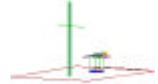




# PCTEST ENGINEERING LABORATORY, INC.

6660-B Dobbin Road, Columbia, MD 21045 USA  
Tel. 410.290.6652 / Fax 410.290.6554  
http://www.pctestlab.com



## CERTIFICATE OF COMPLIANCE FCC Part 74 Certification

**Applicant Name:**  
SONY Corporation  
6-7-35 Kitashinagawa, Shinagawa-ku  
Tokyo, 141-0001  
JAPAN

**Date of Testing:**  
June 14-16, 2006  
**Test Site/Location:**  
PCTEST Lab, Columbia, MD, USA  
**Test Report Serial No.:**  
0605310420

**FCC ID:** AK8WRT8P  
**APPLICANT:** SONY CORPORATION

**Application Type:** Certification  
**FCC Classification:** Licensed Broadcast Transmitter Held to Face (TBF)  
**FCC Rule Part(s):** § 2 & § 74 Subpart H – Low Power Auxiliary Stations  
**EUT Type:** UHF Synthesized Transmitter – Wireless Microphone System  
**Model(s):** SONY WRT-8P (U6264/U6668)  
**TX Frequency Range:** 758 - 805.9 MHz  
**Operating Freq. Band** 24 MHz per model  
**Frequency Tolerance** ±0.005 %  
**RF Power Output:** 250 mW / 50 mW (selectable)  
**Frequency Response** 50 to 18,000 Hz  
**Emission Designator(s):** 116KF3E  
**Test Device Serial No.:** S/N: 8001 (U6264) & 8002 (U6668)

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in Part 74 and Part 2 of the FCC Rules.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

**Grant Conditions:** (M4) Operation of this unit is limited to use at stations licensed for use under Part 74 of FCC Rules.

*PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.*

Randy Ortanez  
President



PCTEST™ Part 74(H) Certification		FCC MEASUREMENT REPORT			Reviewed by:
					Quality Manager
Test Report S/N: 0605310420	Test Dates: June 14-16, 2006	EUT Type: (TBF) UHF Synthesized TX — Wireless Microphone System	FCC ID: AK8WRT8P	Page 1 of 32	

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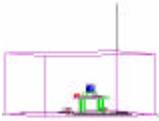
<b>PCTEST™</b> Part 74(H) Certification		FCC MEASUREMENT REPORT	<b>SONY</b>	<b>Reviewed by:</b> Quality Manager
Test Report S/N: 0605310420	Test Dates: June 14-16, 2006	EUT Type: (TBF) UHF Synthesized TX — Wireless Microphone System	FCC ID: AK8WRT8P	Page 2 of 32



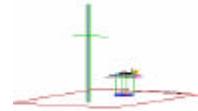
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## 1.0 SCOPE



*Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.*



### 1.1 General Information

The following information about the applicant and the product to be certified are required in accordance with §2.1033 of FCC Rules & §5.10 of ISO/IEC 17025 International Standard.

<b>Applicant Name:</b>	SONY Corporation
<b>Address:</b>	6-7-35 Kitashinagawa, Shinagawa-ku Tokyo, 141-0001 JAPAN

- **FCC ID:** AK8WRT8P
- **Trade Name:** SONY
- **Model Name/No.:** WRT-8P (U6264 & U6668)
- **FCC Classification(s):** Licensed Broadcast Tx Held to Face (TBF)
- **Equipment (EUT) Type:** UHF Synthesized Transmitter – Wireless Microphone System
- **Tx Frequency Range:** 758 - 805.9 MHz
- **Operating Freq. Band:** 24 MHz per model
- **Frequency Tolerance:** ±0.005 %
- **Max. RF Output Power:** 0.250 W ERP
- **Emission Designators:** 116KF3E
- **Bandwidth:** 110 kHz
- **FCC Rule Part(s):** § 2 & § 74 Subpart H – Low Power Auxiliary Stations
- **Quantity:** Quantity production is planned
- **Dates of Tests:** June 14 - 16, 2006
- **Place of Tests:** PCTEST Lab, Columbia, MD U.S.A.
- **Test Report S/N:** 0605310420
- *Deviation from measurement procedure - None*

<b>PCTEST™</b> Part 74(H) Certification		FCC MEASUREMENT REPORT	<b>SONY</b>	<b>Reviewed by:</b> Quality Manager
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## 2.0 INTRODUCTION

### 2.1 Testing Facility

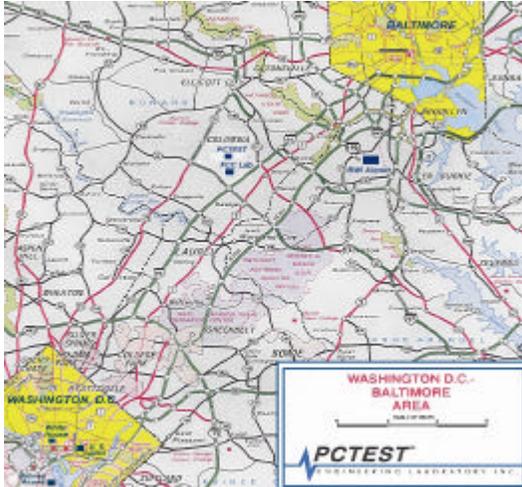


Figure 1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area.

These measurement tests were conducted at PCTEST Engineering Laboratory, Inc. facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 1992.

### 2.2 Accreditations

Measurements were performed at PCTEST Engineering Lab in Columbia, MD 21045, U.S.A.

- PCTEST facility is an FCC registered (PCTEST Reg. No. 90864) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (IC 2451).
- PCTEST Lab is accredited by the U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP) in EMC, Telecommunications, and FCC for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations, NIST Handbook 150 and International Standard ISO/IEC 17025. (NVLAP Lab code: 100431-0)
- PCTEST Lab is accredited by the American Association for Laboratory Accreditation (A2LA) for meeting ISO/IEC 17025 requirements and for technical competence in the field of Electrical Testing. A2LA accreditation is granted to perform Wireless tests on CDMA & AMPS handsets, OTA, Telecommunications, HAC and SAR (FCC & IC).
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules.
- PCTEST facility is an IC registered (IC-2451) test laboratory with the site description on file at Industry Canada.

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### 3.0 PRODUCT (EUT) SPECIFICATIONS

The Equipment Under Test (EUT) is the **SONY** Model WRT-8P UHF Synthesized Transmitter – Wireless Microphone System (**FCC ID: AK8WRT8P**).

The EUT is for FCC Certification classified as a Licensed Broadcast Transmitter Held to Face (TBF) operating under Part 74H as Low Power Auxiliary Station.

- Tx Frequency Range: 758.125 - 781.875 MHz (U6264 Model)  
758.125 - 805.875 MHz (U6668 Model)
- Operating Freq. Band: 24 MHz per model
- Max. RF Output Power: 0.250 W ERP
- Max. Power Rating: 250mW / 50mW (selectable)
- Power Input: 9V DC Alkaline Battery
- Frequency Tolerance:  $\pm 0.005\%$
- Emission Designators: 116KF3E
- Bandwidth: 110 kHz
- EUT Serial No.: #8001 (U6264) & #8002 (U6668)

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## 4.0 SUMMARY OF TEST RESULTS

Chapter	<u>FCC Rule(s)</u>	<u>Description of Test</u>	<u>Results / Notes</u>
<b>6.0</b>	§§ 2.1046 & 74.861(e)(1)(ii)	RF Output Power Measurement	Compliant
<b>7.0</b>	§§ 2.1047 & 74.861(e)(3)	Modulation Characteristics:	
<b>7.4.a</b>	§ 2.1047(a)	Audio Frequency Response	Compliant
<b>7.4.b</b>	§ 2.1047(b)	Modulation Limiting	Compliant
<b>8.0</b>	§§§ 2.1049, 74.861(e)(5) & 74.861(e)(6)	Occupied Bandwidth Emission Limits	Compliant
<b>9.0</b>	§§ 2.1053 & 74.861(e)(6)	Field Strength of Spurious Radiation	Compliant
<b>10.0</b>	§§ 2.1051 & 74.861(e)(6)	Spurious Emission at Antenna Port	Compliant
<b>11.0</b>	§§ 2.1055 & 74.861(e)(4)	Frequency Stability	Compliant
-	§§ 2.1093 & 1.1307(b)(1)	RF Exposure Requirement	(see SAR Test Report)
-	§ 15.107 / § 15.207	AC Line Conducted Emission	Not Applicable
<b>12.0</b>	§ 15.109	Radiated Emission	Compliant

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## 5.0 TEST CONFIGURATION

### 5.1 Test Configuration

The equipment under test (EUT) & support equipment consists of:

- |    |                             |             |                                  |
|----|-----------------------------|-------------|----------------------------------|
| 1. | UHF Synthesized Transmitter | SONY WRT-8P | S/N: 8001 (U6264) & 8002 (U6668) |
| 2. | Microphone                  | SONY F-112  | S/N: none                        |

### 5.2 Operating Condition of EUT

Power supply voltage comes from 9VDC (Alkaline Battery).

The EUT is in Transmit mode while undergoing tests.

### 5.3 Generating and Operating Frequency

TX Operating Frequencies:

- 758.125MHz
- 781.875MHz
- 805.875MHz

### 5.4 EMI Suppression Device(s)

EMI suppression device(s) added and/or modification(s) made during testing:

- None

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## 6.0 RF OUTPUT POWER MEASUREMENT

### 6.1 Applicable Standards – §74.861(e)(1)(ii) & §2.1046

According to §74.861(e)(1)(ii) of the FCC Rules, for low power auxiliary station operating in the 614-806MHz band, the power of the measured unmodulated carrier power and the output of the transmitter power amplifier (antenna input power) may not exceed 250mW.

### 6.2 Test Procedure

The maximum peak output power was measured with a spectrum analyzer connected to the antenna terminal (conducted measurement) while EUT was operating in normal situation. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz. The radiated power output and the field strength of the transmitter harmonic and spurious radiation measurements were made outdoors at a 3-meter test range away from the transmitter, as the equipment under test (EUT), placed on a wooden turntable 3-meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

### 6.3 Test Data

#### Environmental Conditions

Temperature: 23.1 °C (15-35°C)  
 Relative Humidity: 56 % (10-75%)  
 Atmospheric Pressure: 93 kPa (86-106kPa)

#### Test Results

Channel	Spec Freq (MHz)	Peak Output Power (dBm)	Limit (dBm)	Result
Low	758.125	21.6	24	pass
Mid	781.875	21.7	24	pass
High	805.875	21.8	24	pass

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## 6.4 RF Output Power Measurement Plots

See attached.

