# DIGITAL EMC CO., LTD.

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## CERTIFICATE OF COMPLIANCE
## FCC Part 2, 22, 74, & 90 Certification

UNIMO Technology Co., Ltd.
479-12 Bangbae-3Dong, Seocho-Gu,
Seoul, KOREA 137-820

Dates of Tests: Feb 10, 2004 ~ Feb 21,2004
Test Report S/N:DR50110402L
Test Site : DIGITAL EMC CO., LTD.

FCC ID: **O25PF-400NW**

APPLICANT **UNIMO Technology Co., Ltd.**

| | | |
|---|---|---|
| **Device Category** | : | **UHF FM Handheld Transceiver** |
| **Device name** | : | **Land Mobile Radio** |
| **Manufacturer** | : | UNIMO Technology Co., Ltd. |
| **Trade mark** | : | UNIMO |
| **Model name** | : | PF-400NW |
| **Serial number** | : | Identical prototype |
| **FCC Rule Part(s)** | : | §2, §22, §74, §90 |
| **Frequency Range** | : | 400~470MHz |
| **RF Output Power** | : | 4W / 1W |
| **Channel Separation** | : | 12.5kHz / 25.0kHz |
| **Emission Designators:** | : | 11K0F3E, 16K0F3E |
| **Data of issue** | : | February 21, 2004 |

**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.**

NVLAP LAB CODE 200559-0

 

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# 1. General information's

This report contains the result of tests performed by:

DIGITAL EMC CO., LTD.
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Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competents of calibration and testing laboratory".
This laboratory is accredited by NVLAP for NVLAP Lab. Code : 200559-0.

**Test operator: engineer**

| Data | Name | Signature |
|---|---|---|
| February 21, 2004 | Kyung-Taek LEE | |

**Report Reviewed By: manager**

| Data | Name | Signature |
|---|---|---|
| February 21, 2004 | Dong –Min JUNG | |

Ordering party:

| | | |
|---|---|---|
| Company name | : | UNIMO Technology Co., Ltd. |
| Address | : | 479-12 Bangbae-3Dong, Seocho-Gu, |
| Zipcode | : | 137-820 |
| City/town | : | Seoul |
| Country | : | Korea |
| Date of order | : | January 19, 2004 |

# 2. Information's about test item

**O25PF-400NW**

## 2.1 Equipment information

| | |
|---|---|
| Equipment model no. | **PF-400NW** |
| Equipment serial no. | Identical prototype |
| Type of equipment | UHF FM Handheld Transceiver |
| Frequency Range | 400 ~ 470 MHz |
| Channel Separation | 12.5kHz / 25.0kHz |
| Rated RF output power | 4W (High Power) / 1W(Low Power) |
| Duty cycle TX power | 5(Tx) : 5(Rx) : 90(Stand-by) |
| Type of antenna | λ/4 Whip Antenna |
| Battery type | 7.5V DC rechargeable Li-NH battery |
| Speaker Impedance | 16 ohm |
| Audio Output Power | 1.0Watt across an 16-ohm load |
| Intermediate Frequencies | 1 st : 21.4 MHz 2 st: 455 kHz |

## 2.2 Tested frequency

| Frequency | TX | RX |
|---|---|---|
| Low frequency | 400.050 MHz | 400.050 MHz |
| Middle frequency | 435.050 MHz | 435.050 MHz |
| High frequency | 469.950 MHz | 469.950 MHz |

## 2.3 Test conditions (note 1)

| Test Conditions | Temperature(℃) |
|---|---|
| Low | -30 |
| High | +60 |

# 3. Test Report

## 3.1 Summary of tests

| Rule Reference | Parameter | Status (note 1) |
|---|---|---|
| | | |
| 2.1046 (a) | Carrier Output Power (Conducted) | C |
| 2.1051 | Unwanted Emissions (Transmitter Conducted) | C |
| 2.1053 (a) | Field Strength of Spurious Radiation | C |
| 2.1049 (c) (1) | Emission Masks (Occupied Bandwidth) | C |
| 90.214 | Transient Frequency Behavior | C |
| 2.1047 (a) | Audio Low Pass Filter (Voice Input) | C |
| 2.1047 (a) | Audio Frequency Response | C |
| 2.1047 (b) | Modulation Limiting | C |
| 2.1055 (a) (1) | Frequency Stability (Temperature Variation) | C |
| 2.1055 (b) (1) | Frequency Stability (Voltage Variation) | C |
| 2.202 (g) | Necessary Bandwidth and Emission Bandwidth | C |
| Note 1: C= Complies NC=Not Complies NT=Not Tested NA=Not Applicable | | |

The sample was tested according to the following specification:

FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.947, 2.1033(c), 2.1046, 2.1047, 2.1079, 2.1051, 2.1053, 2.1055, 2.1057 and Part 22, Part 74 Subpart H, Part 90.

## 3.2 Requirements

### 3.2.1 Carrier Output Power (Conducted)

**Definition:**

- The carrier power output for a transmitter for this service is the power available at the output terminals of the transmitter when the output terminals are connected to the standard transmitter load.

| | | |
|---|---|---|
| FCC ID | : | **O25PF-400NW** |
| Specification | : | 47 CFR 2.1046 (a) |
| Test method | : | ANSI/TIA/EIA-603-2001, Paragraph 2.2.1 |

**Measurement Procedure:**

- The EUT was connected to a resistive coaxial attenuator of normal load impedance, and the unmodulated output power was measured by means of an R.F. Power Meter.

| TEST CONDITIONS | | Carrier power(W) | | |
|---|---|---|---|---|
| **Power level (W)** | **Channel Spacing (kHz)** | **400.050 MHz** | **435.050 MHz** | **469.950 MHz** |
| 1 | 12.5 | **0.94** | **1.08** | **1.09** |
| 4 | 12.5 | **3.90** | **3.94** | **3.75** |
| 1 | 25 | **0.94** | **1.09** | **1.09** |
| 4 | 25 | **3.90** | **3.94** | **3.77** |
| **Measurement uncertainty** | | ± 0,45dB | | |

TEST EQUIPMENT USED: 11, 12, 19, 20, 32, 35

## 3.2.2 Unwanted Emissions (Transmitter Conducted)

**Definition:**

- Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies which are outside a band sufficient to ensure transmission of information of required quality for the class of communication desired.

| | | |
|---|---|---|
| FCC ID | : | **O25PF-400NW** |
| Specification | : | 47 CFR 2.1051 |
| Test method | : | ANSI/TIA/EIA-603-2001, Paragraph 2.2.13 |

**Measurement Procedure:**

- The emissions were measured for the worst case as follows:

(1) Within a band of frequencies defined by the carrier frequency plus and minus one channel.

(2) From the lowest frequency generated in the EUT and to at least the 10th harmonic of the carrier frequency, or 40GHz, whichever is lower.

- The magnitude of spurious emissions that are attenuated more than 20dB below the permissible value need not be specified.

**LIMIT**

| |
|---|
| $= 43 + 10 \log_{10}$ (P) dBc (or -13 dBm) |

TEST EQUIPMENT USED: 2, 19, 20, 35, 37

**Measurement Data:**

OPERATING FREQUENCY : 400.050 MHz

POWER : Low Power

MEASURED OUTPUT POWER: 30.37 dBm = 1.09 W

MODULATION SIGNAL : FM

LIMIT : 43 + 10 $\log_{10}$ (W) = 43.37 dBc

| Freq. (MHz) | Level (dBm) | Level (dBc) | Freq. (MHz) | Level (dBm) | Level (dBc) |
|---|---|---|---|---|---|
| 800.097 | -51.00 | 81.37 | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Remarks

No other emissions were detected at a level greater than 20dB below limit.

OPERATING FREQUENCY : 400.050 MHz

POWER : High Power

MEASURED OUTPUT POWER : 35.96 dBm = 3.94 W

MODULATION SIGNAL : FM

LIMIT : 43 + 10 $\log_{10}$ (W) = 48.96 dBc

| Freq. (MHz) | Level (dBm) | Level (dBc) | Freq. (MHz) | Level (dBm) | Level (dBc) |
|---|---|---|---|---|---|
| 800.10 | -37.00 | 72.96 | | | |
| 1200.15 | -51.33 | 87.29 | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Remarks

No other emissions were detected at a level greater than 20dB below limit.

**Measurement Data:**

OPERATING FREQUENCY : 435.050 MHz

POWER : Low Power

MEASURED OUTPUT POWER: 30.37 dBm = 1.09 W

MODULATION SIGNAL : FM

LIMIT : 43 + 10 $\log_{10}$ (W) = 43.37 dBc

| Freq. (MHz) | Level (dBm) | Level (dBc) | Freq. (MHz) | Level (dBm) | Level (dBc) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Remarks

No emissions were detected at a level greater than 20dB below limit.

OPERATING FREQUENCY : 435.050 MHz

POWER : High Power

MEASURED OUTPUT POWER : 35.96 dBm = 3.94 W

MODULATION SIGNAL : FM

LIMIT : 43 + 10 $\log_{10}$ (W) = 48.96 dBc

| Freq. (MHz) | Level (dBm) | Level (dBc) | Freq. (MHz) | Level (dBm) | Level (dBc) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Remarks

No emissions were detected at a level greater than 20dB below limit.

**Measurement Data:**

OPERATING FREQUENCY : 469.950 MHz

POWER : Low Power

MEASURED OUTPUT POWER: 30.37 dBm = 1.09 W

MODULATION SIGNAL : FM

LIMIT : 43 + 10 $\log_{10}$ (W) = 43.37 dBc

| Freq. (MHz) | Level (dBm) | Level (dBc) | Freq. (MHz) | Level (dBm) | Level (dBc) |
|---|---|---|---|---|---|
| 939.90 | -37.33 | 67.70 | | | |
| 1409.85 | -40.67 | 71.04 | | | |
| 1879.80 | -42.67 | 73.04 | | | |
| 2349.75 | -59.17 | 89.54 | | | |
| 2819.70 | -53.17 | 83.54 | | | |
| | | | | | |

Remarks

No other emissions were detected at a level greater than 20dB below limit.

