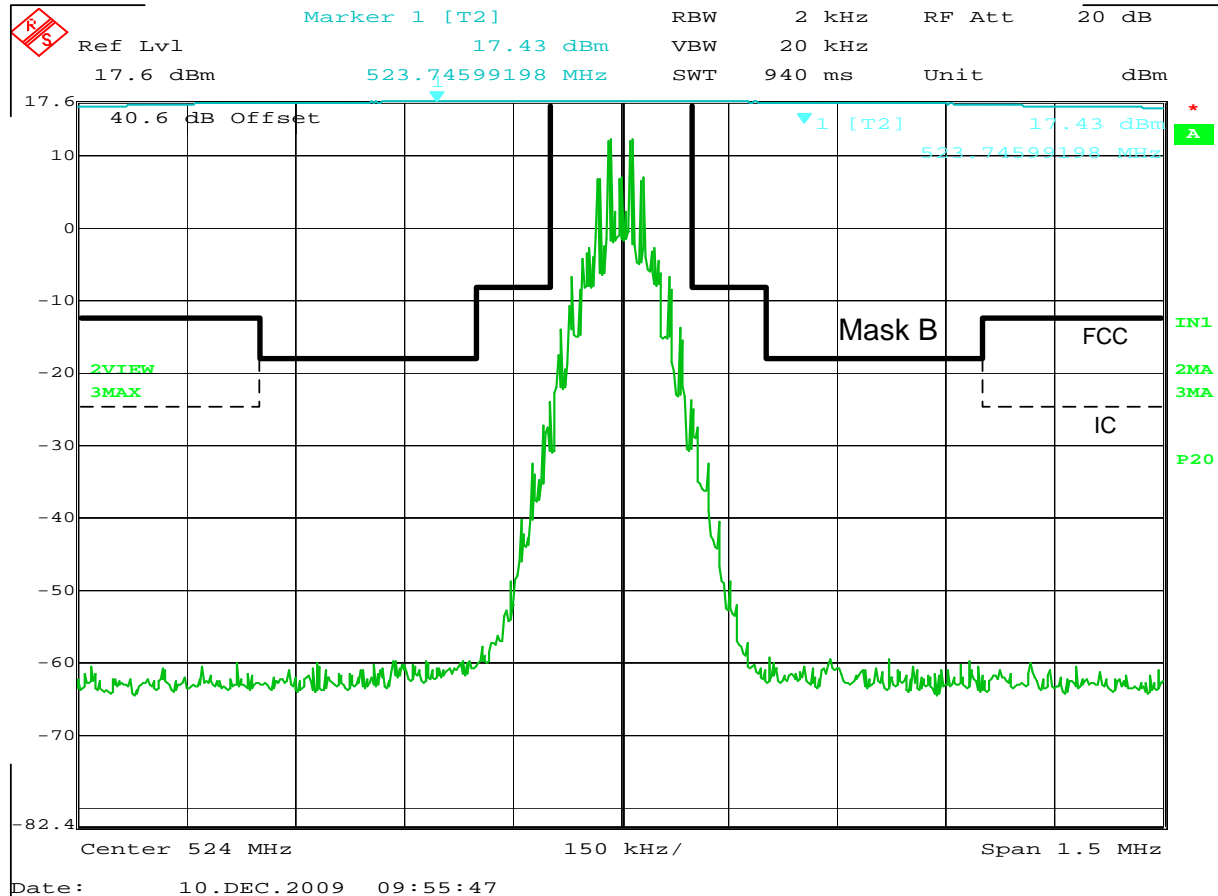
### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 506MHz to 542MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 524MHz  
TEST POWER : 50mW  
NOTES : CW  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0