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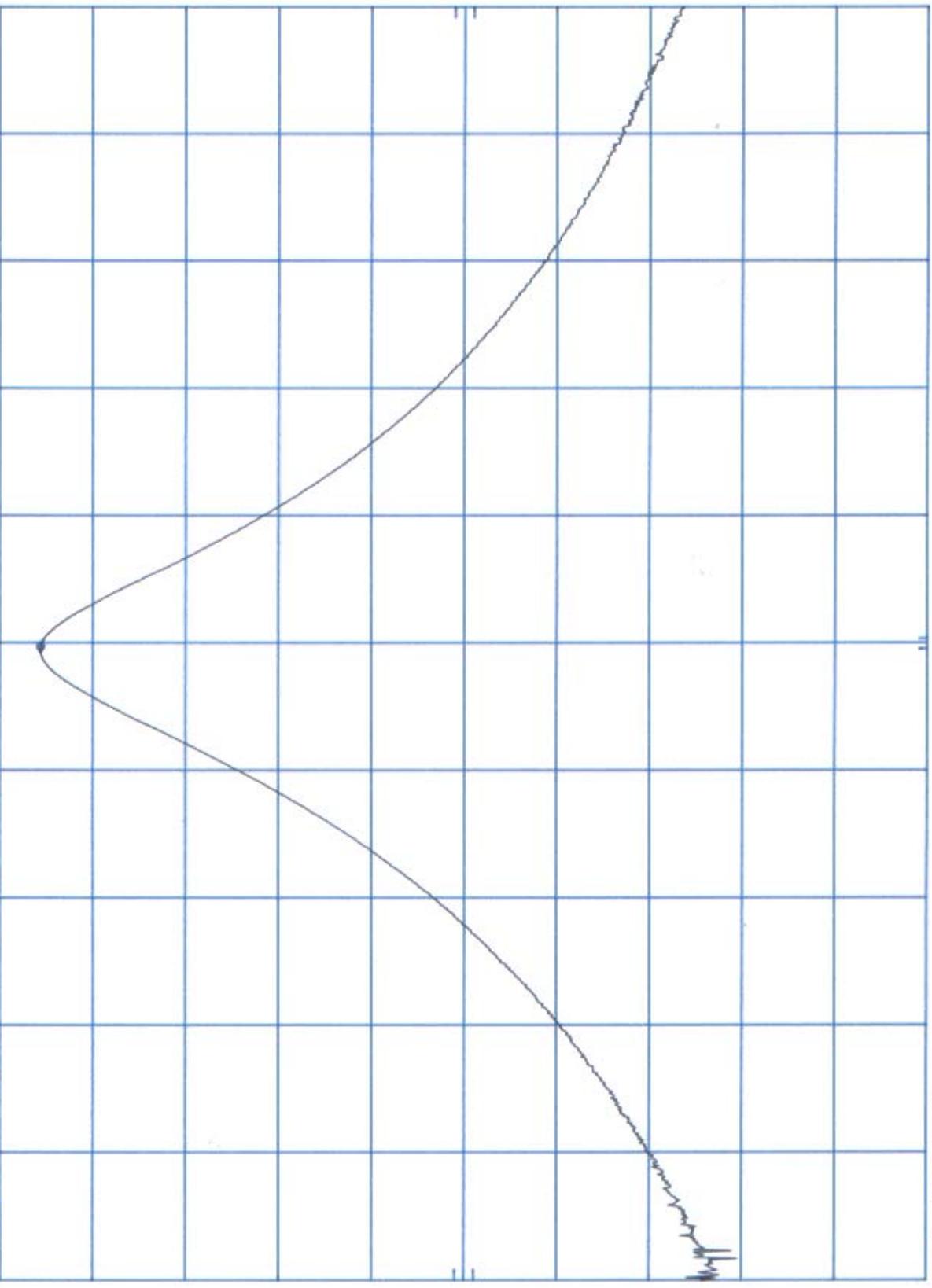
MKR 758.117 MHz  
21.60 dBm

FCC ID-AK8WRT8P PWR C-LOW  
REF 26.0 dBm ATTEN 40 dB

hp

10 dB/

OFFSET  
1.0  
dB



SPAN 2.00 MHz  
SWP 20.0 msec

VBW 300 kHz

CENTER 758.12 MHz  
RES BW 100 kHz

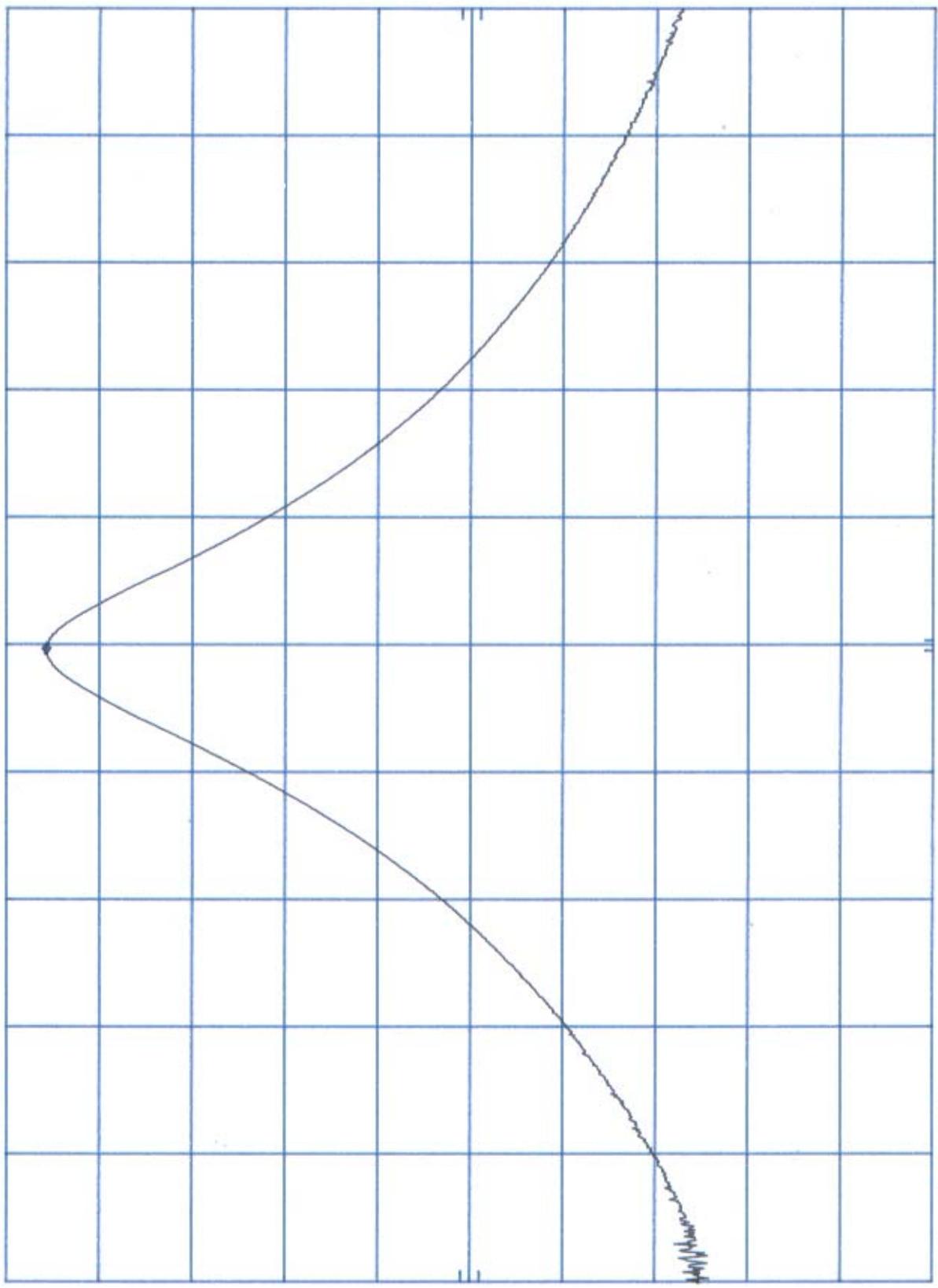
MKR 781.867 MHz  
21.70 dBm

FCC ID-AK8WRT8P PWR C.Mid  
REF 26.0 dBm ATTEN 40 dB

hp

10 dB/

OFFSET  
1.0  
dB



SPAN 2.00 MHz  
SWP 20.0 msec

VBW 300 KHZ

CENTER 781.87 MHz  
RES BW 100 KHZ

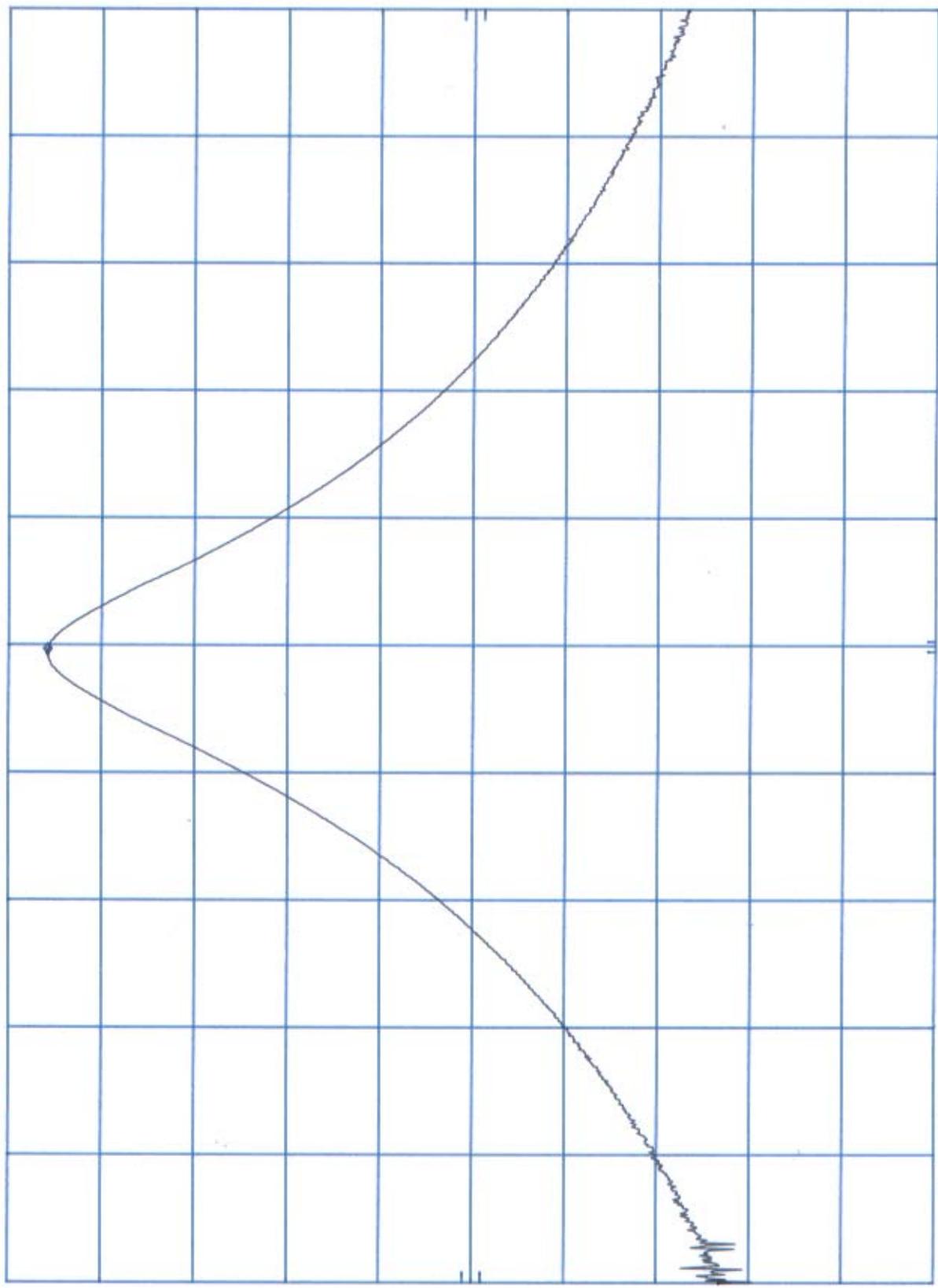
FCC ID-AK8WRT8P PWR C-HIGH  
REF 26.0 dBm ATTEN 40 dB

MKR 805.867 MHz  
21.80 dBm

HP

10 dB/

OFFSET  
1.0  
dB



CENTER 805.87 MHz  
RES BW 100 kHz  
SPAN 2.00 MHz  
SWP 20.0 msec  
VBW 300 kHz

## 7.0 MODULATION CHARACTERISTICS

### 7.1 Applicable Standards – §74.861(e)(3) & §2.1047(a)

According to §2.1047(a) of the FCC Rules, for Voice Modulated Communication Equipment, the frequency response of the audio modulating circuit over a range of 100Hz to 5000Hz shall be measured. For equipment required to have an audio low-pass filter, the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be measured.