OPERATING FREQUENCY : 469.950 MHz

POWER : High Power

MEASURED OUTPUT POWER : 35.96 dBm = 3.94 W

MODULATION SIGNAL : FM

LIMIT : 43 + 10 $\log_{10}$ (W) = 48.96 dBc

| Freq. (MHz) | Level (dBm) | Level (dBc) | Freq. (MHz) | Level (dBm) | Level (dBc) |
|---|---|---|---|---|---|
| 939.90 | -37.67 | 73.63 | | | |
| 1409.85 | -38.33 | 74.29 | | | |
| 1879.80 | -42.83 | 91.79 | | | |
| 2349.75 | -57.00 | 92.96 | | | |
| | | | | | |
| | | | | | |

Remarks

No other emissions were detected at a level greater than 20dB below limit.

## 3.2.3 Field Strength of Spurious Radiation

**Definition:**

- Radiated spurious emissions are emissions from the equipment when transmitting into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desire.

| | | |
|---|---|---|
| FCC ID | : | **O25PF-400NW** |
| Specification | : | 47 CFR 2.1053(a) |
| Test method | : | ANSI/TIA/EIA-603-2001, Paragraph 2.2.12 |

**Measurement Procedure:**

- The test sample was set up at a distance of three meters from the test instrument. Valid spurious signals were determined by switching the power on and off.
- In the field, the test sample was placed on a wooden turntable above ground at three meters away from the search antenna.
- The cables were oriented in order to obtain the maximum response. At each emission frequency, the turntable was rotated and the search antennas were raised and lowered vertically.
- The emission was observed with both a vertically polarized and a horizontally polarized search antenna and the worst case was used.
- The field strength of each emission within 20dB of the limit was recorded and corrected with the appropriate cable and transducer factors.
- From the lowest frequency generated in the EUT and to at least the 10th harmonic of the carrier frequency, or 40GHz, whichever is lower.
- The worst case for all channels is shown.

**LIMIT**

| |
|---|
| $= 43 + 10 \log_{10} (P)$ dBc (or -13 dBm) |

TEST EQUIPMENT USED: 1, 8, 19, 22, 23, 33, 34, 35

**Measurement Data: Attached for Worst Case**

OPERATING FREQUENCY : 435.050 MHz

POWER : Low Power

MEASURED OUTPUT POWER: 30.37 dBm = 1.09 W

MODULATION SIGNAL : FM

LIMIT : 43 + 10 $\log_{10}$ (W) = 43.37 dBc

| Freq. (MHz) | LEVEL@ ANTENNA TERMINALS (dBm) | SUBSTITUTE ANTENNA GAIN (dBd) | CORRECT GENERATOR LEVEL (dBm) | POL (H/V) | (dBc) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Remarks

No emissions were detected at a level greater than 20dB below limit.

**Measurement Data: Attached for Worst Case**

OPERATING FREQUENCY : 435.050 MHz

POWER : High Power

MEASURED OUTPUT POWER : 35.96 dBm = 3.94 W

MODULATION SIGNAL : FM

LIMIT : $43 + 10 \log_{10} (W)$ = 48.96 dBc

| Freq. (MHz) | LEVEL@ ANTENNA TERMINALS (dBm) | SUBSTITUTE ANTENNA GAIN (dBd) | CORRECT GENERATOR LEVEL (dBm) | POL (H/V) | (dBc) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Remarks

No emissions were detected at a level greater than 20dB below limit.

## 3.2.4 Emission Masks (Occupied Bandwidth)

**Definition:**

- The term transmitter Sideband Spectrum denotes the sideband energy produced at a discrete frequency separation from the carrier up to the test bandwidth due to all sources of unwanted noise within the transmitter in a modulated condition.

| | | |
|---|---|---|
| FCC ID | : | **O25PF-400NW** |
| Specification | : | 47 CFR 2.1049(c)(1) |
| Test method | : | ANSI/TIA/EIA-603-2001, Paragraph 2.2.11 |

**Measurement Procedure:**

- The EUT and test equipment were set up as shown on the following page, with the Spectrum Analyzer connected.
- For EUTs supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for ±2.5 / ±1.25 kHz deviation (or 50% modulation). With level constant, the signal level was increased 16dB.
- For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.
- The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.

**Measurement Data:**

Refer to the Appendix II

TEST EQUIPMENT USED: 2, 19, 20, 35, 37

## 3.2.5 Transient Frequency Behavior

**Definition:**

- The transient frequency behavior is a measure of the difference, as a function in time. of the actual transmitter frequency to the assigned transmitter frequency when the transmitted RF output power is switched on or off.

| | | |
|---|---|---|
| FCC ID | : | **O25PF-400NW** |
| Specification | : | 47 CFR 90.214 |
| Test method | : | ANSI/TIA/EIA-603-2001, Paragraph 2.2.19 |

**Measurement Procedure:**

- The EUT was set up as shown on the attached page, following TIA/EIA-603 steps a, b, and c as a guide.
- The transmitter was turned on.
- Sufficient attenuation was provided so that the transmitter carrier level measured at the output of the combiner was 40 dB below the maximum input level of the test receiver. This level was recorded as step f.
- The transmitter was turned off.
- An RF signal generator (1) modulated with a 1 kHz tone at either 25, 12.5, or 6.25 kHz deviation, and set to the same frequency as the assigned transmitter frequency, (2) was adjusted to a level -20 dB below the level recorded for step f, as measured at the output of the combiner. This level was then fixed for the remainder of the test and is recorded at step h.
- The oscilloscope was set up using TIA/EIA-603 steps j and k as a guide, and to either 10 ms/div (UHF) of 5ms/div (VHF).
- The 30 dB attenuator was removed, the transmitter was turned on, and the level of the carrier at the output of the combiner was recorded as step l.
- The carrier on-time as referenced in TIA/EIA-603 steps m, n, and o was captured and plotted. The carrier off-time as referenced in TIA/EIA-603 steps p, q, r, and s was captured and plotted.
- For EUTs supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for ±2.5 / ±1.25 kHz deviation (or 50% modulation). With level constant, the signal level was increased 16dB.
- For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.
- The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.

**Measurement Data:**

Refer to the Appendix II

TEST EQUIPMENT USED: 2, 19, 20, 35, 37

## 3.2.6 Audio Low Pass Filter (Voice Input)

**Definition:**

- The Audio Low Pass Filter Response is the frequency response of the post limiter low pass filter circuit above 3000Hz.

| | | |
|---|---|---|
| FCC ID | : | **O25PF-400NW** |
| Specification | : | 47 CFR 2.1047(a) |
| Test method | : | ANSI/TIA/EIA-603-2001, Paragraph 2.2.15 |

**Measurement Procedure:**

- The EUT and test equipment were set up such that the audio input was connected at the input to the modulation limiter, and the modulated stage.
- The audio output was connected at the output to the modulated stage.

**Measurement Data:**

Refer to the Appendix II

TEST EQUIPMENT USED: 2, 19, 20, 35, 37

## 3.2.7 Audio Frequency Response

**Definition:**

- The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

| | | |
|---|---|---|
| FCC ID | : | **O25PF-400NW** |
| Specification | : | 47 CFR 2.1047(a) |
| Test method | : | ANSI/TIA/EIA-603-2001, Paragraph 2.2.6 |

**Measurement Procedure:**

- The audio signal input was adjusted to obtain 20% modulation at 1kHz, and this point was taken as the 0dB reference level.
- With input levels held constant and below limiting at all frequencies, the audio signal generator was varied from 300 Hz to 30 kHz.
- The response in dB relative to 1 kHz was then measured, using the HP 8901A Modulation Analyzer.

**Measurement Data:**

Refer to the Appendix II

TEST EQUIPMENT USED: 2, 19, 20, 35, 37

## 3.2.8 Modulation Limiting

**Definition:**

- Modulation limiting refers to the transmitter circuits ability to limit the transmitter from producing deviations due to modulation in excess of a rated system deviation.

| | | |
|---|---|---|
| FCC ID | : | **O25PF-400NW** |
| Specification | : | 47 CFR 2.1047(b) |
| Test method | : | ANSI/TIA/EIA-603-2001, Paragraph 2.2.3 |

**Measurement Procedure:**

- The signal generator was connected to the input of the EUT as for " Frequency Response of the Modulating Circuit."
- The modulation response was measured for each of three frequencies (one of which was the frequency of maximum response), and the input voltage was varied and was observed on an HP 8901A Modulation Analyzer.
- The input level was varied from 30% modulation (±1.5 kHz deviation) to at least 20 dB higher than the saturation point.

**Measurement Data:**

Refer to the Appendix II

TEST EQUIPMENT USED: 2, 19, 20, 35, 37

## 3.2.9 Frequency Stability

**Definition:**

- Modulation limiting refers to the transmitter circuits ability to limit the transmitter from producing deviations due to modulation in excess of a rated system deviation.

| | | |
|---|---|---|
| FCC ID | : | **O25PF-400NW** |
| Specification | : | 47 CFR 2.1055 |
| Test method | : | ANSI/TIA/EIA-603-2001, Paragraph 2.2.2 |

**Measurement Procedure:**

The frequency stability of the transmitter is measured by:

a) Temperature: The temperature is varied from -30℃ to +60℃ 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 ±0.00025(±2.5ppm) of the center frequency.

Time Period and Procedure:

1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature (25℃ to 27℃ to provide a reference).
2. The equipment is subjected to an overnight "soak" at -30℃ without power applied.
3. After the overnight "soak" at 30℃(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℃ 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℃ up to +60℃ 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.