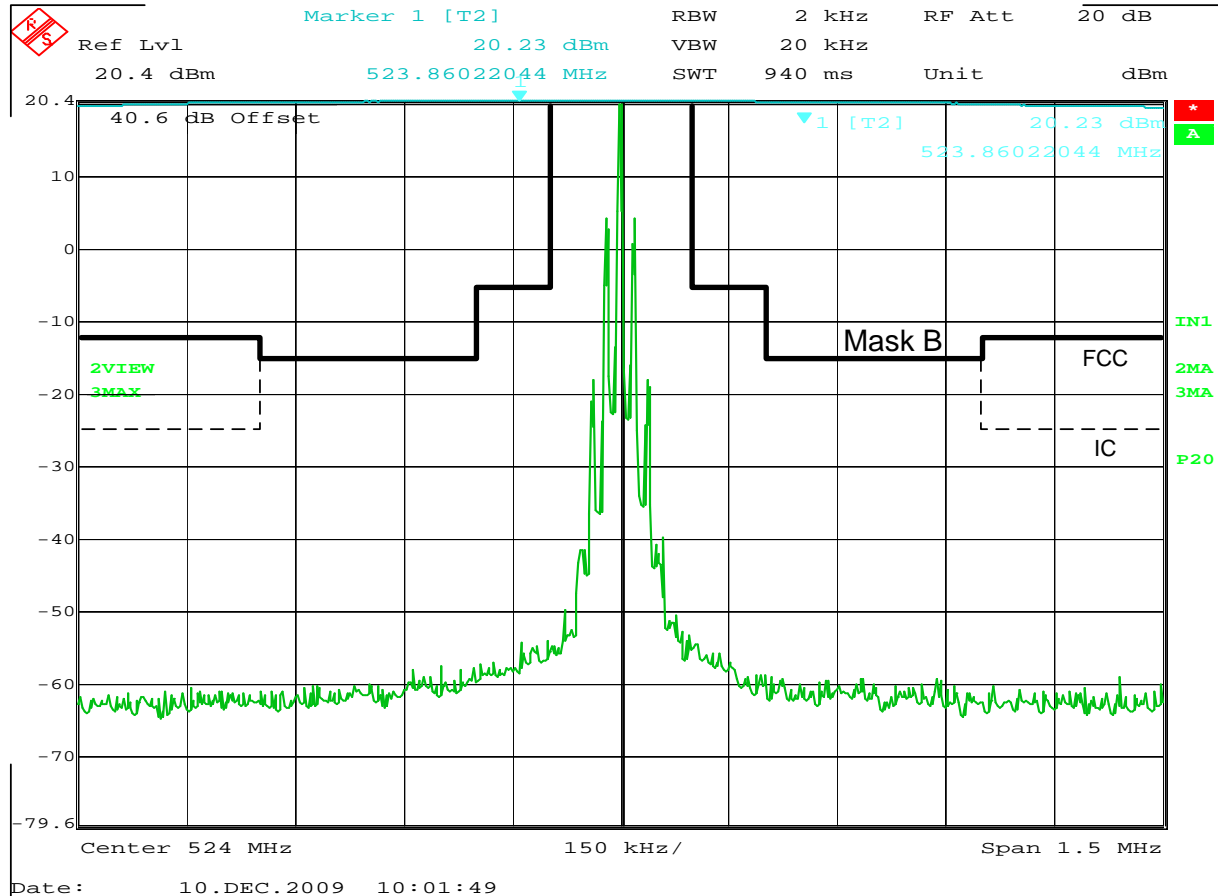
### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 506MHz to 542MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 524MHz  
TEST POWER : 50mW  
NOTES : 2500Hz at 16dB over 50%  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0