According to §74.861(e)(3) of the FCC Rules, any form of modulation may be used. A maximum deviation of  $\pm 75$  kHz is permitted when frequency modulation is employed.

### 7.2 Test Procedure

The audio signal generator was connected to the input circuit of the EUT through a matching network. The audio signal input was adjusted to obtain 50% modulation at the maximum audio frequency response of the transmitter, and this point was taken as the 0db reference level. The frequency of the input signal was changed from 100Hz to 20kHz and the input level to obtain 50% modulation was plotted. The modulation response was measured up to a maximum modulation for each of three tones: 100Hz, 2500Hz and 15kHz. The audio input level was changed to 10% modulation up to a maximum rated modulation.

#### **7.2.a Audio Frequency Response**

- 1) Position the EUT to connect to Modulation Analyzer and Audio Generator.
- 2) Adjust the audio input frequency from 300Hz to 20KHz in sequence and keep the input level constant according to TIA/EIA Standard 603-C

#### **7.2.b Modulation Limit**

- 1) Position the EUT to connect to Modulation Analyzer and Audio Generator.
- 2) Adjust the audio input frequency to 100 Hz and the input level from 0V to maximum permitted input voltage with recording each carrier frequency deviation responding to respective input level.
- 3) Repeat step 1 with changing the input frequency for 300, 1000, 2500 and 3000 Hz in sequence.

### 7.3 Test Data

#### **Environmental Conditions**

Temperature: 23.1 °C (15-35°C)  
 Relative Humidity: 56 % (10-75%)  
 Atmospheric Pressure: 93 kPa (86-106kPa)

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## 7.4 Modulation Characteristics Plots

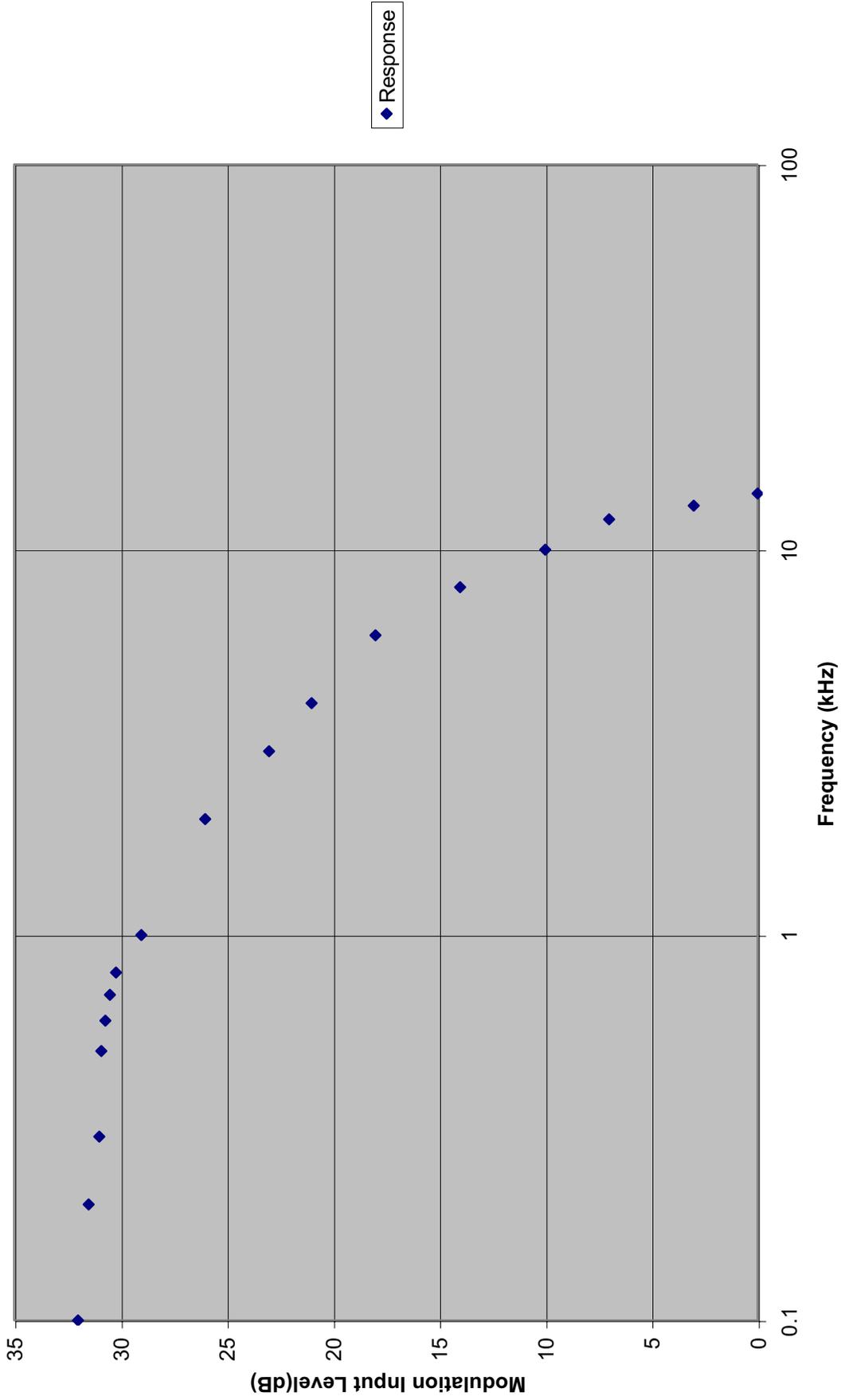
See attached graphs:

7.4.a Audio Frequency Response

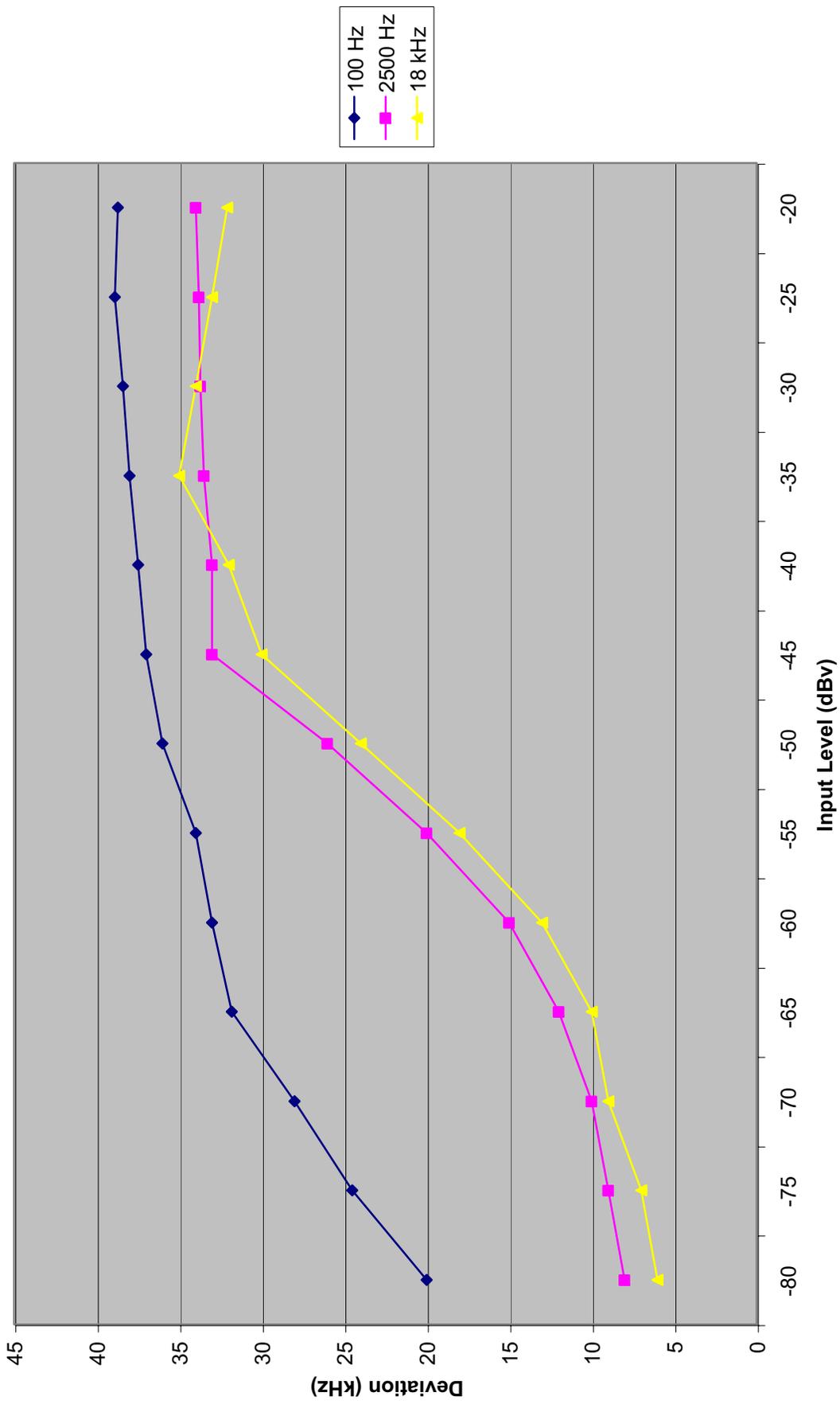
7.4.b Modulation Limiting

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# Frequency Response



# Modulation Characteristics



## 8.0 OCCUPIED BANDWIDTH EMISSION LIMITS

### 8.1 Applicable Standards – §74.861(e)(5), §74.861(e)(6) & §2.1049(c)(1)

With radiotelephone transmitters, according to §2.1049(c)(1) of the FCC Rules, “other than single sideband or independent sideband transmitter– when modulated by a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. The input level shall be established at the frequency of maximum response of the audio modulating circuit.”

According to §74.861(e)(5) & §74.861(e)(6) of the FCC Rules,

- (1) the operating bandwidth shall not exceed 200 kHz
- (2)(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.

### 8.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Install new batteries in the EUT. Turn on the EUT and set it to any one convenient frequency within its operating range.

### 8.3 Test Data

#### Environmental Conditions

Temperature: 23.1 °C (15-35°C)  
 Relative Humidity: 56 % (10-75%)  
 Atmospheric Pressure: 93 kPa (86-106kPa)

#### Test Results

Channel	Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Result
Low	741.2	75.0	200	pass
Mid	746.0	75.7	200	pass
High	751.8	76.3	200	pass

#### Emission Designator:

Calculated Emission:  $2M + 2D = (2 \times 18\text{kHz}) + (2 \times 40\text{kHz}) = 116\text{KF3E}$

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## 8.4 Emission Mask (Occupied Bandwidth) Plots

See attached.

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# PCTEST Engineering Lab.