**Measurement Data:**

Refer to the Appendix II

TEST EQUIPMENT USED: 2, 19, 20, 35, 37

### 3.2.10 Necessary Bandwidth and Emission Bandwidth

| | | |
|---|---|---|
| FCC ID | : | **O25PF-400NW** |
| Specification | : | 47 CFR 2.202 (g) |

MODULATION = 16K0F3E

NECESSARY BANDWIDTH CALCULATION:

| | |
|---|---|
| MAXIMUM MODULATION (M), kHz | = 3 |
| MAXIMUM DEVIATION (D), kHz | = 5 |
| CONSTANT FACTOR (K) | = 1 |
| NECESSARY BANDWIDTH (BN), kHz | = (2 * M) + (2 * D * K) |
| | = 16.0 |

MODULATION = 11K0F3E

NECESSARY BANDWIDTH CALCULATION:

| | |
|---|---|
| MAXIMUM MODULATION (M), kHz | = 3 |
| MAXIMUM DEVIATION (D), kHz | = 2.5 |
| CONSTANT FACTOR (K) | = 1 |
| NECESSARY BANDWIDTH (BN), kHz | = (2 * M) + (2 * D * K) |
| | = 11.0 |

# APPENDIX I

## TEST EQUIPMENT USED FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

| | Type | Manufacturer | Model | Cal.Due.Date (dd/mm/yy) | S/N |
|---|---|---|---|---|---|
| 01 | Spectrum Analyzer | Agilent | E4404B | 22/11/04 | 30601-01-6025569 |
| 02 | Spectrum Analyzer | H.P | 8563E | 25/09/04 | 3551A04634 |
| 03 | Power Meter | H.P | EPM-442A | 15/03/04 | GB37170413 |
| 04 | Power Sensor | H.P | 8481A | 19/04/04 | 3318A96332 |
| 05 | Frequency Counter | H.P | 5342A | 26/09/04 | 2119A04450 |
| 06 | Multfunction Synthesizer | H.P | 8904A | 15/10/04 | 3633A08404 |
| 07 | Signal Generator | H.P | 8673D | 26/09/04 | 2844A00753 |
| 08 | Signal Generator | H.P | E4421A | 29/04/04 | US37230529 |
| 09 | Signal Generator | H.P | 8657A | 05/06/04 | 3430U02049 |
| 10 | Audio Analyzer | H.P | 8903B | 18/04/04 | 3011A0944B |
| 11 | Modulation Analyzer | H.P | 8901B | 21/04/04 | 3028A03029 |
| 12 | Sensor Module | H.P | 11722A | 21/04/04 | 3111A04665 |
| 13 | Oscilloscope | LeCroy | 9314A | 27/08/04 | 93144390 |
| 14 | CDMA Mobile Station Test Set | H.P | 8924C | 09/09/04 | US35360688 |
| 15 | Power Splitter | WEINSCHEL | 1593 | 23/04/04 | 332 |
| 16 | BAND Reject Filter | Wainwright | WRCG824 | 19/08/04 | SN1 |
| 17 | BAND Reject Filter | Wainwright | WRCG1750 | 19/08/04 | SN2 |
| 18 | AC Power supply | DAEKWANG | 5KVA | 03/04/04 | N/A |
| 19 | DC Power Supply | H.P | 6622A | 24/03/04 | 465487 |
| 20 | Attenuator (30dB) | H.P | 8498A | 23/05/04 | 50101 |
| 21 | Attenuator (10dB) | WEINSCHEL | 23-10-34 | 15/10/04 | BP4387 |
| 22 | HORN ANT | EMCO | 3115 | 22/02/04 | 6419 |
| 23 | HORN ANT | EMCO | 3115 | 01/10/04 | 21097 |
| 24 | HORN ANT | A.H.Systems | SAS-574 | 27/11/04 | 154 |
| 25 | HORN ANT | A.H.Systems | SAS-574 | 14/11/04 | 155 |
| 26 | Dipole Antenna | Schwarzbeck | VHA9103 | 04/10/04 | 2116 |

| | Type | Manufacturer | Model | Cal.Due.Date (dd/mm/yy) | S/N |
|---|---|---|---|---|---|
| 27 | Dipole Antenna | Schwarzbeck | VHA9103 | 04/10/04 | 2117 |
| 28 | Dipole Antenna | Schwarzbeck | UHA9105 | 04/10/04 | 2261 |
| 29 | Dipole Antenna | Schwarzbeck | UHA9105 | 04/10/04 | 2262 |
| 30 | RFI/FIELD Iintensity Meter | Kyorits | KNM-504D | 25/07/04 | SN-161-4 |
| 31 | Frequency Converter | Kyorits | KCV-604C | 05/07/04 | 4-230-3 |
| 32 | TEMP & HUMIDITY Chamber | JISCO | J-RHC2 | 14/09/04 | 021031 |
| 33 | Log Periodic Antenna | Schwarzbeck | UHALP9108A1 | 23/10/04 | 1098 |
| 34 | Biconical Antenna | Schwarzbeck | VHA9103 | 23/10/04 | VHA91031946 |
| 35 | Digital Multimeter | H.P | 34401A | 15/10/04 | 3146A13475 |
| 36 | Attenuator (10dB) | WEINSCHEL | 23-10-34 | 15/10/04 | BP4386 |
| 37 | High-Pass Filter | ANRITSU | MP526 | 12/05/04 | M27756 |
| 38 | Attenuator (3dB) | Agilent | 8491B | 15/10/04 | 58177 |
| 39 | Oscillo Scope | Tektronics | TDS644B | 18/11/04 | B010834 |

# APPENDIX II

## TEST PLOTS

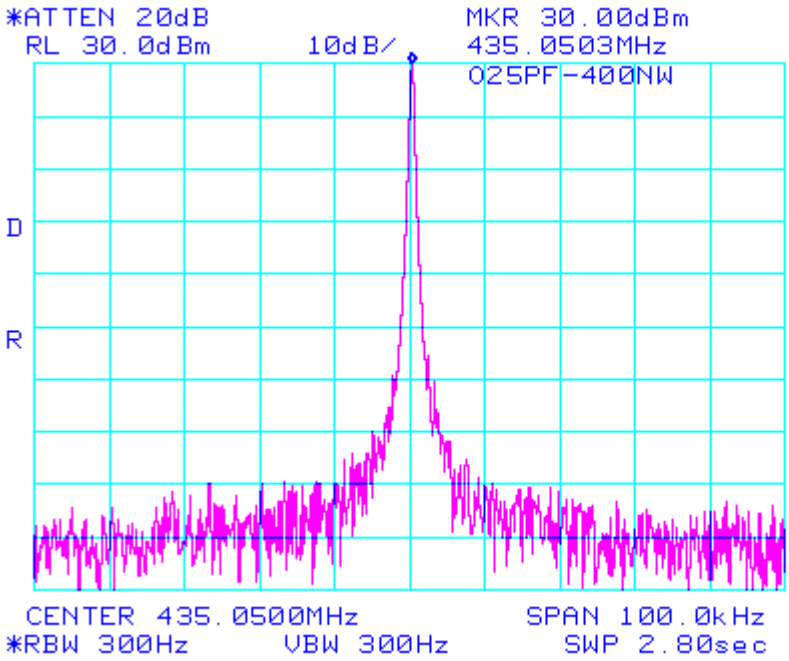
 

## Emission Masks **Measurement Data:**

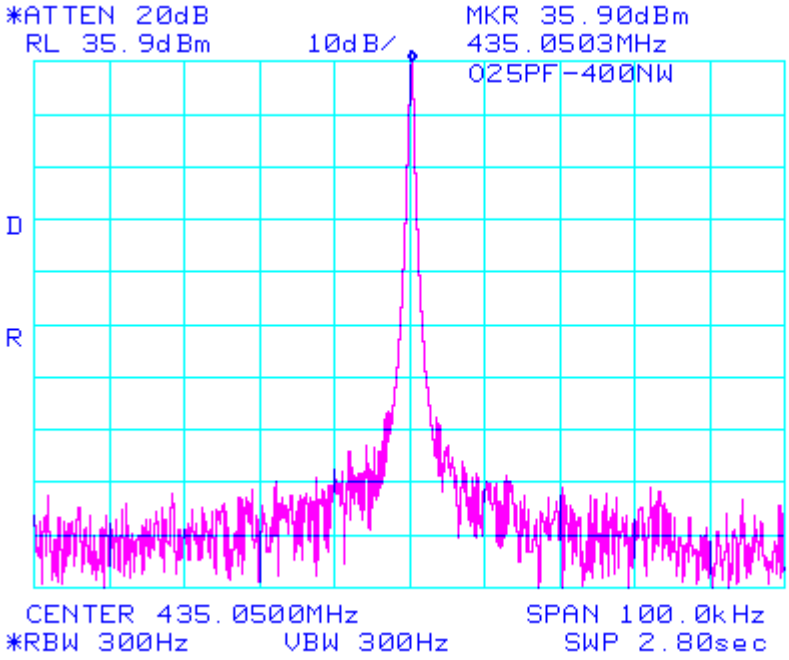
OPERATING FREQUENCY : 435.050 MHz

MODULATION : None

POWER : Low Power




POWER : High Power



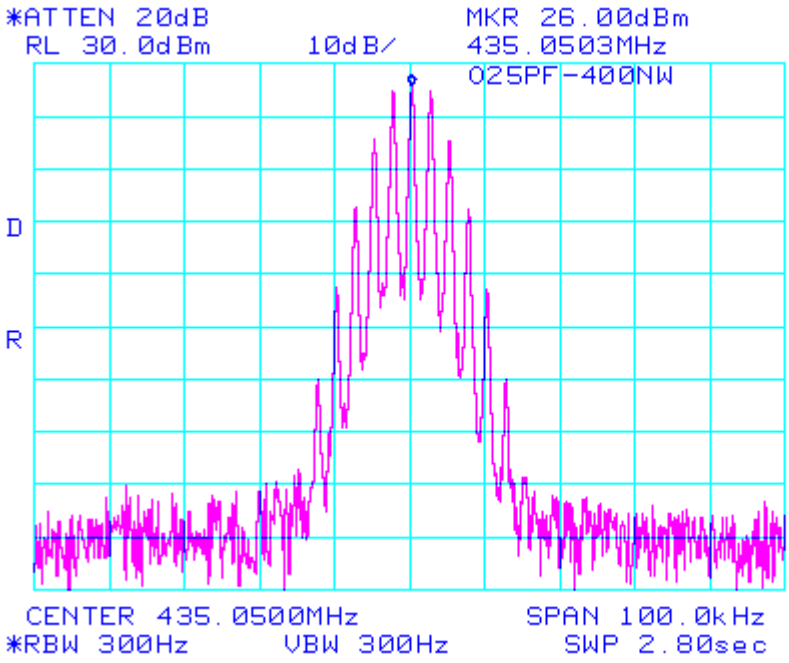

 