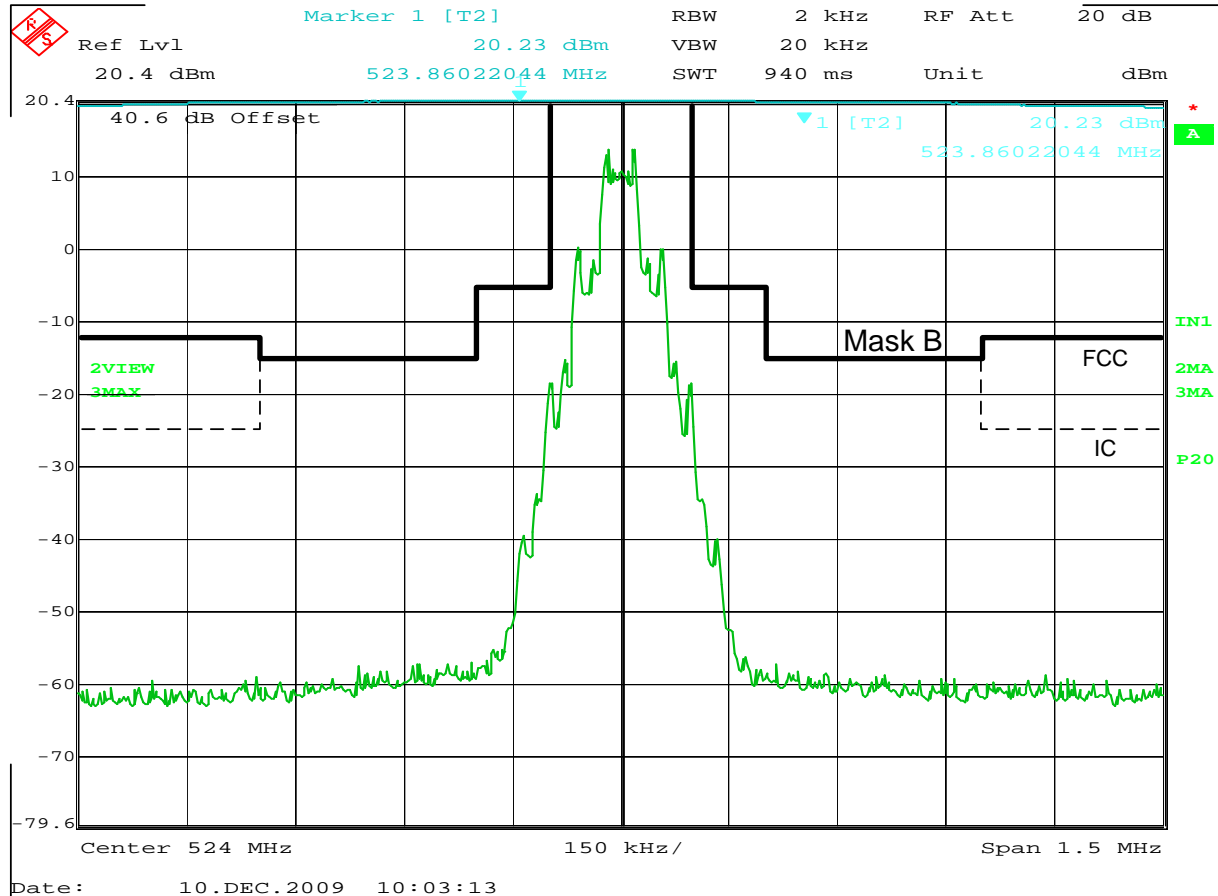


### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 506MHz to 542MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 524MHz  
TEST POWER : 50mW  
NOTES : 15kHz @ 85% Modulation  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0

**IC/FCC Occupied Bandwidth**

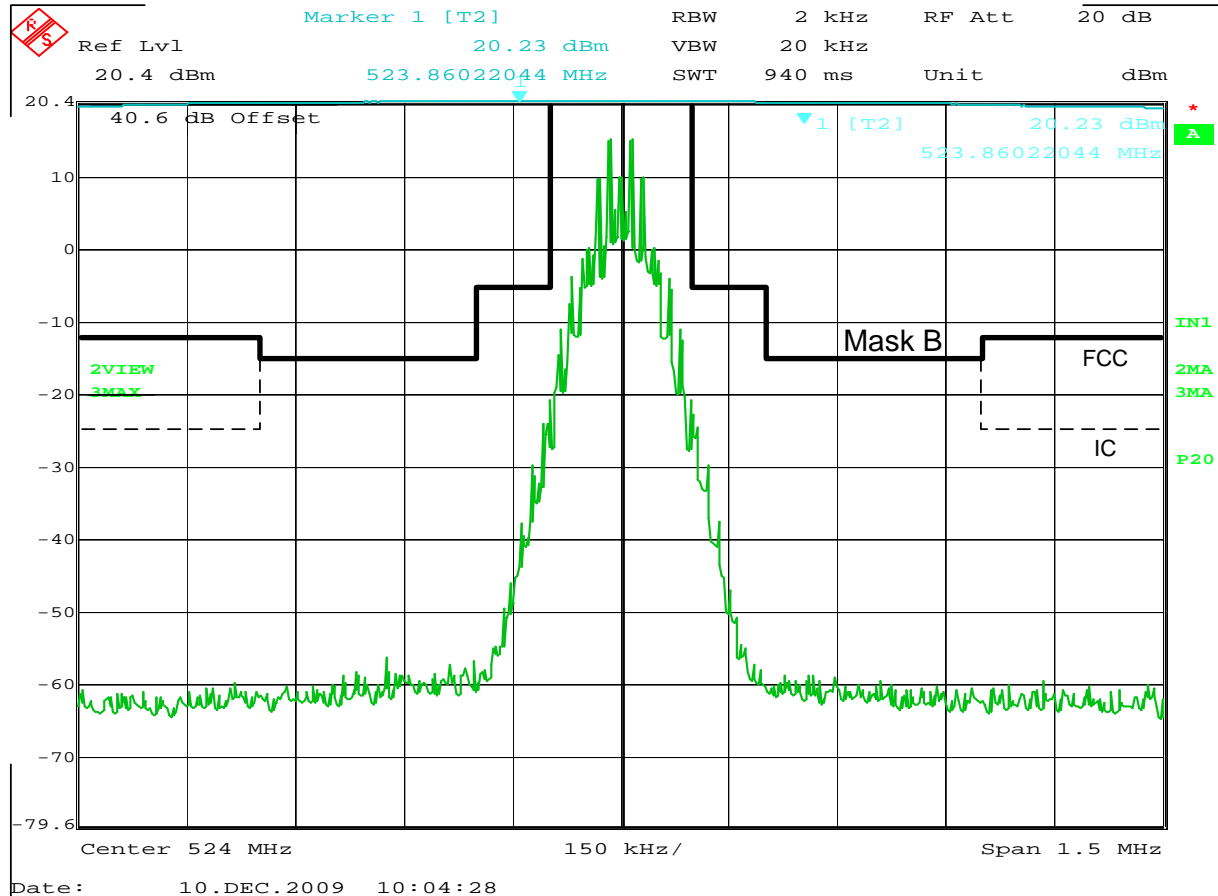
MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 506MHz to 542MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 524MHz  
TEST POWER : 100mW  
NOTES : CW  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0