## SPECTRUM ANALYZER PRESENTATION

FCC ID:AK8WRT8P

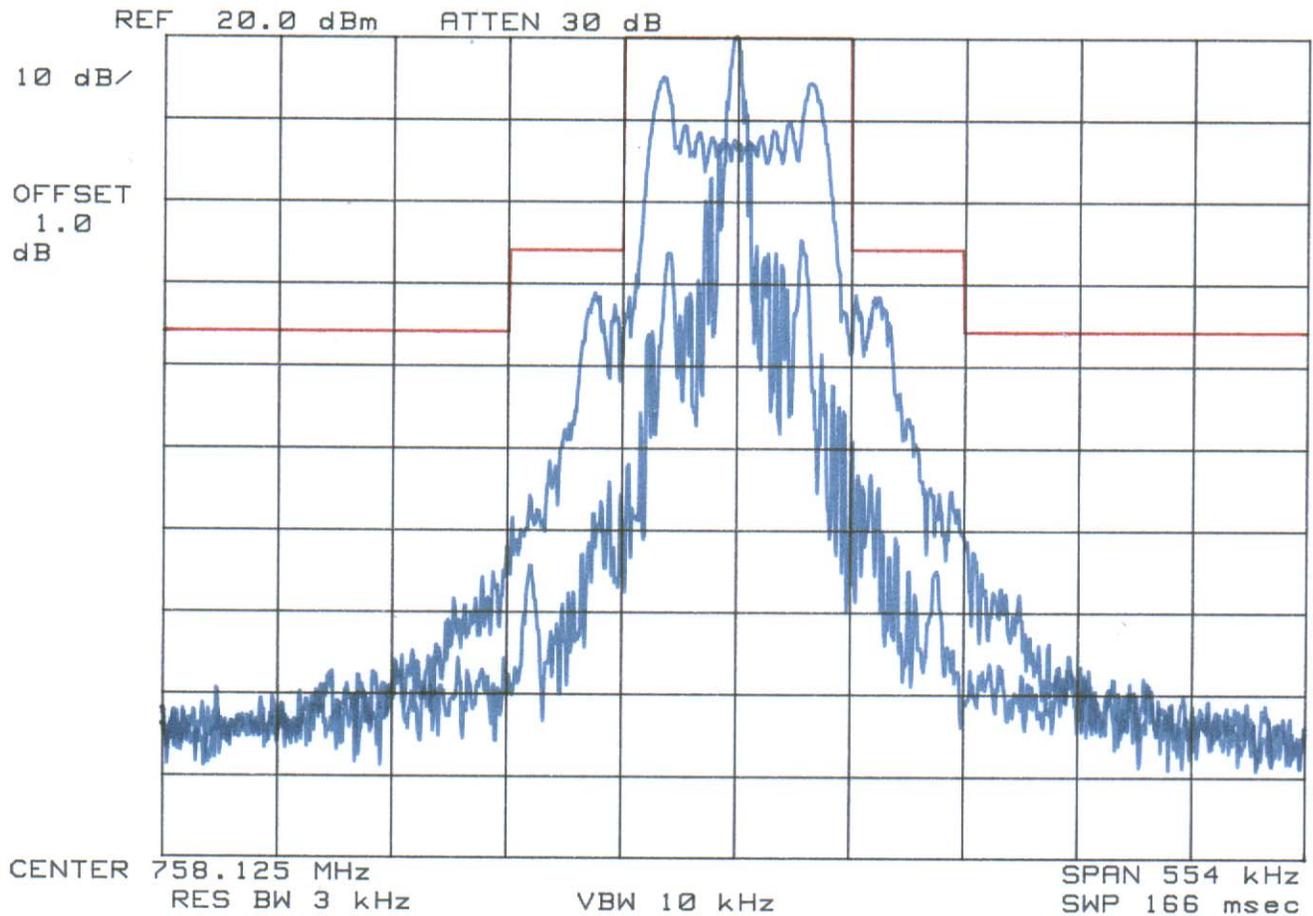
SONY WRT-P8

MODEL:U6264

Operating Frequency: 758.125 MHz

Output Power : 20.0 dBm

Test Mode:Unmodulated Signal



# PCTEST Engineering Lab.

## SPECTRUM ANALYZER PRESENTATION

FCC ID:AK8WRT8P

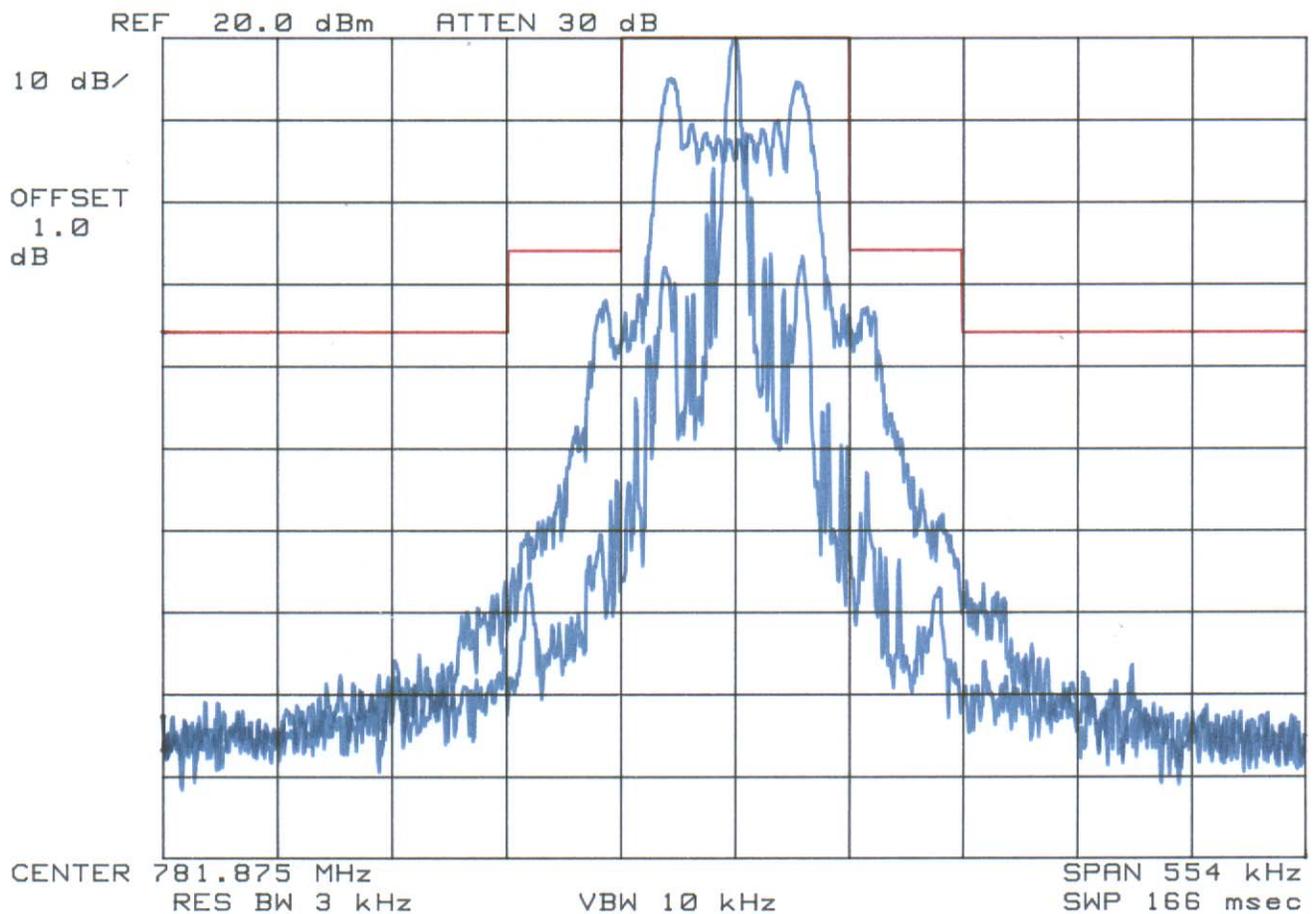
SONY WRT-P8

MODEL:U6264

Operating Frequency: 781.875 MHz

Output Power : 20.0 dBm

Test Mode:Unmodulated Signal



# PCTEST Engineering Lab.

## SPECTRUM ANALYZER PRESENTATION

FCC ID:AK8WRT8P

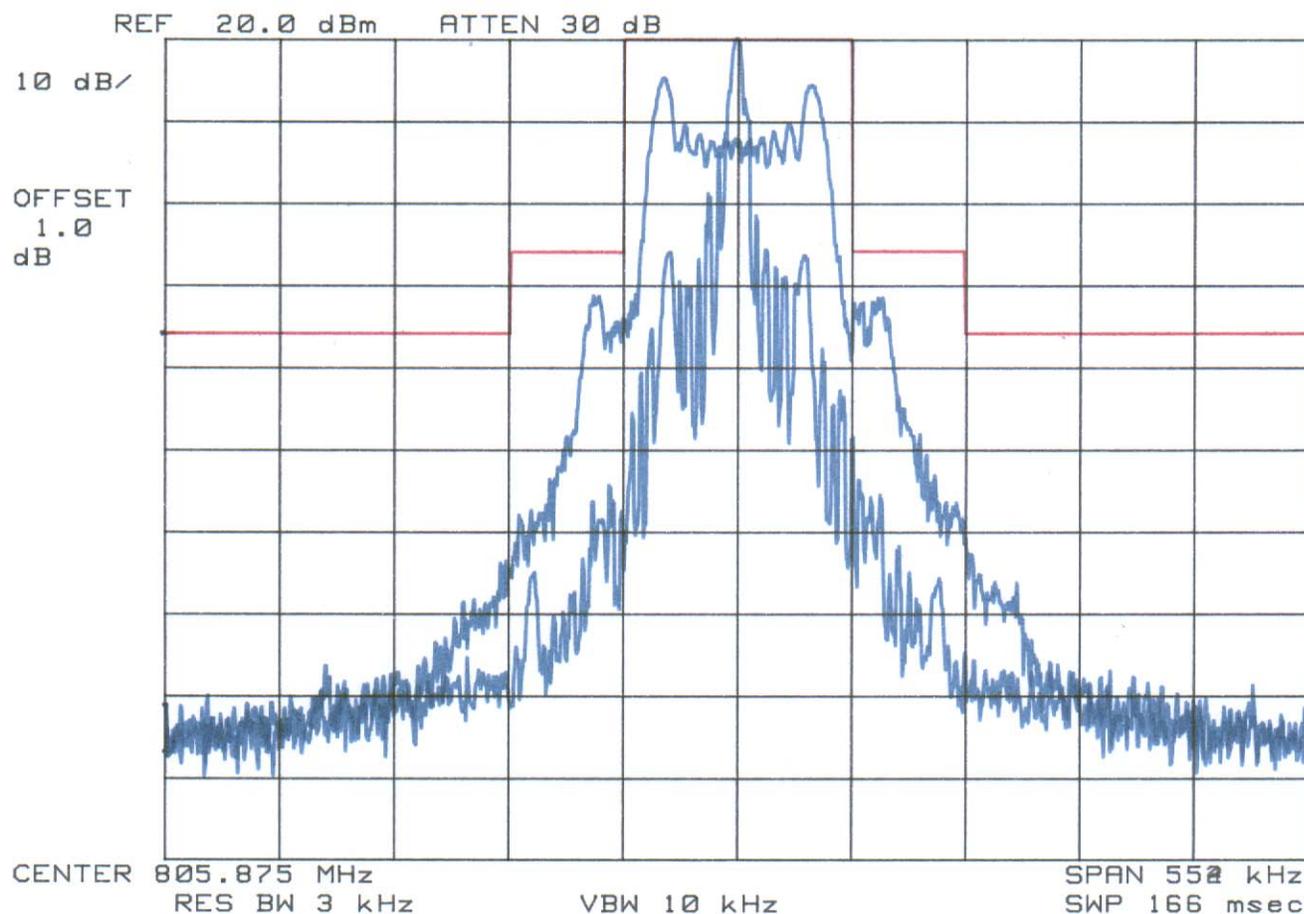
SONY WRT-P8

MODEL:U6668

Operating Frequency: 805.875 MHz

Output Power : 20.0 dBm

Test Mode:Unmodulated Signal



## 9.0 FIELD STRENGTH OF RADIATED SPURIOUS EMISSION

### 9.1 Applicable Standards – §74.861(e)(6) & §2.1053

According to §2.1053 of the FCC Rules, measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediated circuit elements under normal condition of installation and operation. Information submitted shall include the relative radiated power of spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from a half wave dipole antenna.