OPERATING FREQUENCY : 435.050 MHz

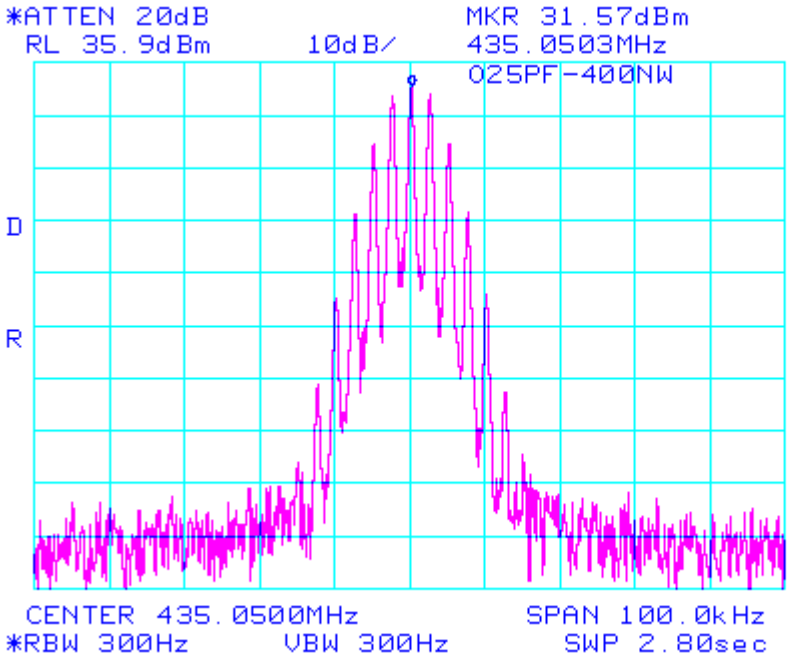
MODULATION : Voice: 2500 Hz, Sine Wave

MASK: B, VHF/UHF 25 kHz, w/LPF

POWER : Low Power




POWER : High Power



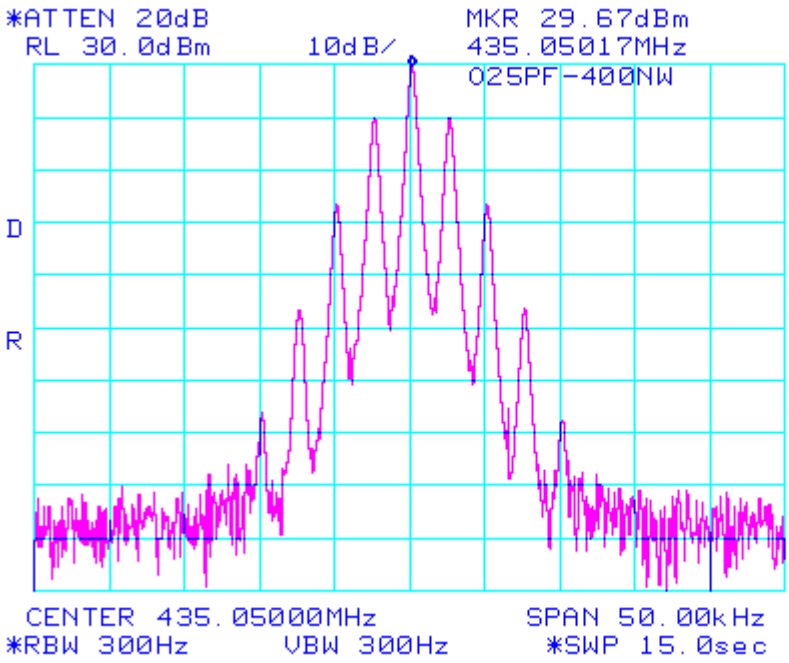

 

OPERATING FREQUENCY : 435.050 MHz

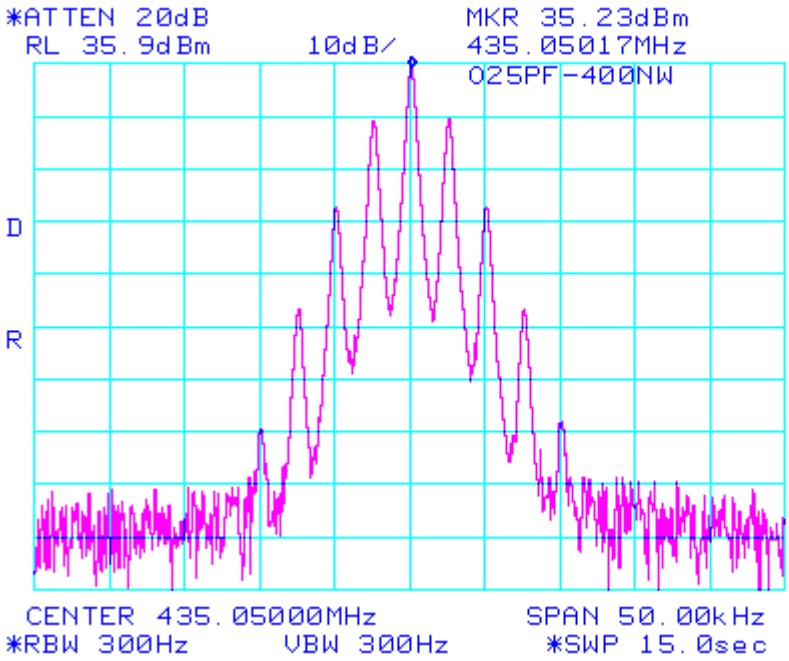
MODULATION : Voice: 2500 Hz, Sine Wave

MASK: D, VHF/UHF 12.5 kHz BW

POWER : Low Power



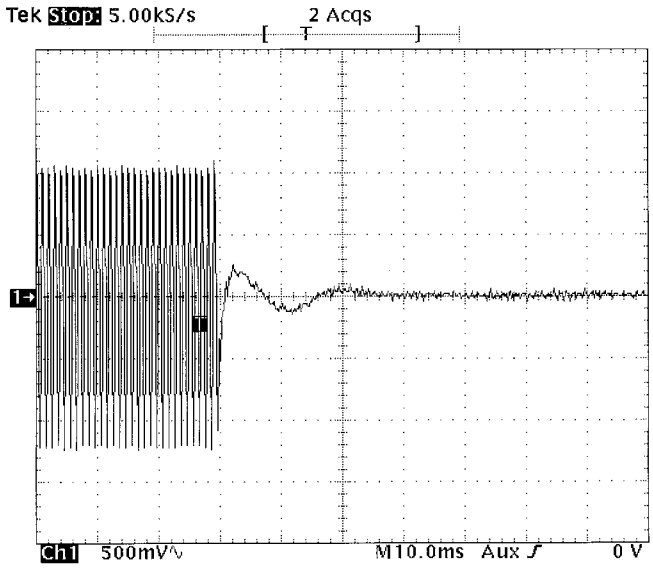

POWER : High Power

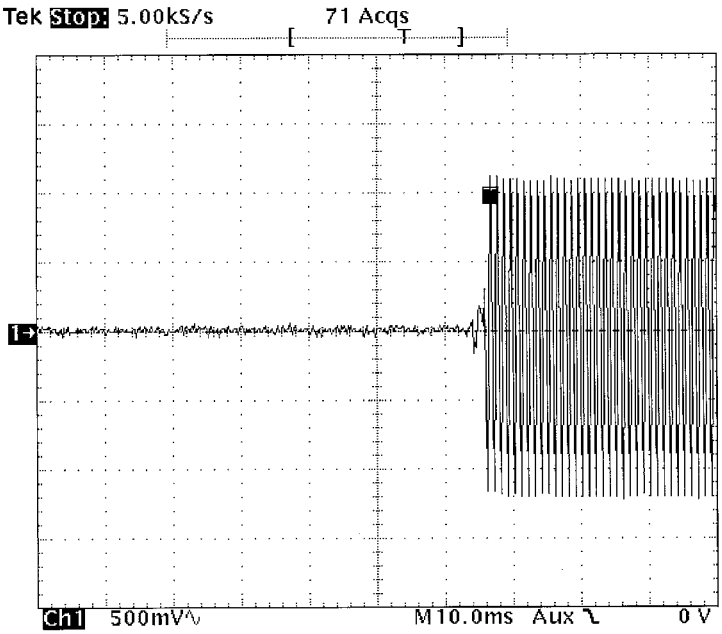


**Transient Frequency Behavior Measurement Data:**

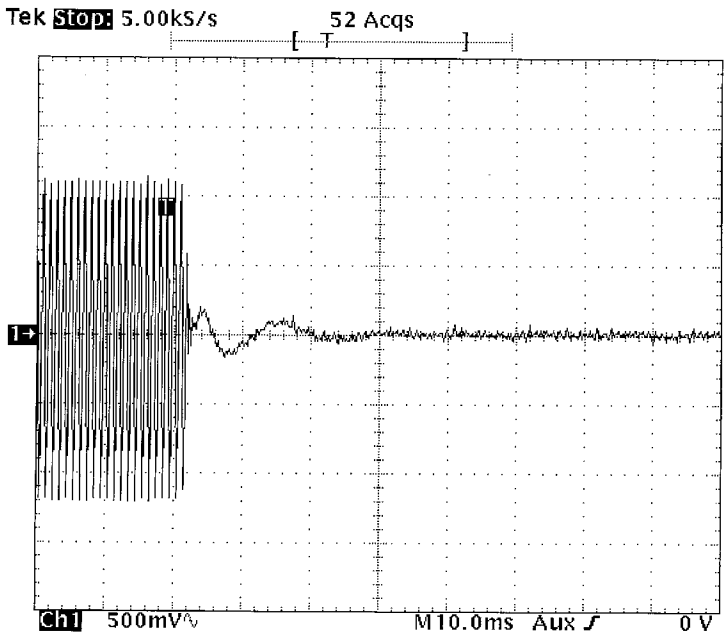
400.050 MHz Power Output Level = 4W 12.5 kHz Channel Spacing