### IC/FCC Occupied Bandwidth

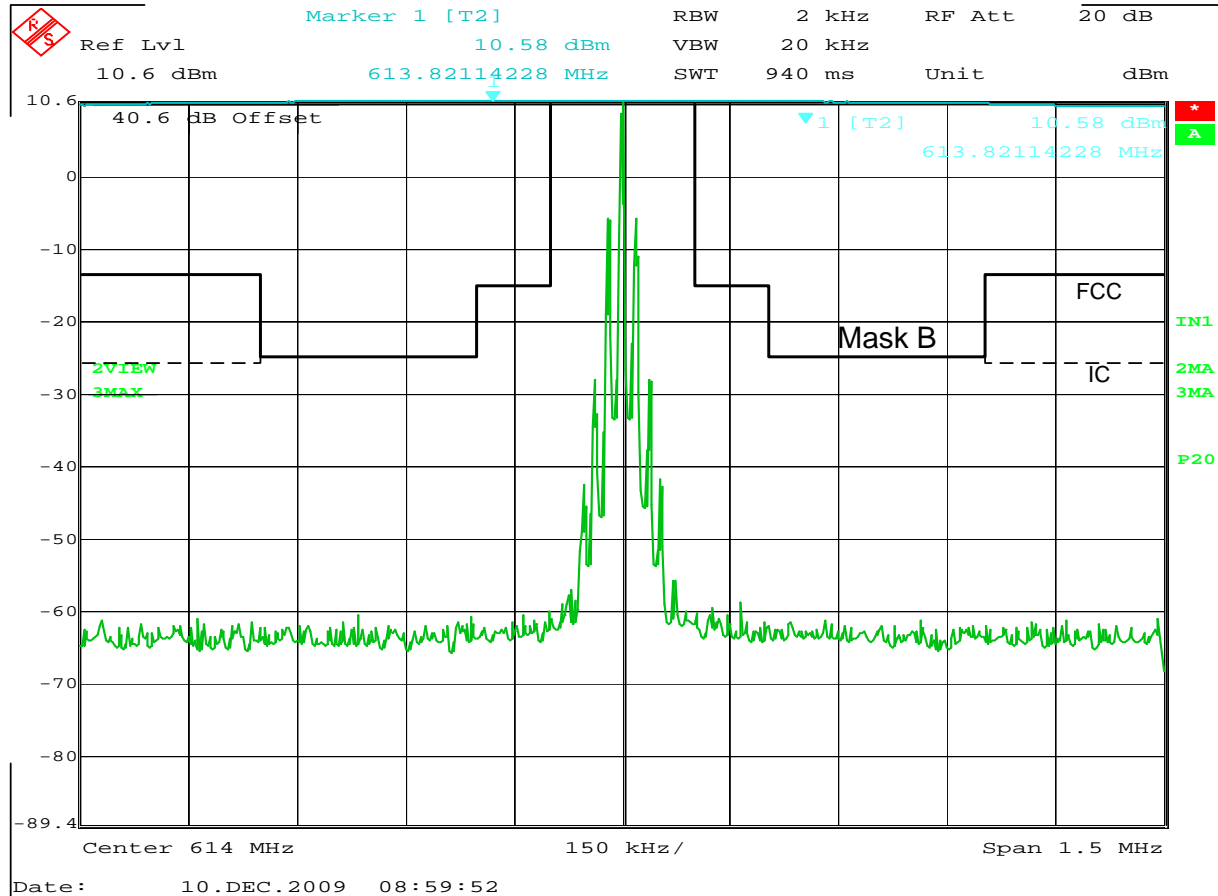
MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 506MHz to 542MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 524MHz  
TEST POWER : 100mW  
NOTES : 2500Hz at 50%  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0