According to §74.861(e)(6) of the FCC Rules, the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

1. 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.
2. 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.
3. On any frequency removed from the operating frequency by more than 250 percent up to and the authorized bandwidth shall be attenuated below the un-modulated carrier by at least 43 plus 10 Log (output power in watts) dB.

### 9.2 Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable. 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.

### 9.3 Test Data

#### **Environmental Conditions**

Temperature: 23.1 °C (15-35°C)  
 Relative Humidity: 56 % (10-75%)  
 Atmospheric Pressure: 93 kPa (86-106kPa)

#### **Spurious Emissions**

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001) – the absolute level

#### **Spurious Attenuation Limit**

Spurious attenuation limit in dB = 43 + 10 Log10 (power out in Watts)

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### 9.3 Test Data (continued)

#### 9.3.A Effective Radiated Power (ERP) - HIGH Power

FREQ. (MHz)	REF. LEVEL (dBm)	POL (H/V)	ERP (dBm)	ERP (W)	Battery
758.13	-19.12	V	23.961	0.250	Standard
781.88	-20.00	V	23.251	0.212	Standard
805.88	-19.60	V	23.821	0.242	Standard

#### 9.3.B Effective Radiated Power (ERP) - LOW Power

FREQ. (MHz)	REF. LEVEL (dBm)	POL (H/V)	ERP (dBm)	ERP (W)	Battery
758.13	-26.20	V	16.881	0.049	Standard
781.88	-26.25	V	17.001	0.050	Standard
805.88	-26.80	V	16.621	0.046	Standard



### 9.3 Test Data (continued)

#### 9.3.C Field Strength of Spurious Radiation: Peak Power (Low Channel)

OPERATING FREQUENCY: 758.125 MHz  
CHANNEL: Low  
MEASURED OUTPUT POWER: 23.981 dBm = 0.250 W  
DISTANCE: 3 meters  
LIMIT:  $43 + 10 \log_{10}(W) =$  36.98 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1516.25	-46.93	8.70	-38.23	V	62.2
2274.38	-51.83	9.70	-42.13	V	66.1
3032.50	-52.63	9.90	-42.73	V	66.7
3790.63	-71.13	11.40	-59.73	V	83.7
4548.75	-77.33	12.10	-65.23	V	89.2

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### 9.3 Test Data (continued)

#### 9.3.D Field Strength of Spurious Radiation: Peak Power (Mid Channel)

OPERATING FREQUENCY: 781.875 MHz  
CHANNEL: Mid  
MEASURED OUTPUT POWER: 23.981 dBm = 0.250 W  
DISTANCE: 3 meters  
LIMIT:  $43 + 10 \log_{10}(W) =$  36.98 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1563.75	-46.63	8.70	-37.93	V	61.9
2345.63	-50.53	9.70	-40.83	V	64.8
3127.50	-59.83	9.90	-49.93	V	73.9
3909.38	-61.93	11.40	-50.53	V	74.5
4691.25	-73.13	12.10	-61.03	V	85.0

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### 9.3 Test Data (continued)

#### 9.3.E Field Strength of Spurious Radiation: Peak Power (High Channel)

OPERATING FREQUENCY: 805.875 MHz  
 CHANNEL: High  
 MEASURED OUTPUT POWER: 23.981 dBm = 0.250 W  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  36.98 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1611.75	-47.43	8.70	-38.73	V	62.7
2417.63	-53.43	9.70	-43.73	V	67.7
3223.50	-63.69	9.90	-53.79	V	77.8
4029.38	-67.43	11.40	-56.03	V	80.0
4835.25	-76.93	12.10	-64.83	V	88.8

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### 9.3 Test Data (continued)

#### 9.3.F Field Strength of Spurious Radiation: Low Power (Low Channel)

OPERATING FREQUENCY: 758.125 MHz  
CHANNEL: Low  
MEASURED OUTPUT POWER: 17.001 dBm = 0.050 W  
DISTANCE: 3 meters  
LIMIT:  $43 + 10 \log_{10}(W) =$  29.99 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1516.25	-52.53	8.70	-43.83	V	60.8
2274.38	-61.23	9.70	-51.53	V	68.5
3032.50	-63.43	9.90	-53.53	V	70.5
3790.63	-77.43	11.40	-66.03	V	83.0
4548.75	-77.33	12.10	-65.23	V	82.2

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**9.3 Test Data (continued)**

**9.3.G Field Strength of Spurious Radiation: Low Power (Mid Channel)**

OPERATING FREQUENCY: 781.875 MHz  
 CHANNEL: Mid  
 MEASURED OUTPUT POWER: 17.001 dBm = 0.050 W  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10} (W) =$  29.99 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1563.75	-56.23	8.70	-47.53	V	64.5
2345.63	-58.03	9.70	-48.33	V	65.3
3127.50	-71.13	9.90	-61.23	V	78.2
3909.38	-77.23	11.40	-65.83	V	82.8
4691.25	-77.13	12.10	-65.03	V	82.0

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### 9.3 Test Data (continued)

#### 9.3.H Field Strength of Spurious Radiation: Low Power (High Channel)

OPERATING FREQUENCY: 805.875 MHz  
 CHANNEL: High  
 MEASURED OUTPUT POWER: 17.001 dBm = 0.050 W  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  29.99 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1611.75	-56.93	8.70	-48.23	V	65.2
2417.63	-62.83	9.70	-53.13	V	70.1
3223.50	-69.93	9.90	-60.03	V	77.0
4029.38	-76.93	11.40	-65.53	V	82.5
4835.25	-76.93	12.10	-64.83	V	81.8

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## 10.0 SPURIOUS EMISSION AT ANTENNA PORT

### 10.1 Applicable Standards – §74.861(e)(6) & §2.1051

According to §2.1051 of the FCC Rules, the radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions, which are attenuated more than 20 dB below the permissible value, need not be specified

According to §74.861(e)(6) of the FCC Rules, the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

1. 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.
2. 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.
3. On any frequency removed from the operating frequency by more than 250 percent up to and the authorized bandwidth shall be attenuated below the unmodulated carrier by at least 43 plus 10 Log (output power in watts) dB.

### 10.2 Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the SA on Max-Hold Mode, and then keep the EUT in transmitting mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete

### 10.3 Test Data

#### Environmental Conditions

Temperature: 23.1 °C (15-35°C)  
 Relative Humidity: 56 % (10-75%)  
 Atmospheric Pressure: 93 kPa (86-106kPa)

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## 10.4 Conducted Spurious Emission Plots

See attached.

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FCC ID-AK8WRT8P CON SPURS C-Low