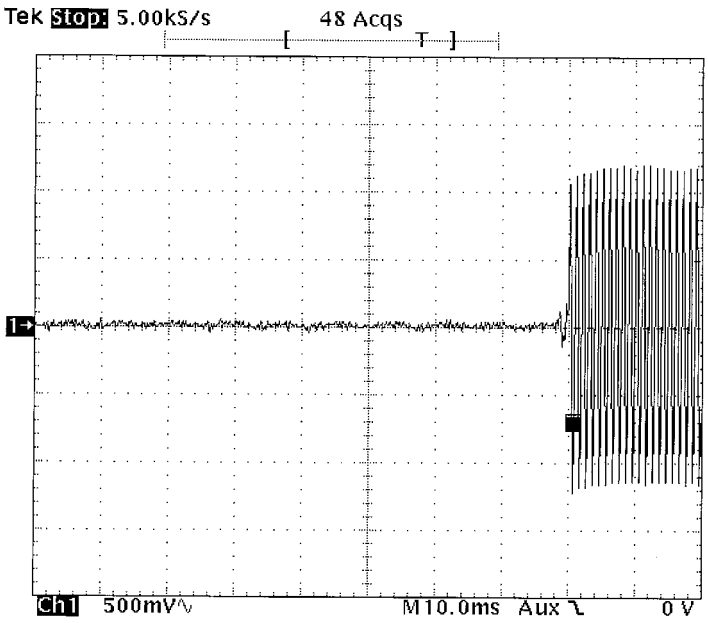


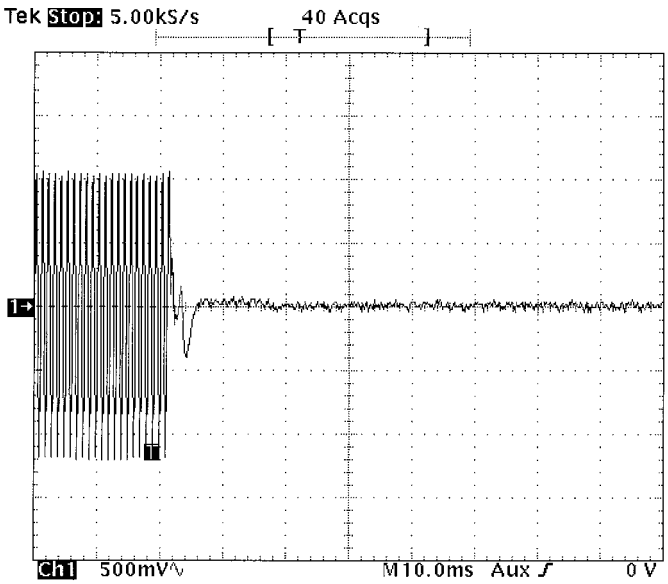
435.050 MHz Power Output Level = 4W 12.5 kHz Channel Spacing

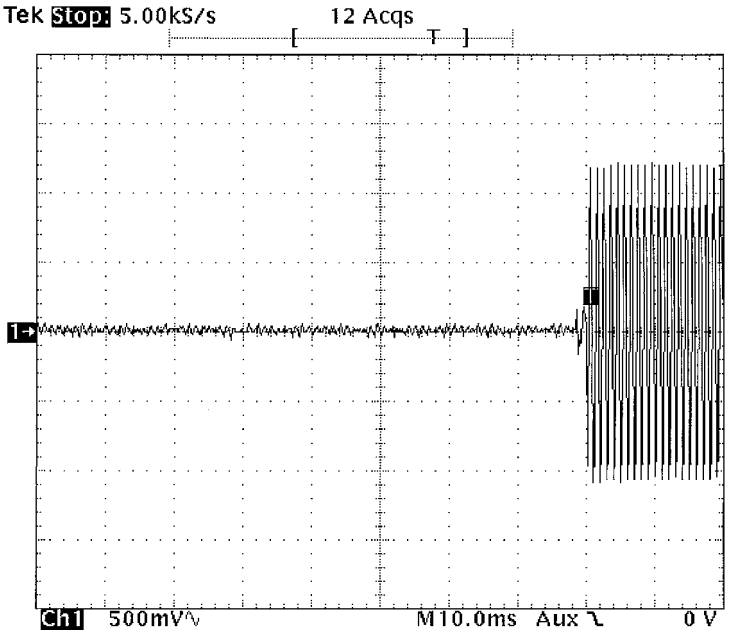


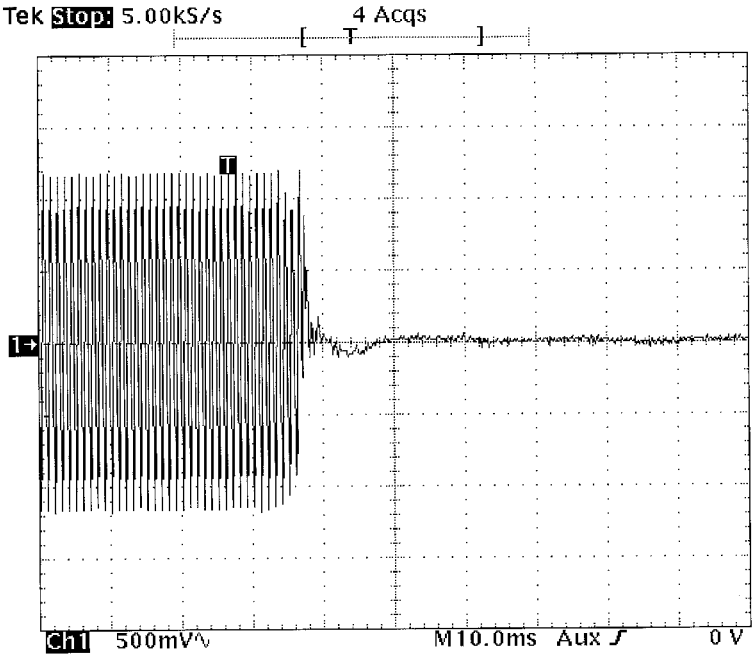

 

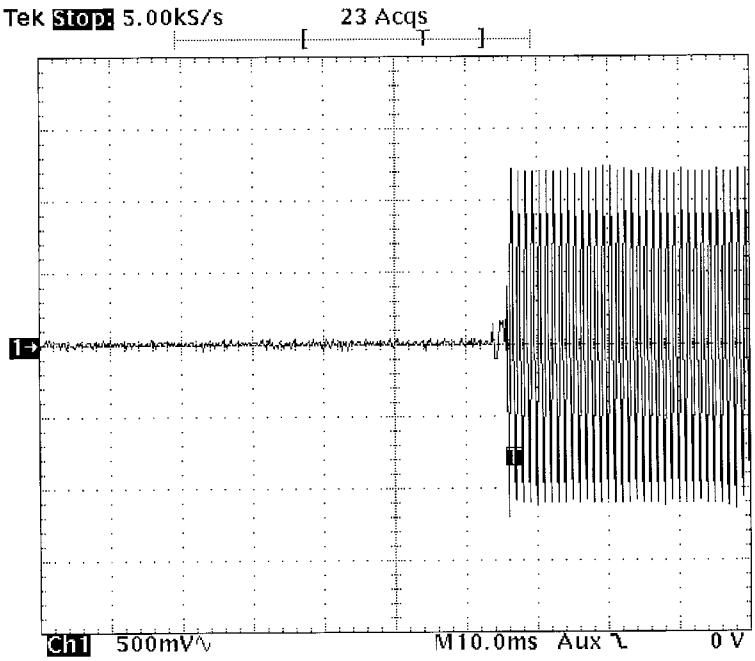
469.950 MHz  Power Output Level = 4W  12.5 kHz Channel Spacing



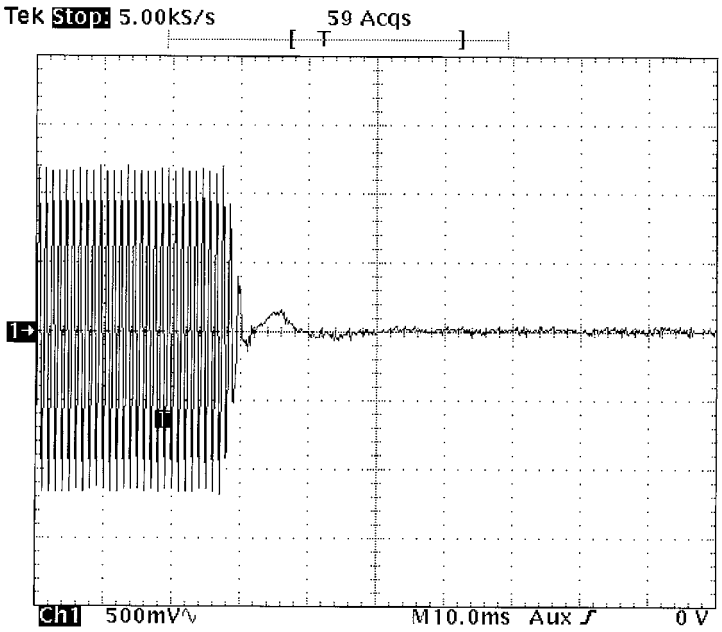



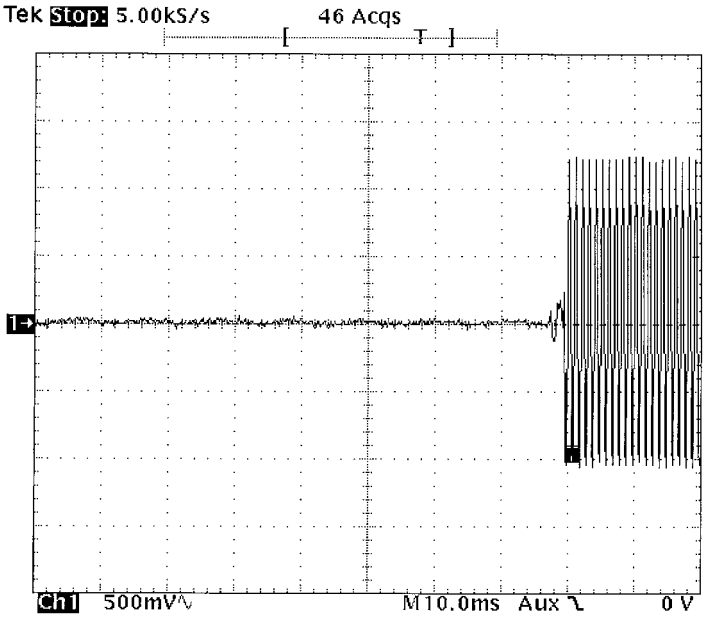
400.050 MHz  Power Output Level = 1W  12.5 kHz Channel Spacing