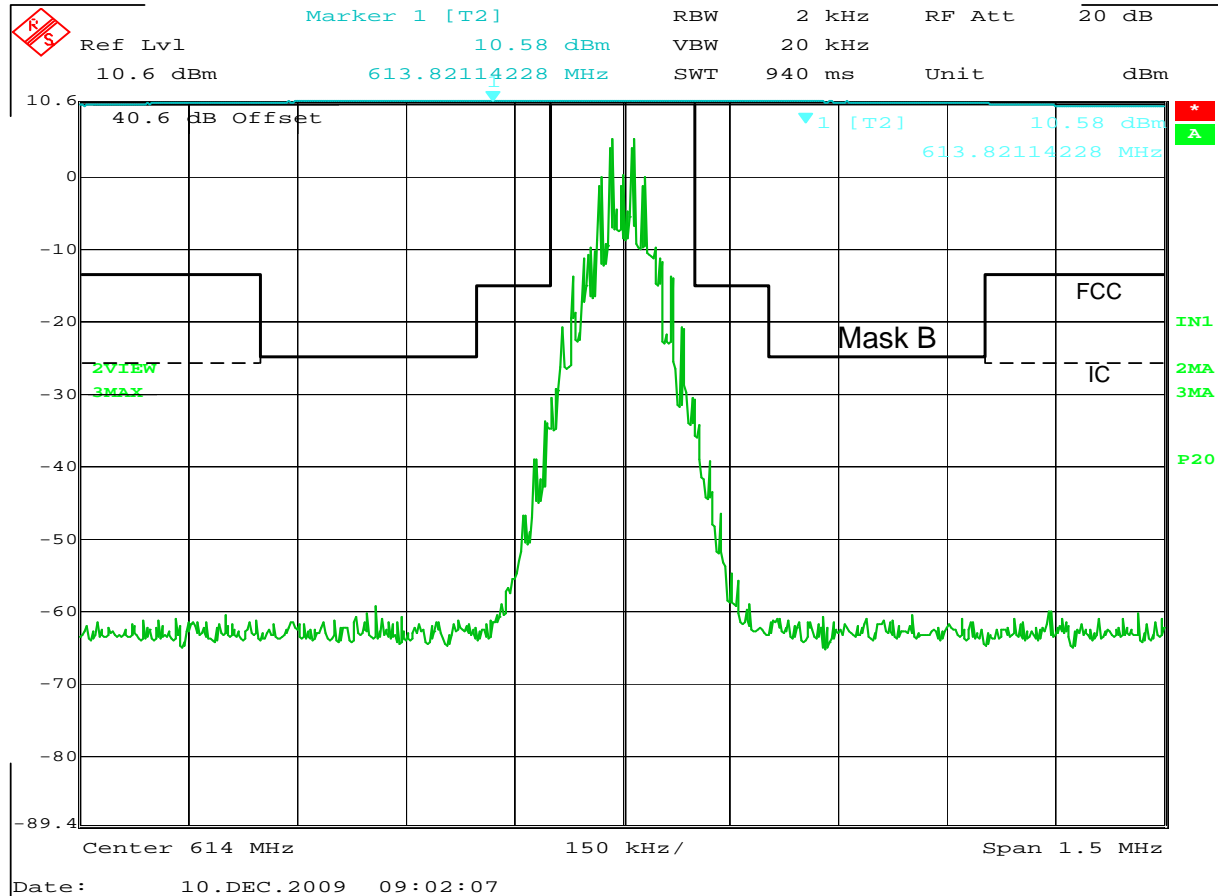
### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 506MHz to 542MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 524MHz  
TEST POWER : 100mW  
NOTES : 15kHz at 85% Modulation  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0