MKR 1.514 GHz  
-43.90 dBm

hp

REF 21.8 dBm

ATTEN 40 dB

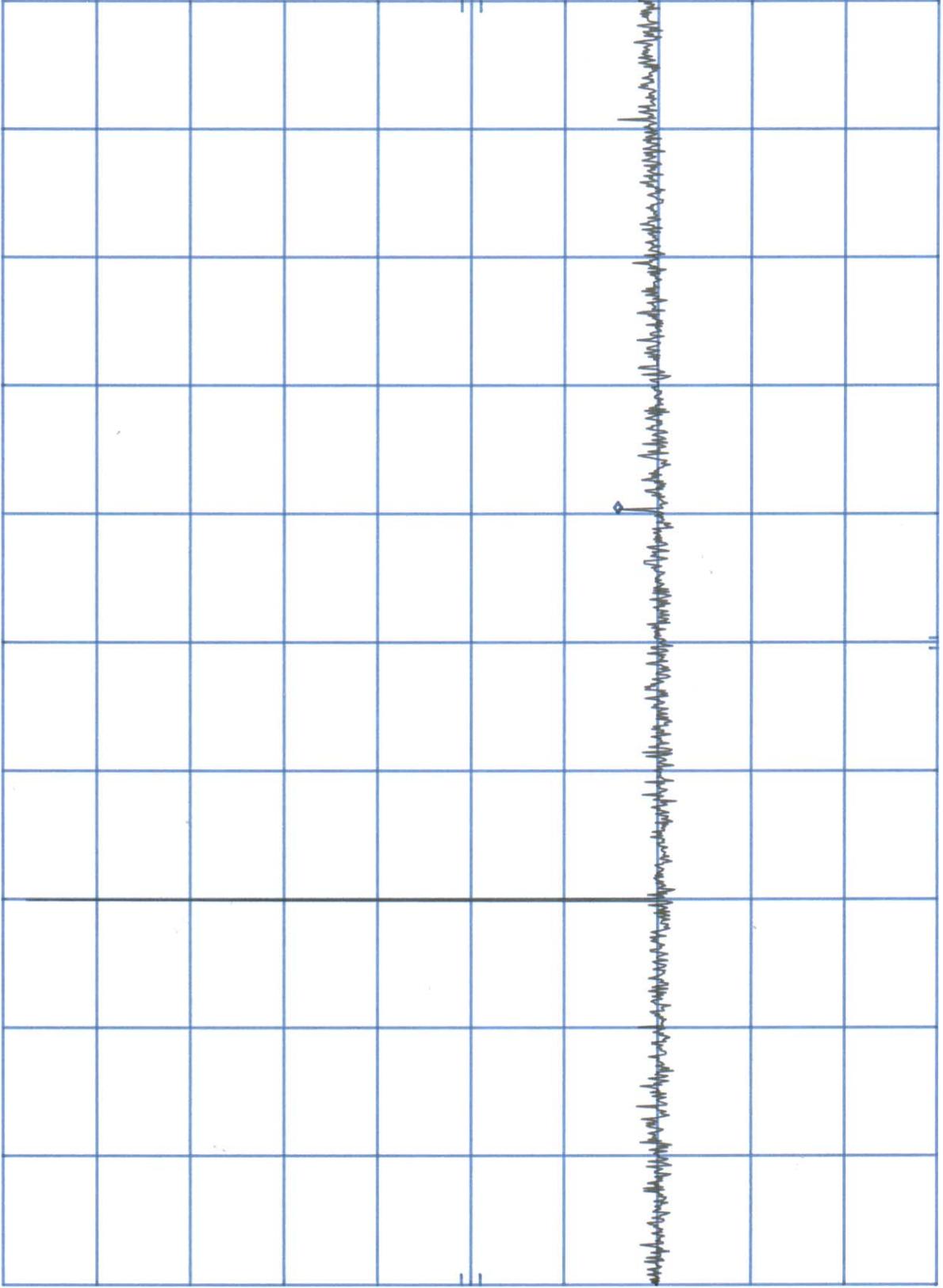
10 dB/

POS PK

OFFSET

1.0

dB



START 10 MHz

RES BW 100 kHz

VBW 300 kHz

STOP 2.50 GHz

SWP 747 msec

FCC ID-AK8WRT8P CON SPURS C-Low

MKR 9.160 GHz  
-41.40 dBm

hp

10 dB/

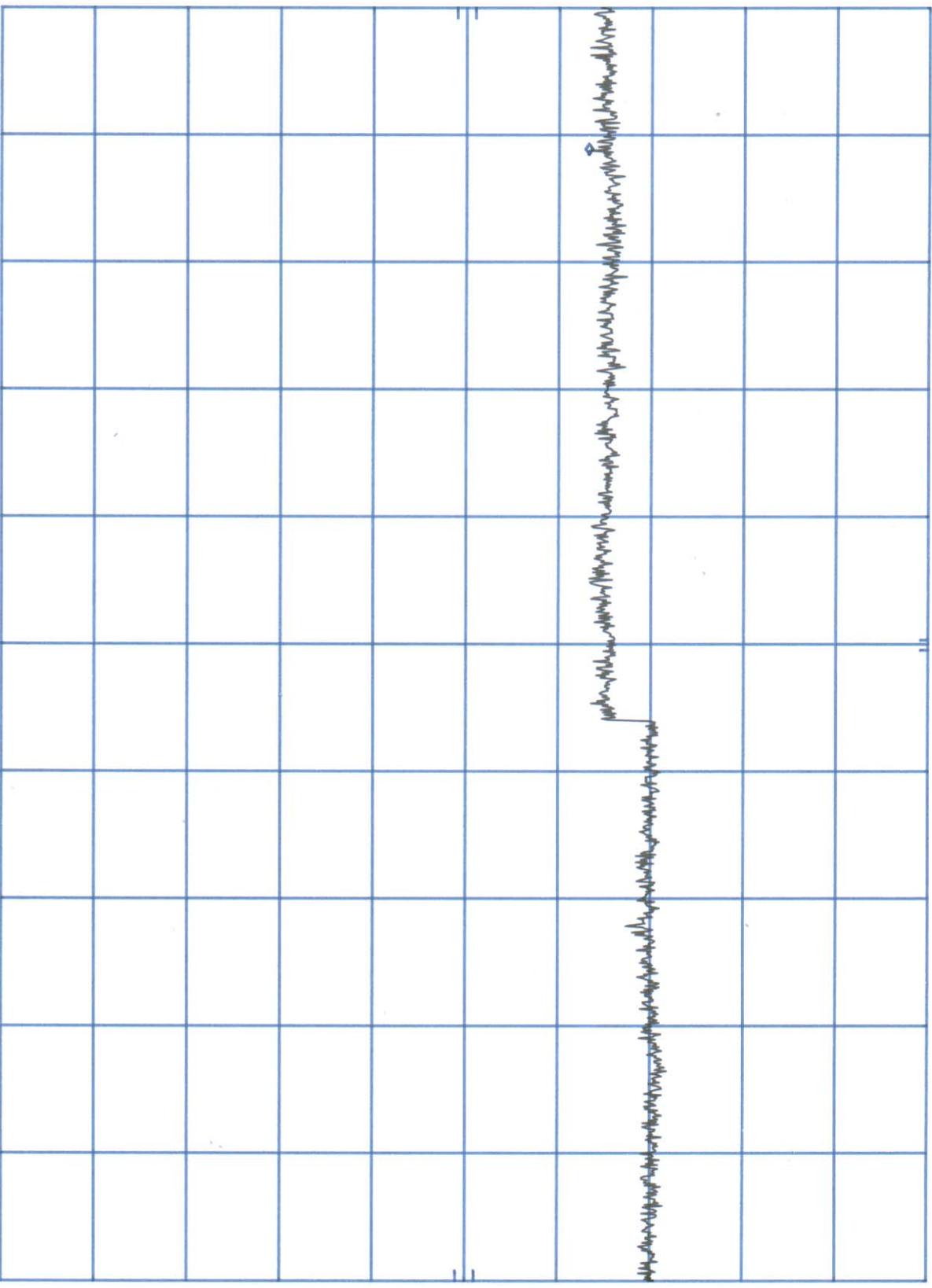
POS PK

OFFSET

1.0

dB

REF 21.8 dBm ATTEN 40 dB



START 2.50 GHz      RES BW 100 KHz      VBW 300 KHz      STOP 10.00 GHz  
 SWP 2.25 sec