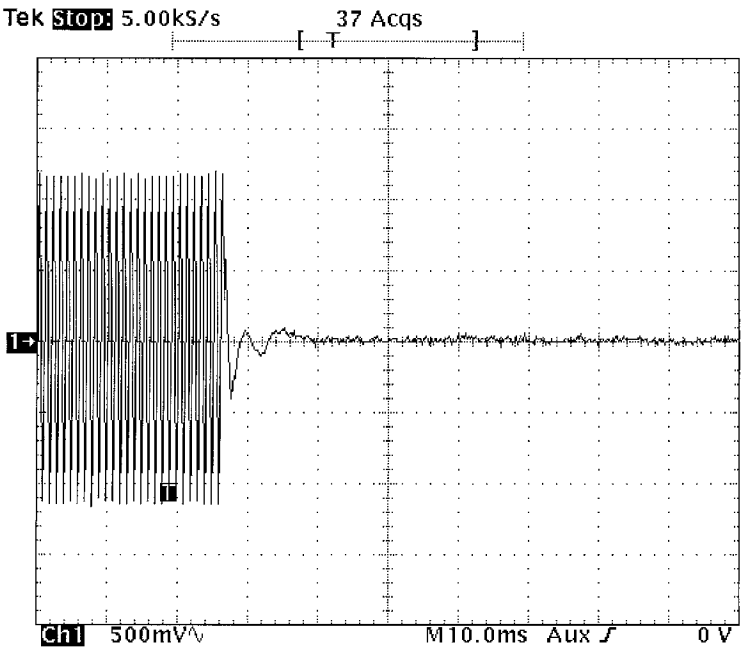



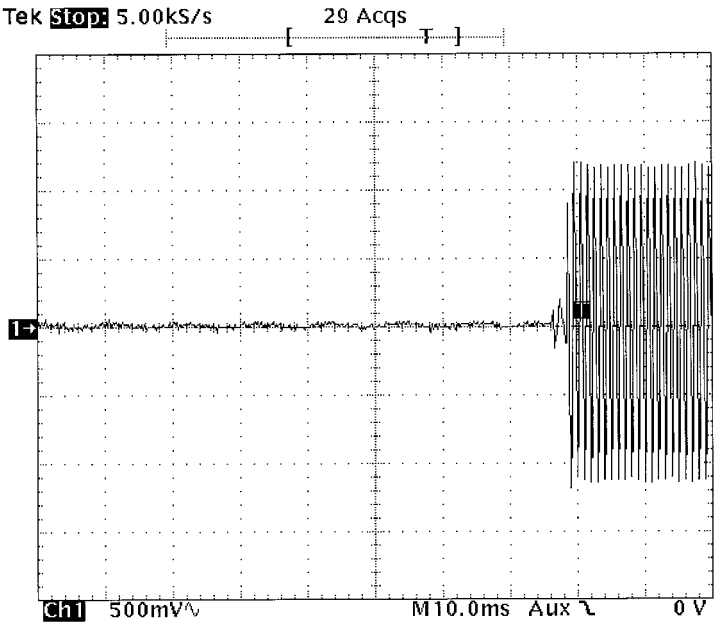
435.050 MHz Power Output Level = 1W 12.5 kHz Channel Spacing



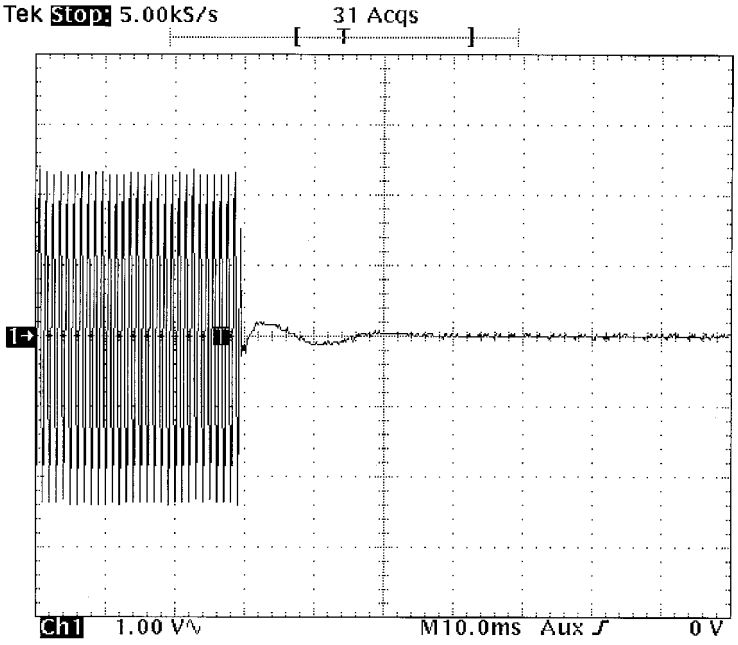
469.950 MHz Power Output Level = 1W 12.5 kHz Channel Spacing

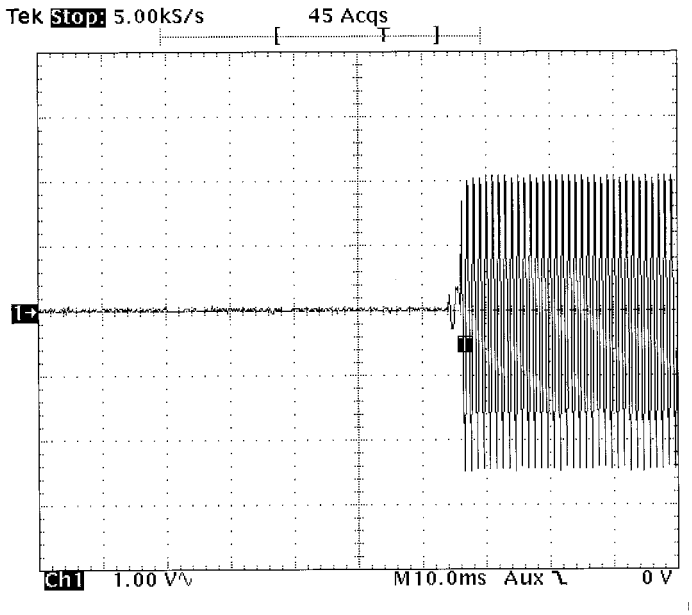


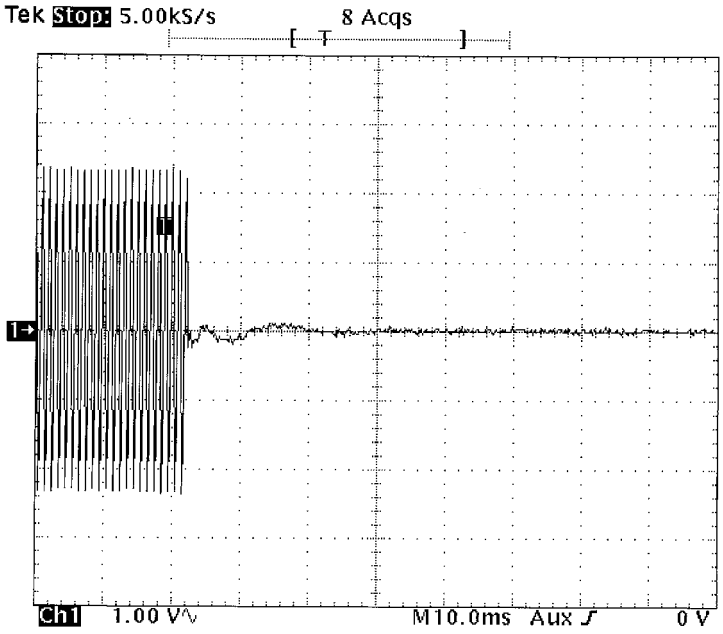

 

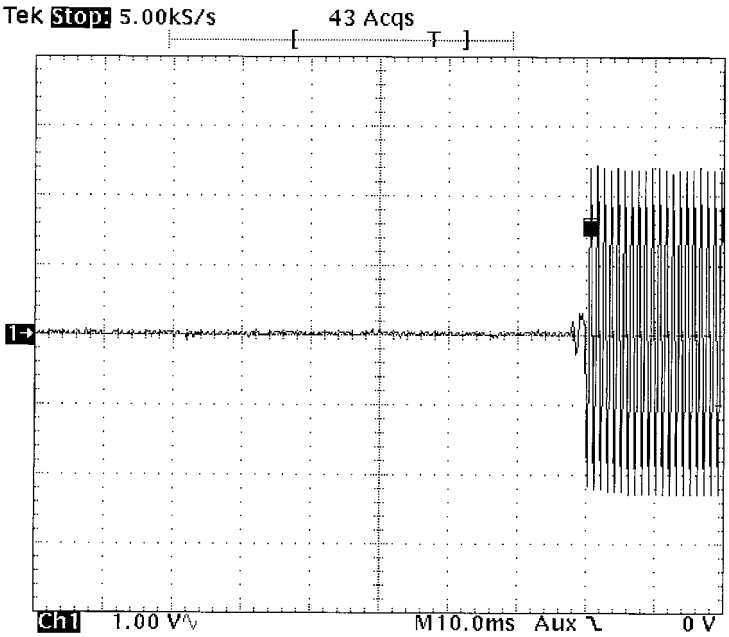
400.050 MHz  Power Output Level = 4W  25 kHz Channel Spacing