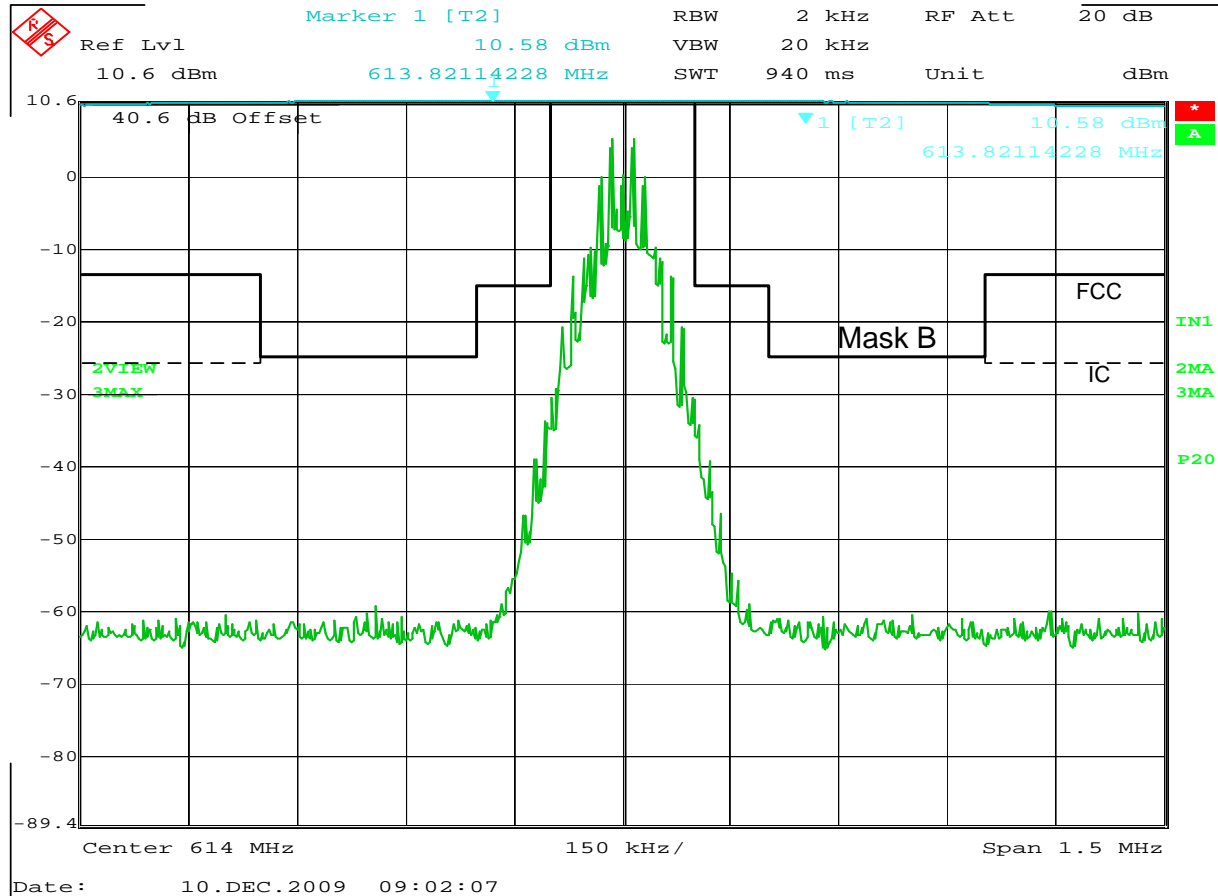
### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 596MHz to 632MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 614MHz  
TEST POWER : 10mW  
NOTES : CW  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0



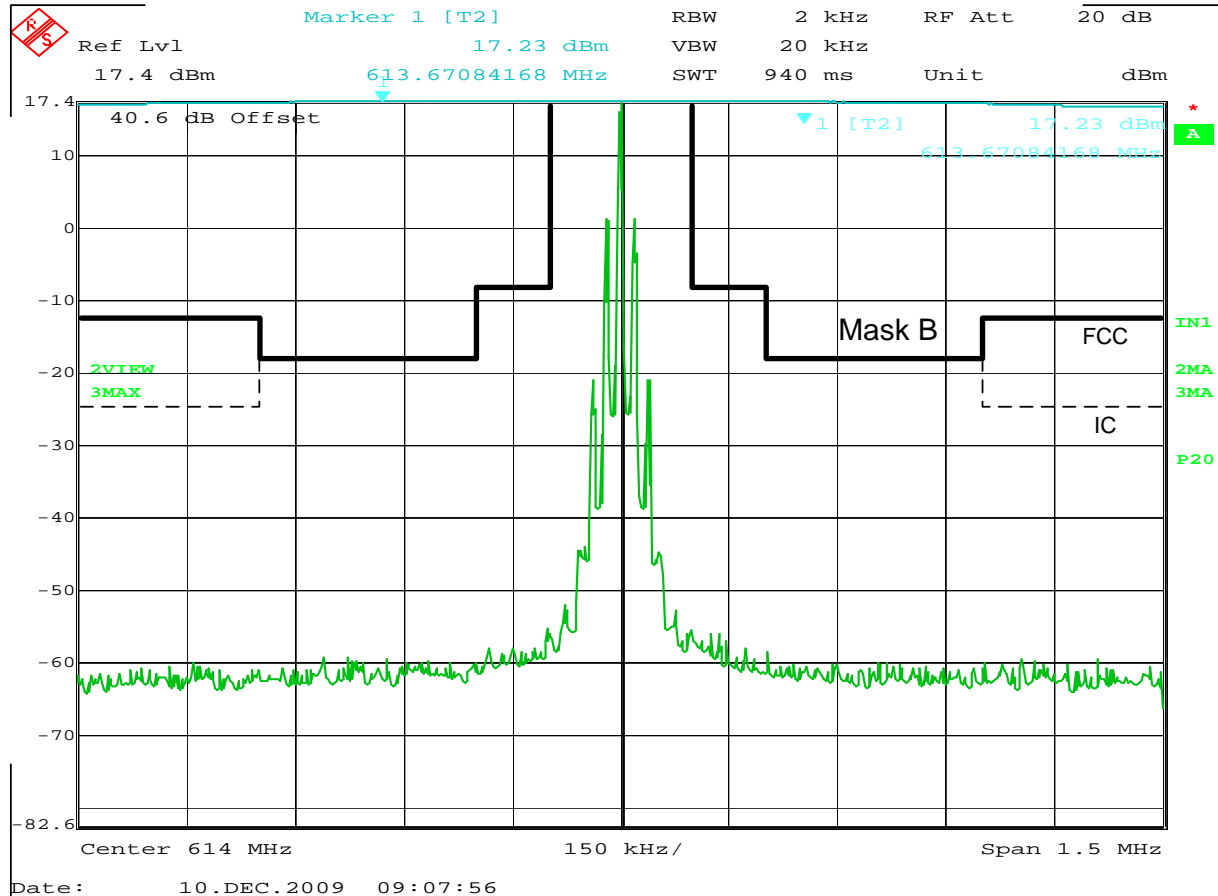
### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 596MHz to 632MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 614MHz  
TEST POWER : 10mW  
NOTES : 2500Hz at 16dB over 50%  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0