FCC ID-AK8WRT8P CON SPURS C-m;d

MKR 1.561 GHz  
-44.50 dBm

REF 21.8 dBm  
ATTEN 40 dB

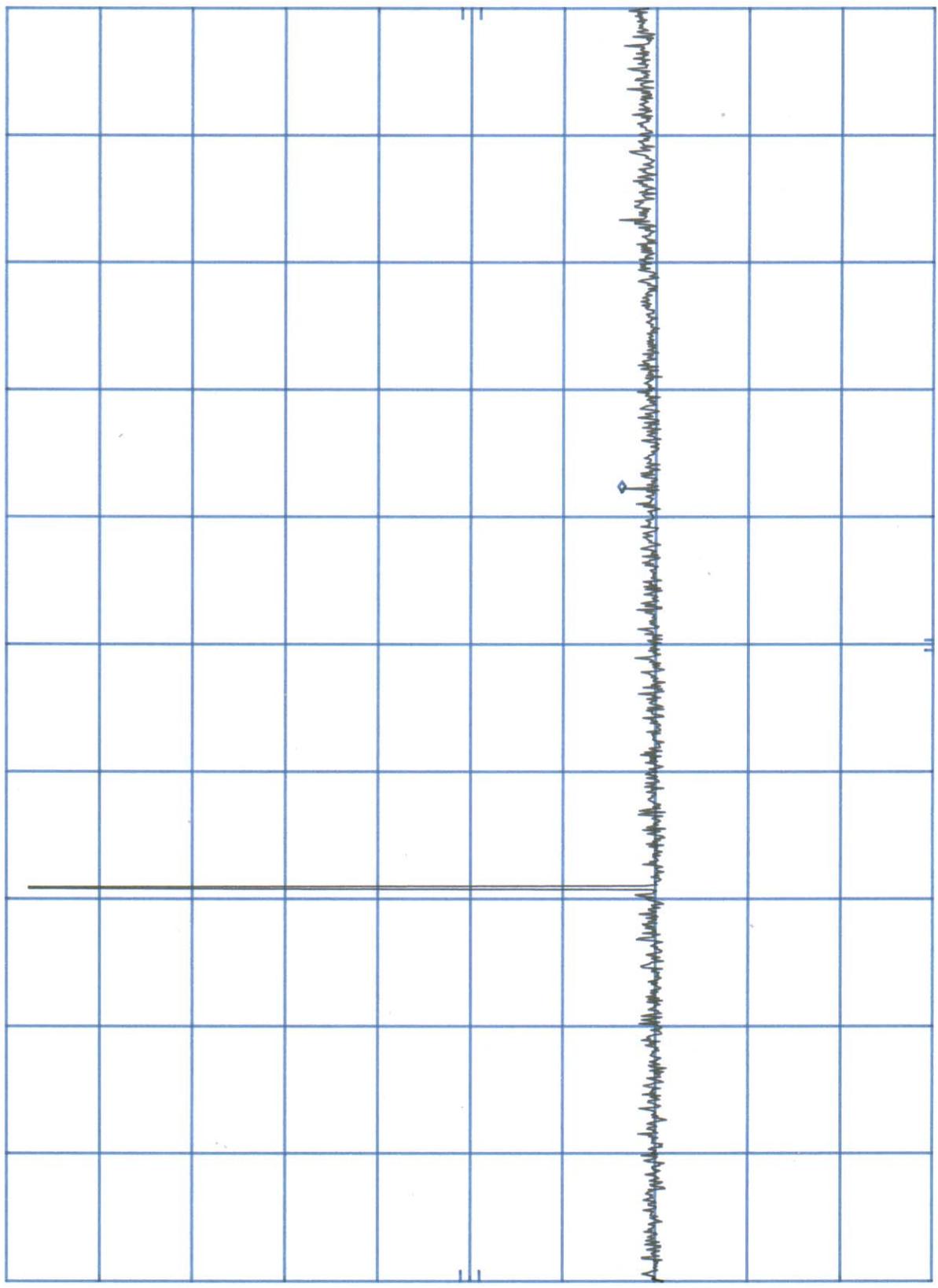
HP

10 dB/

POS PK

OFFSET

1.0  
dB



START 10 MHz      RES BW 100 KHZ      VBW 300 KHZ      STOP 2.50 GHz  
 SWP 747 msec

FCC ID-AK8WRT8P CON SPURS C-mid

MKR 6.573 GHz  
-40.70 dBm

HP REF 21.8 dBm ATTEN 40 dB

HP

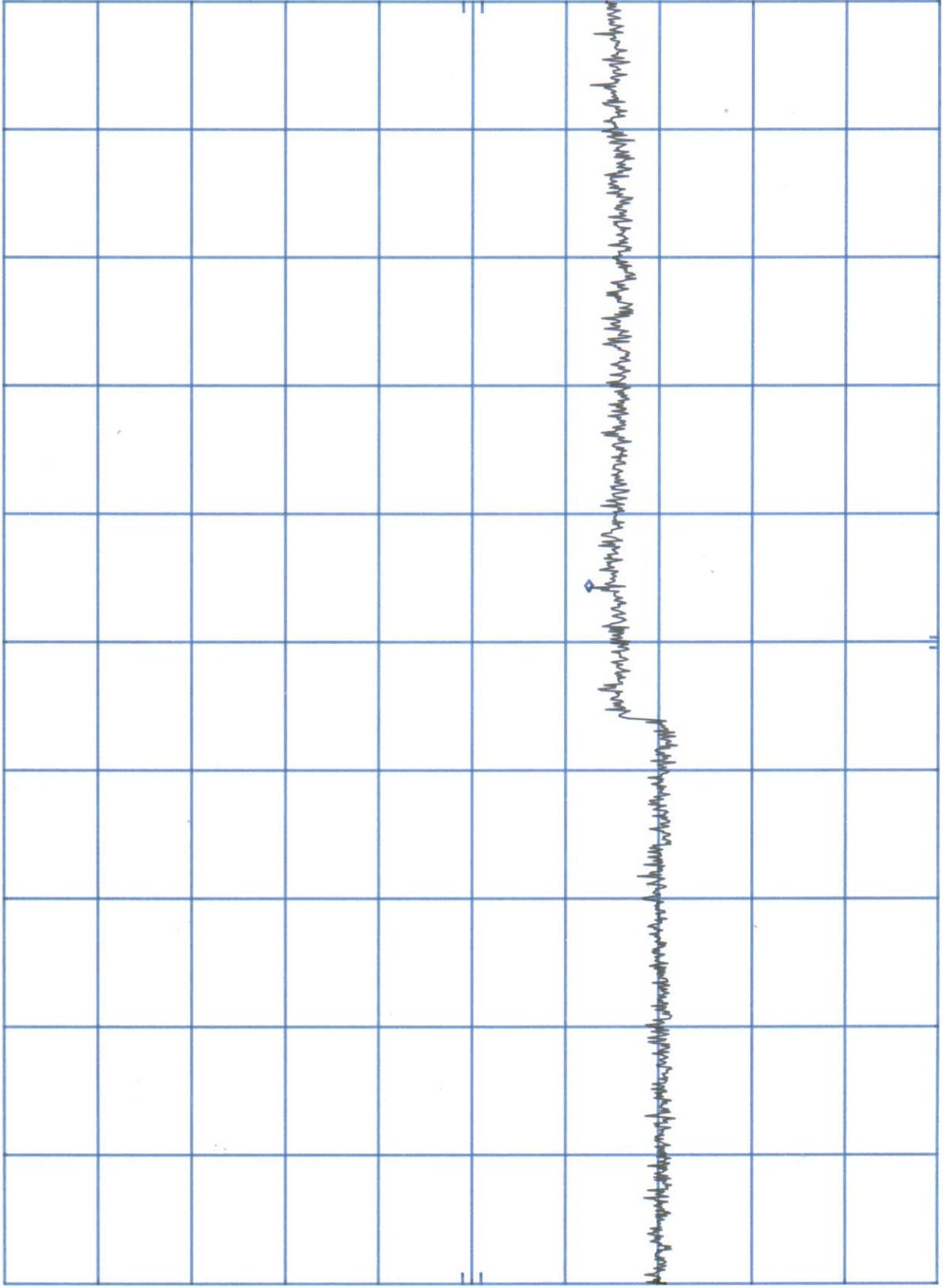
10 dB/

POS PK

OFFSET

1.0

dB



START 2.50 GHz

RES BW 100 kHz

VBW 300 kHz

STOP 10.00 GHz

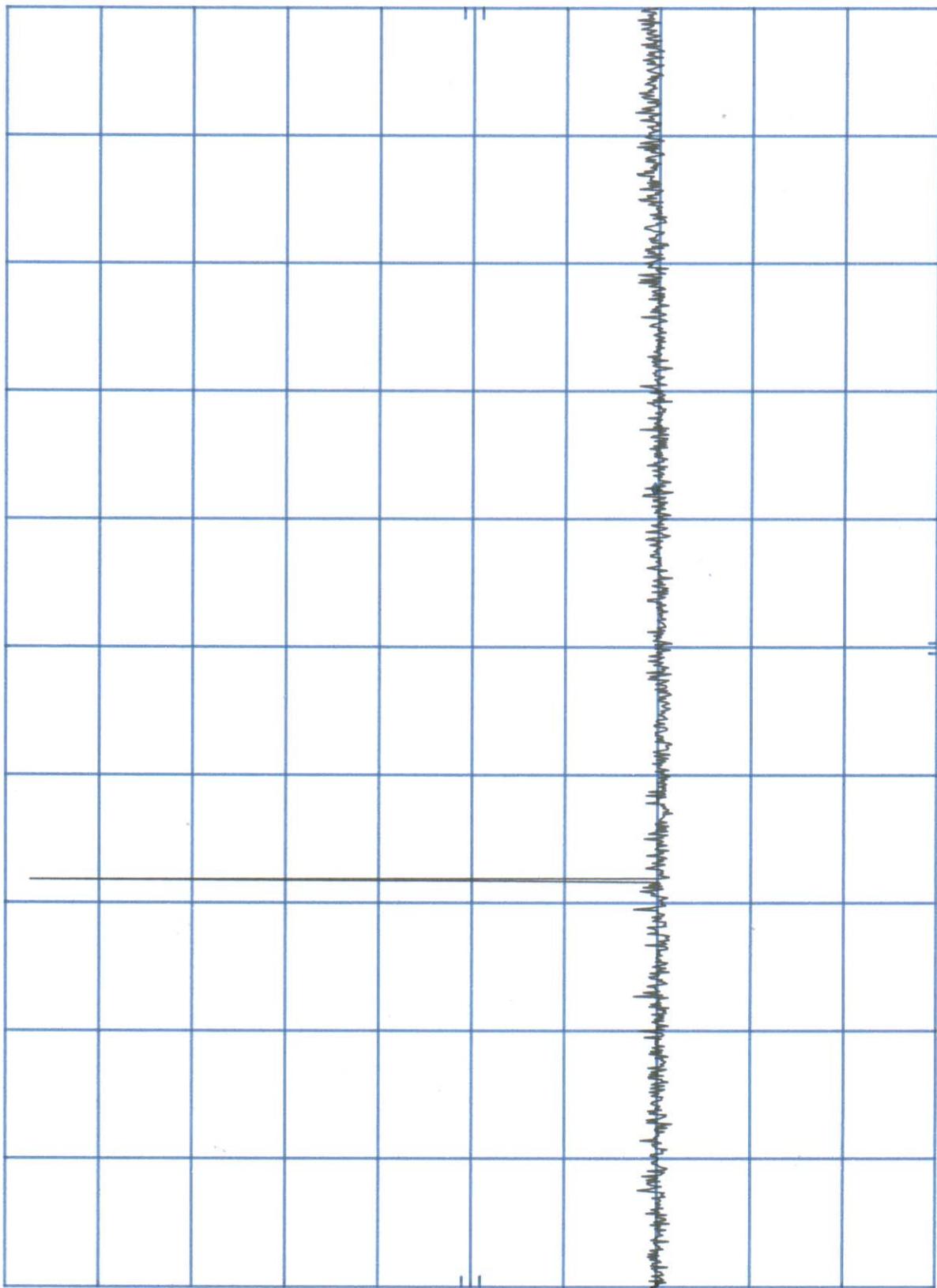
SWP 2.25 sec

*hp* C-High

MKR 1.561 GHz  
-47.80 dBm

FCC ID-AK8WRT8P CON SPURS  
REF 21.8 dBm ATTEN 40 dB

10 dB/  
POS PK  
OFFSET  
1.0  
dB



START 10 MHz RES BW 100 KHZ VBW 300 KHZ STOP 2.50 GHz  
SWP 747 msec

FCC ID-AK8WRT8P CON SPURS C-High

MKR 6.603 GHz  
-40.80 dBm

HP

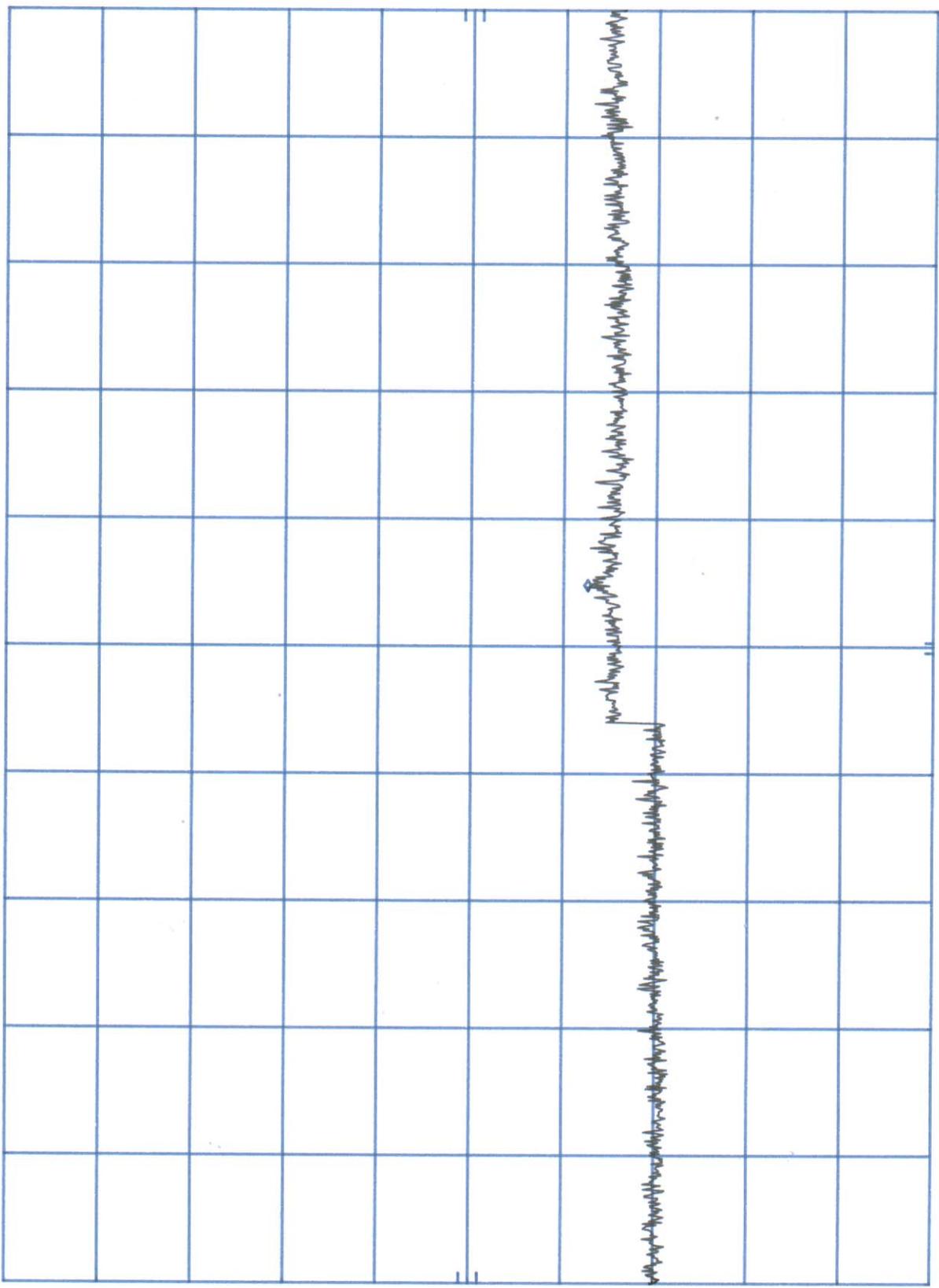
REF 21.8 dBm ATTEN 40 dB

10 dB/

POS PK

OFFSET

1.0  
dB



START 2.50 GHz

RES BW 100 KHZ

VBW 300 KHZ

STOP 10.00 GHz

SWP 2.25 sec

## 11.0 FREQUENCY STABILITY

### 11.1 Applicable Standards – §74.861(e)(4) & §2.1055

According to §2.1055(a)(1) of the FCC Rules, the frequency stability shall be measure with variation of ambient temperature from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ , and according to FCC 2.1055(d)(2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer.

According to §74.861(e)(4) of the FCC Rules, the frequency tolerance of the transmitter shall be 0.005 percent.

### 11.2 Test Procedure

The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from  $-30^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$  using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

*Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within  $\pm 0.005$  ( $\pm 50$  ppm) of the center frequency.*

#### **Time Period and Procedure:**

1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature ( $22^{\circ}\text{C}$  to  $25^{\circ}\text{C}$  to provide a reference).
2. The equipment is subjected to an overnight “soak” at  $-30^{\circ}\text{C}$  without any power applied.
3. After the overnight “soak” at  $-30^{\circ}\text{C}$  (usually 14-16 hours), the equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter and the individual oscillators is made within a three minute interval after applying power to the transmitter.
4. Frequency measurements are made at  $10^{\circ}\text{C}$  interval up to room temperature. At least a period of one and one half-hour is provided to allow stabilization of the equipment at each temperature level.
5. Again the transmitter carrier frequency and the individual oscillators is measured at room temperature to begin measurement of the upper temperature levels.
6. Frequency measurements are at 10 intervals starting at  $-30^{\circ}\text{C}$  up to  $+50^{\circ}\text{C}$  allowing at least two hours at each temperature for stabilization. In all measurements the frequency is measured within three minutes after re-applying power to the transmitter.
7. The artificial load is mounted external to the temperature chamber.