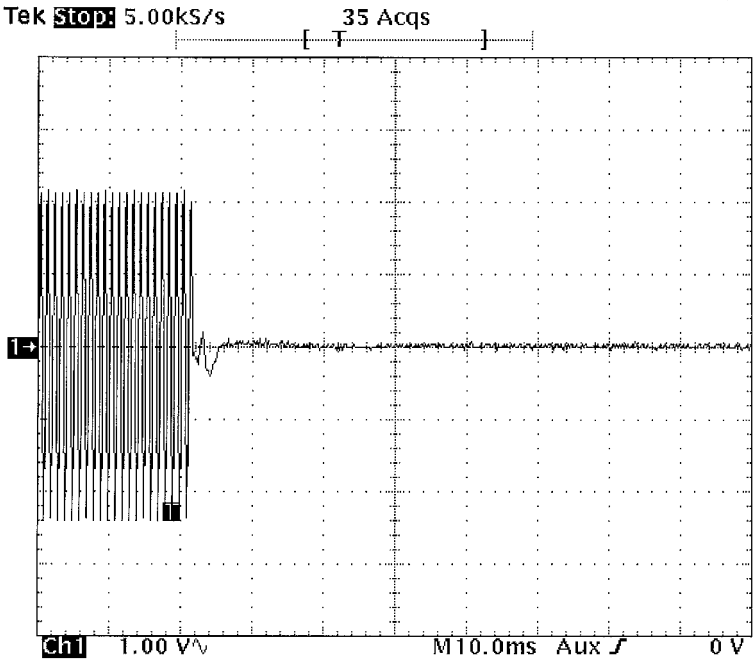



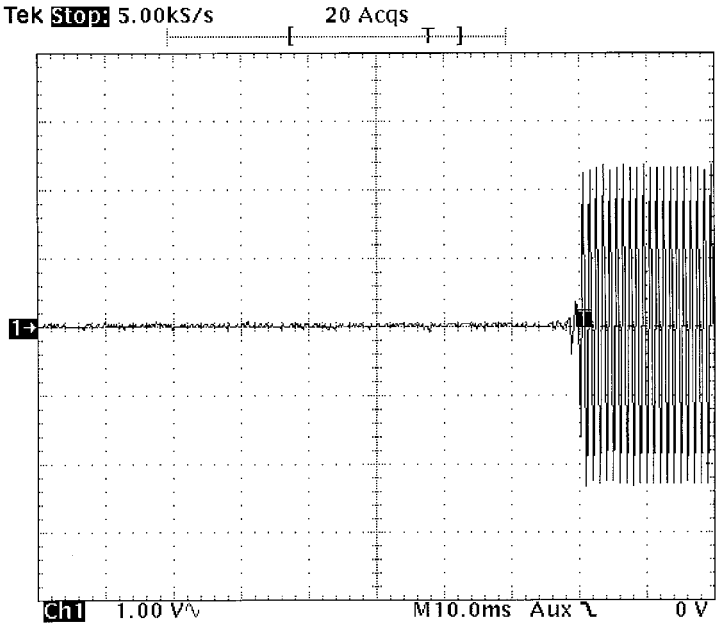
435.050 MHz  Power Output Level = 4W  25 kHz Channel Spacing



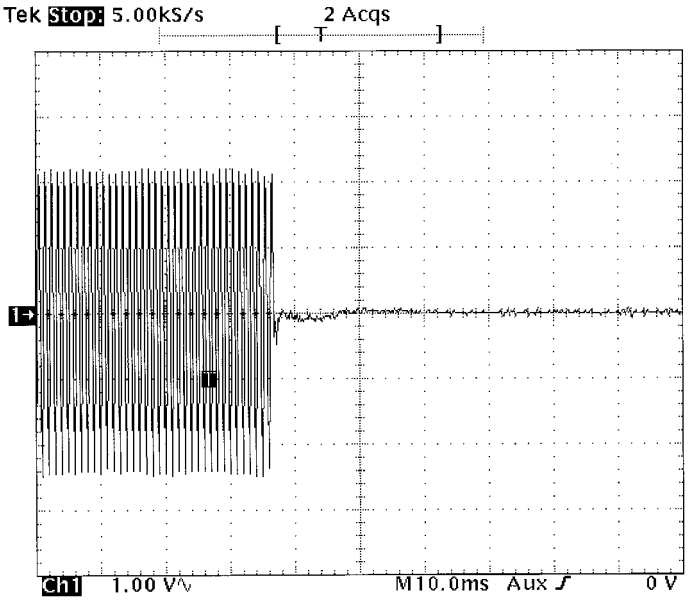



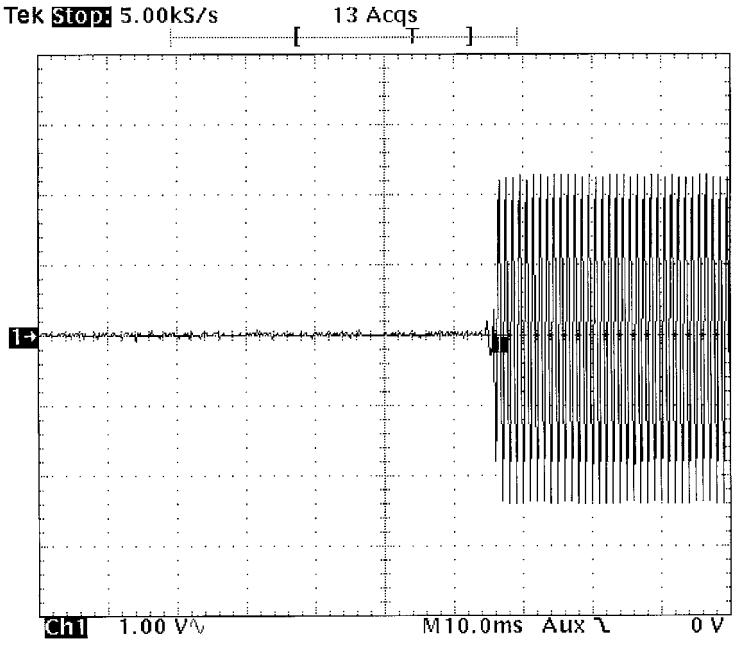
469.950 MHz Power Output Level = 4W 25 kHz Channel Spacing



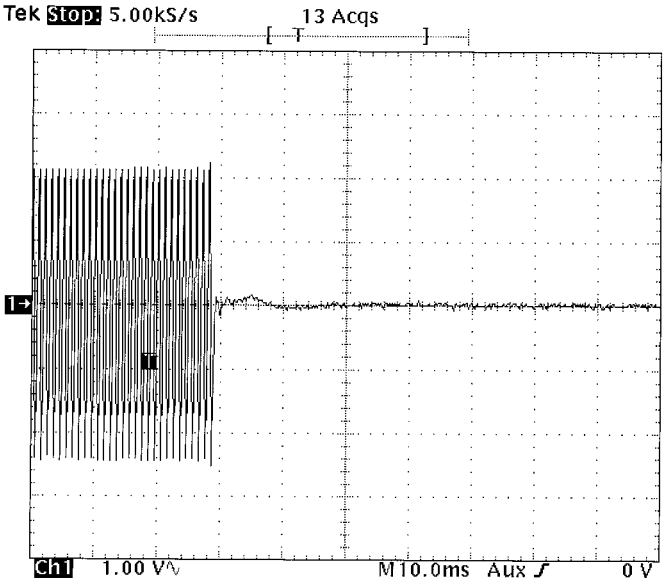



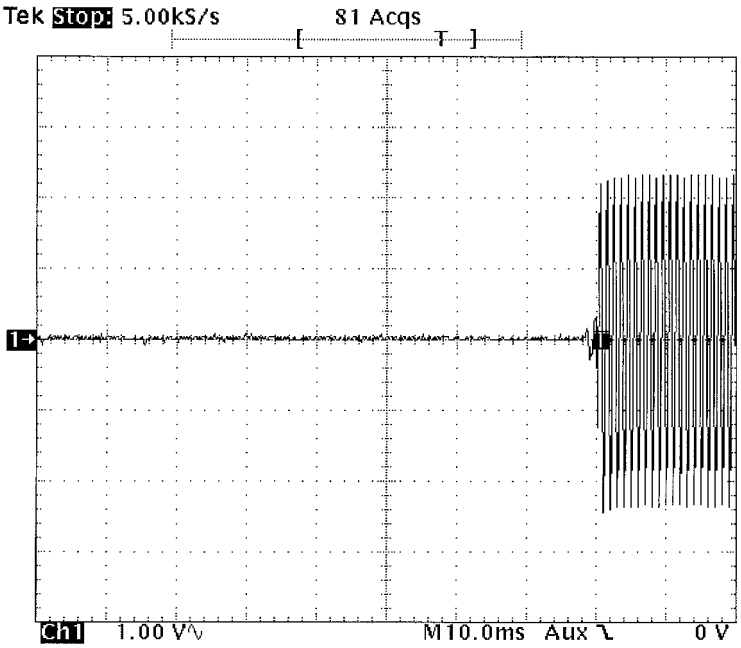
400.050 MHz Power Output Level = 1W 25 kHz Channel Spacing