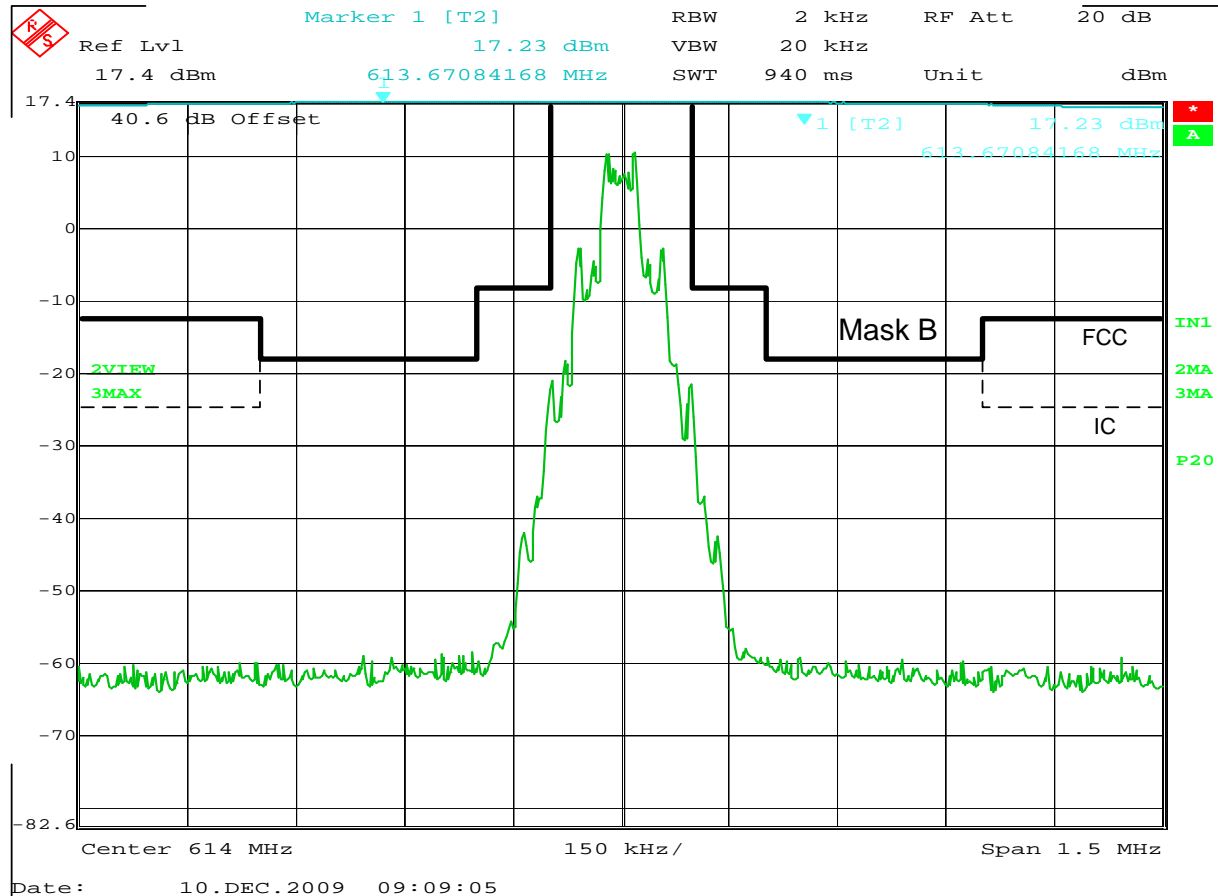
### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 596MHz to 632MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 614MHz  
TEST POWER : 10mW  
NOTES : 15kHz at 85% Modulation  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0