**NOTE: The EUT is tested down to the battery endpoint.**

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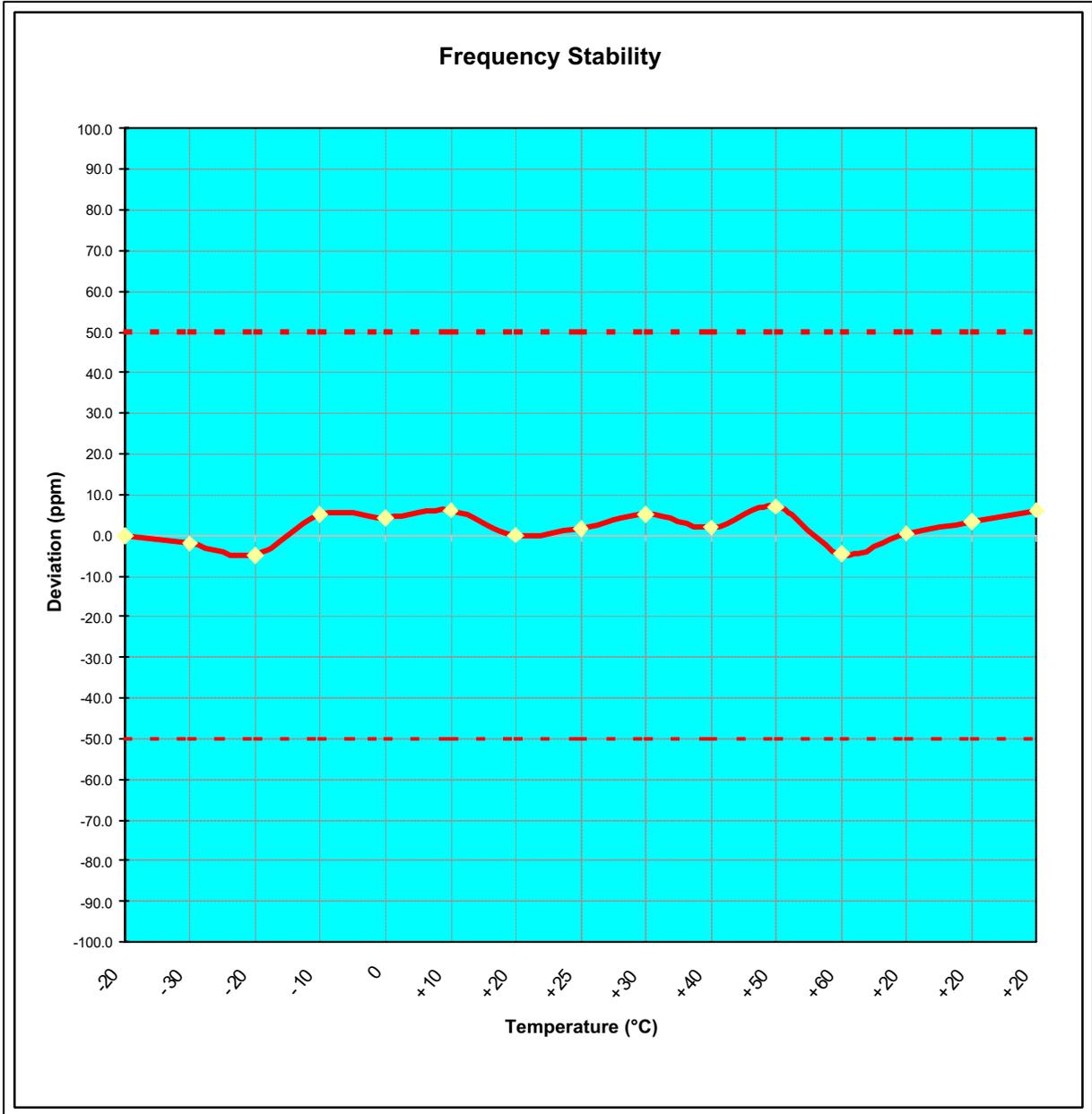
### 11.3 Frequency Stability Test Data

#### Environmental Conditions

Temperature: 23.1 °C (15-35°C)  
 Relative Humidity: 56 % (10-75%)  
 Atmospheric Pressure: 93 kPa (86-106kPa)

OPERATING FREQUENCY: <u>781,875,000</u> Hz					
CHANNEL: Mid					
REFERENCE VOLTAGE: <u>9</u> VDC					
FREQUENCY TOLERANCE: <u>± 0.005</u> %					
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQ. (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	9.00	+ 20 (Ref)	781,875,000	0	0.00000
100 %		- 30	781,876,642	-1,642	-0.00021
100 %		- 20	781,878,831	-3,831	-0.00049
100 %		- 10	781,870,856	4,144	0.00053
100 %		0	781,871,560	3,440	0.00044
100 %		+ 10	781,870,152	4,848	0.00062
100 %		+ 20	781,874,922	78	0.00001
100 %		+ 25	781,873,593	1,407	0.00018
100 %		+ 30	781,870,934	4,066	0.00052
100 %		+ 40	781,873,514	1,486	0.00019
100 %		+ 50	781,869,449	5,551	0.00071
100 %		+ 60	781,878,518	-3,518	-0.00045
85 %		7.65	+ 20	781,874,664	336
115 %	10.35	+ 20	781,872,263	2,737	0.00035
BATT. ENDPOINT	7.50	+ 20	781,870,074	4,926	0.00063

## 11.4 Frequency Stability Graph



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## 12.0 RADIATED EMISSIONS

### 12.1 Applicable Standards – §15.109

According to §15.109 of the FCC Rules, the spurious emissions from an unintentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ( $\mu\text{m}$ )	Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

### 12.2 Test Procedure

Final radiated measurements were made outdoors at 3-meter test range using Roberts™ Dipole antennas or horn antenna. The test equipment was placed on a wooden and plastic bench situated on a 1.5 x 2 meter area adjacent to the measurement area. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined and investigated using EMI/Field Intensity Meter and Quasi-Peak Adapter. The detector function was set to quasi-peak mode and the bandwidth of the receiver was set to 100kHz or 1 MHz depending on the frequency or type of signal. Above 1GHz the detector function was set to average mode (RBW = 1MHz, VBW = 10Hz).

The half-wave dipole antenna was tuned to the frequency found during preliminary radiated measurements. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1x1.5 meter table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission. Each EME reported was calibrated using the HP8640B signal generator.

Above 1 GHz, linearly polarized double ridge horn antennas were used.

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### 12.3 Radiated Emissions Test Data

#### Environmental Conditions

Temperature: 23.1 °C (15-35°C)  
 Relative Humidity: 56 % (10-75%)  
 Atmospheric Pressure: 93 kPa (86-106kPa)

FREQ (MHz)	Level (dBm)	AFCL (dB)	POL (H/V)	Height (m)	Azimuth (° angle)	F/S (uV/M)	Margin (dB)
66.4	-89.09	5.80	H	3.3	10	15.36	-16.3
95.55	-88.45	9.16	V	2.6	110	24.32	-15.8
86.5	-93.81	8.22	V	2.7	190	11.80	-18.6
531.1	-97.43	26.74	H	1.4	170	65.36	-9.7
675.9	-106.87	29.48	V	1.3	180	30.25	-16.4
687.7	-102.38	29.68	H	1.1	300	51.93	-11.7

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				Quality Manager
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## 13.0 TEST EQUIPMENT

TYPE	MODEL	CAL DUE DATE S/N	
Signal Generator*	Rohde & Schwarz (0.1-1000MHz)	9/11/2006	894215/012
Aitech/Eaton Receiver	NM 37/57A-SL (30-1000MHz)	4/12/2007	0792-03271
Aitech/Eaton Receiver	NM 37/57A (30-1000MHz)	3/11/2007	0805-03334
Aitech/Eaton Receiver	NM 17/27A (0.1-32MHz)	9/17/2006	0608-03241
Aitech/Eaton Adapter	CCA-7 CISPR/ANSI QP Adapter	3/11/2007	0194-04082
Harmonic/Flicker	Test System HP 6841A (IEC 555-2/3)	2/11/2007	3531A00115/ PCT468
Shielded Screen Room	RF Lindgren Model 26-2/2-0	N/A	6710 (PCT270)
Shielded Semi-Anechoic Chamber	Ray Proof Model S81	N/A	R2437 (PCT278)
Quasi-Peak Adapter	HP 85650A	8/9/2006	2043A00301
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	8/15/2006	3638A08713
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	4/17/2007	2542A11898
Spectrum Analyzer/Tracking Gen.	HP 8591A (100Hz-1.8GHz)	9/12/2006	3144A02458
Signal Generator	HP 8648D (9kHz-4GHz)	5/1/2007	3613A00315
Spectrum Analyzer	HP 8594A	11/2/2006	3051A00187
Spectrum Analyzer (2)	HP 8591A	10/15/2006	3034A01395, 3108A02053
Audio Analyzer	HP 8903B		3011A09025
Modulation Analyzer	HP 8901A		2432A03467
Power Meter	HP 437B		3125U24437
Power Sensor	HP 8482H (30mW-3W)		2237A02084
Broadband Amplifier (2)	HP 8447D		1145A00470, 1937A03348
Broadband Amplifier	HP 8447F		2443A03784
Network Analyzer	HP 8753E (30kHz-3GHz)		JP38020182
Attenuator	HP 8495A (0-70dB) DC-4GHz		
Horn Antenna	EMCO Model 3115 (1-18GHz)		9704-5182
Horn Antenna	EMCO Model 3115 (1-18GHz)		9205-3874
Horn Antenna	EMCO Model 3116 (18-40GHz)		9203-2178
Biconical Antenna (4)	Eaton 94455/Eaton 94455-1/Singer 94455-1/Compliance Design		1295, 1332, 0355
Log-Spiral Antenna (3)	Aitech/Eaton 93490-1		0608, 1103, 1104
Roberts Dipoles	Compliance Design (1 set)		
Aitech Dipoles	DM-105A (1 set)		33448-111
EMCO LISN (6)	3816/2		1079
Microwave Preamp/40dB	Gain HP 83017A (0.5-26.5GHz)		3123A00181
Microwave Cables	MicroCoax (1.0-26.5GHz)		
Gigatronics Universal Power Meter	8657A		1835256
Gigatronics Power Sensor	80701A (0.05-18GHz)		1833460
Amplifier Research	5S1G4 (5W, 800MHz-4.2GHz)		22322
Microwave Survey Meter	Holaday Model 1501 (2.450GHz)		80931
Digital Thermometer	Extech Instruments 421305		426966
Bi? Directional Coax Coupler	Narda 3020A (50-1000MHz)		
Environmental Chamber	Associated Systems Model 1025 (Temperature/Humidity)		PCT285

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## 14.0 SAMPLE CALCULATIONS

### 12.3 Emission Designator

**Emission Designator = 120KF3E**

BW = 120 kHz

F = Frequency Modulation

3 = Composite Digital Info

E = Combination (Audio/Data) (Measured at the 99.75% power bandwidth)

**Calculated Emission:**

2M + 2D

= (2x18kHz) + (2x40kHz)

= 36kHz + 80kHz

= 116KF3E

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## 15.0 CONCLUSION

The data collected shows that the SONY Corporation UHF Synthesized Transmitter – Wireless Microphone System FCC ID: AK8WRT8P complies with all the requirements of Parts 2 and 74 of the FCC rules.

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