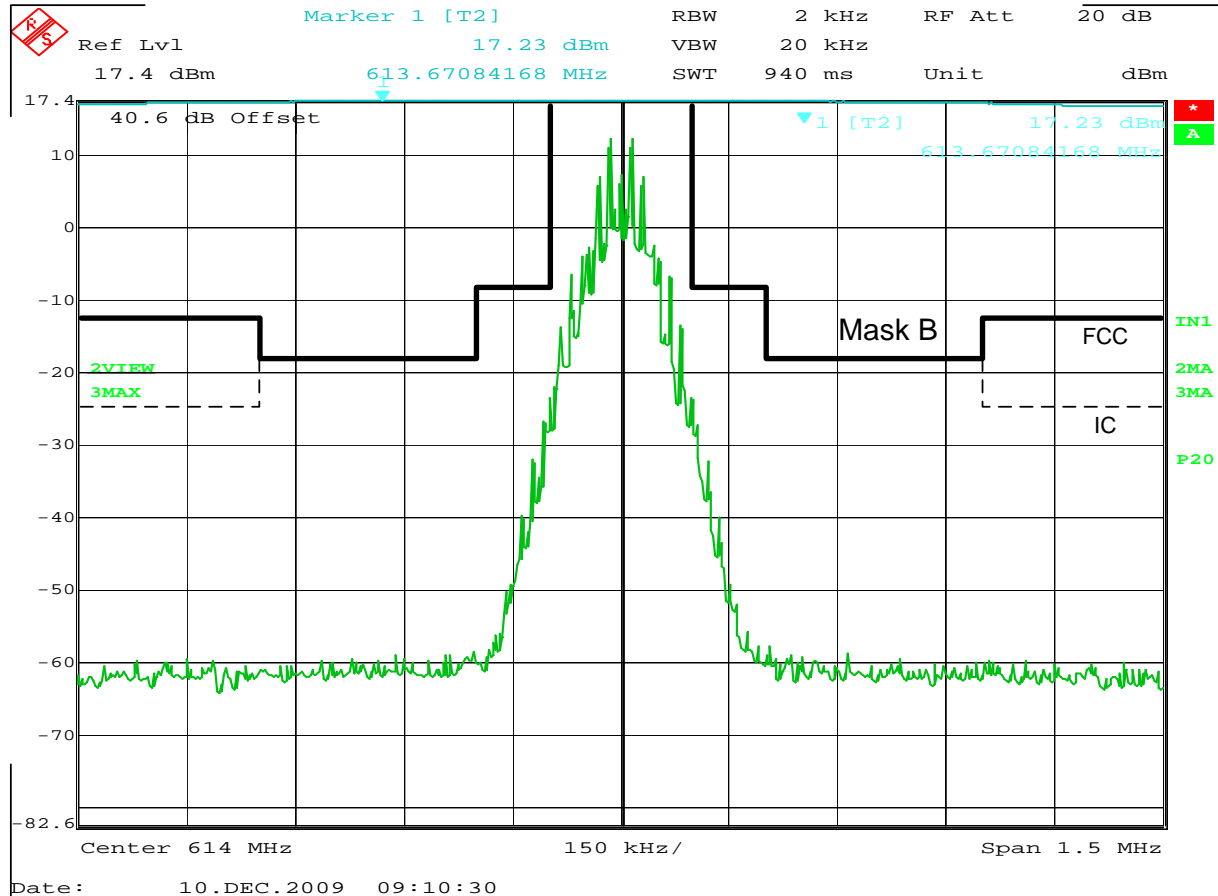


### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 596MHz to 632MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 614MHz  
TEST POWER : 50mW  
NOTES : CW  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0

**IC/FCC Occupied Bandwidth**

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 596MHz to 632MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 614MHz  
TEST POWER : 50mW  
NOTES : 2500Hz at 16dB over 50%  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0



### IC/FCC Occupied Bandwidth

MANUFACTURER : Shure, Inc.  
MODEL NUMBER : P9T 596MHz to 632MHz  
SERIAL NUMBER : 2  
TEST MODE : Tx at 614MHz  
TEST POWER : 50mW  
NOTES : 15kHz at 85% Modulation  
EQUIPMENT USED : RBA0, GWH2, GWH4, T2S3, T2S4, RYE0