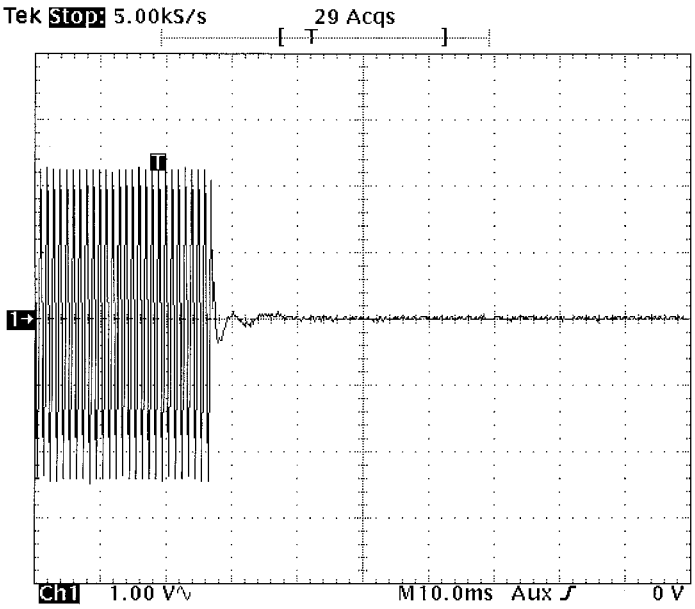



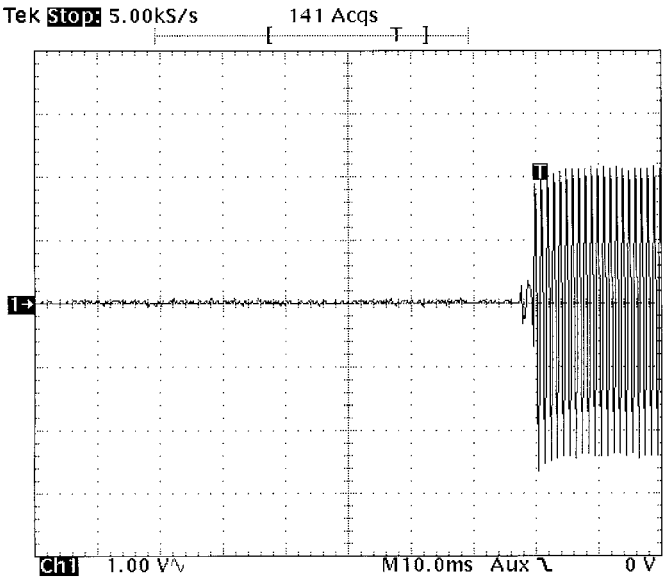
435.050 MHz Power Output Level = 1W 25 kHz Channel Spacing



469.950 MHz Power Output Level = 1W 25 kHz Channel Spacing



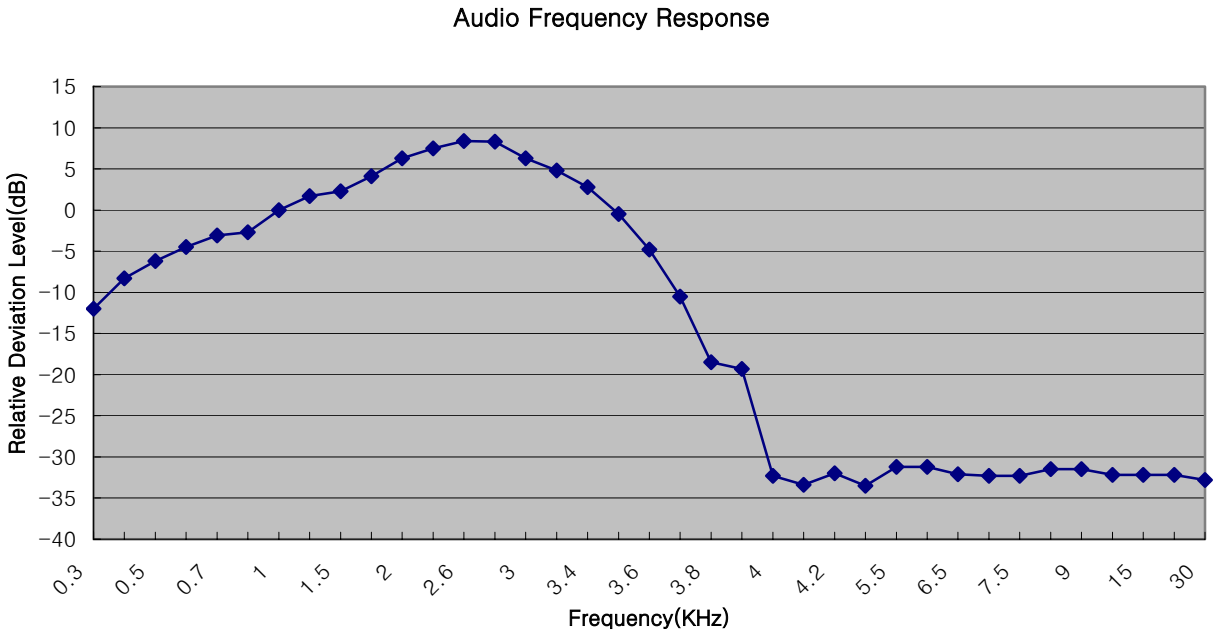



**Audio Frequency Response Measurement Data:**

OPERATING FREQUENCY : 435.050 MHz

REFERENCE LEVEL : 0dB @ 1kHz

| Audio Frequency Response | | | | | |
|---|---|---|---|---|---|
| **Freq., kHz** | **Level, dB** | **Freq., kHz** | **Level, dB** | **Freq., kHz** | **Level, dB** |
| **0.3** | -12 | **2.8** | 8.3 | **5.5** | -31.2 |
| **0.4** | -8.3 | **3.0** | 6.3 | **6.0** | -31.2 |
| **0.5** | -6.2 | **3.3** | 4.8 | **6.5** | -32.1 |
| **0.6** | -4.5 | **3.4** | 2.8 | **7.0** | -32.3 |
| **0.7** | -3.1 | **3.5** | -0.5 | **7.5** | -32.3 |
| **0.8** | -2.7 | **3.6** | -4.8 | **8.0** | -31.5 |
| **1.0** | 0 | **3.7** | -10.5 | **9.0** | -31.5 |
| **1.2** | 1.7 | **3.8** | -18.5 | **10.0** | -32.2 |
| **1.5** | 2.3 | **3.9** | -19.3 | **15.0** | -32.2 |
| **1.7** | 4.1 | **4.0** | -32.3 | **20.0** | -32.2 |
| **2.0** | 6.3 | **4.1** | -33.4 | **30.0** | -32.8 |
| **2.3** | 7.5 | **4.2** | -32 | | |
| **2.6** | 8.4 | **4.8** | -33.5 | | |



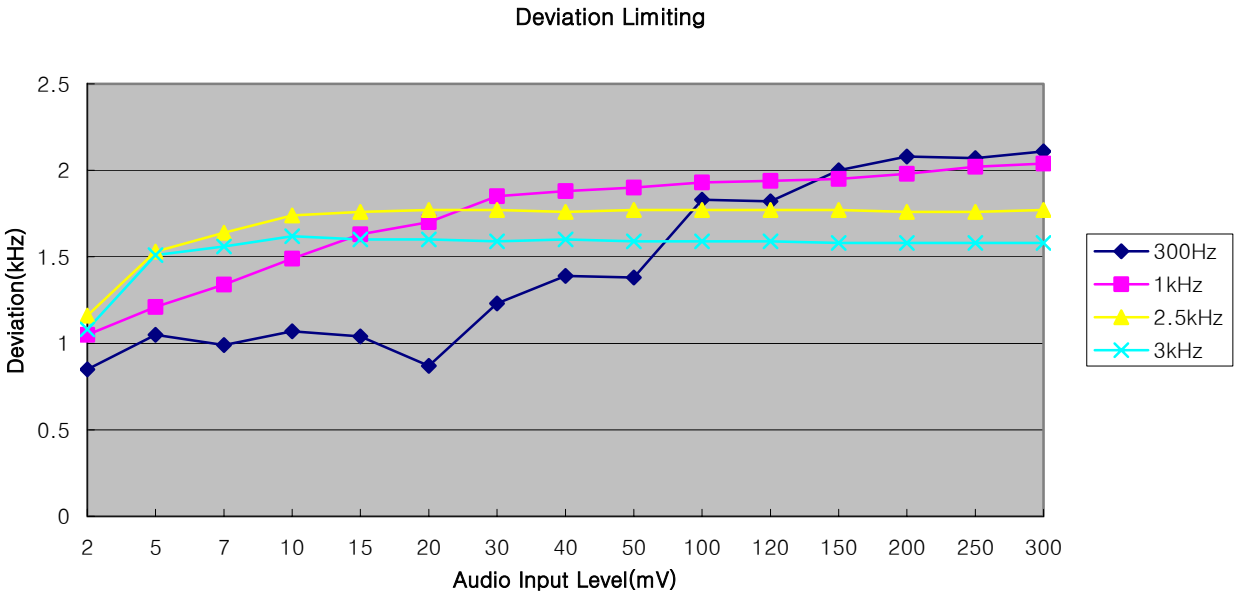

 

**Modulation Limiting Measurement Data:**

OPERATING FREQUENCY : 435.050 MHz

CHANNEL SPACING : 12.5 kHz

| Input Level (mV) | FM Deviation in kHz at Indicated Modulating Frequency | | | |
|---|---|---|---|---|
| | 300Hz | 1KHz | 2.5KHz | 3KHz |
| 2 | 0.85 | 1.05 | 1.16 | 1.08 |
| 5 | 1.05 | 1.21 | 1.53 | 1.51 |
| 7 | 0.99 | 1.34 | 1.64 | 1.56 |
| 10 | 1.07 | 1.49 | 1.74 | 1.62 |
| 15 | 1.04 | 1.63 | 1.76 | 1.60 |
| 20 | 0.87 | 1.70 | 1.77 | 1.60 |
| 30 | 1.23 | 1.85 | 1.77 | 1.59 |
| 40 | 1.39 | 1.88 | 1.76 | 1.60 |
| 50 | 1.38 | 1.90 | 1.77 | 1.59 |
| 100 | 1.83 | 1.93 | 1.77 | 1.59 |
| 120 | 1.82 | 1.94 | 1.77 | 1.59 |
| 150 | 2.00 | 1.95 | 1.77 | 1.58 |
| 200 | 2.08 | 1.98 | 1.76 | 1.58 |
| 250 | 2.07 | 2.02 | 1.76 | 1.58 |
| 300 | 2.11 | 2.04 | 1.77 | 1.58 |

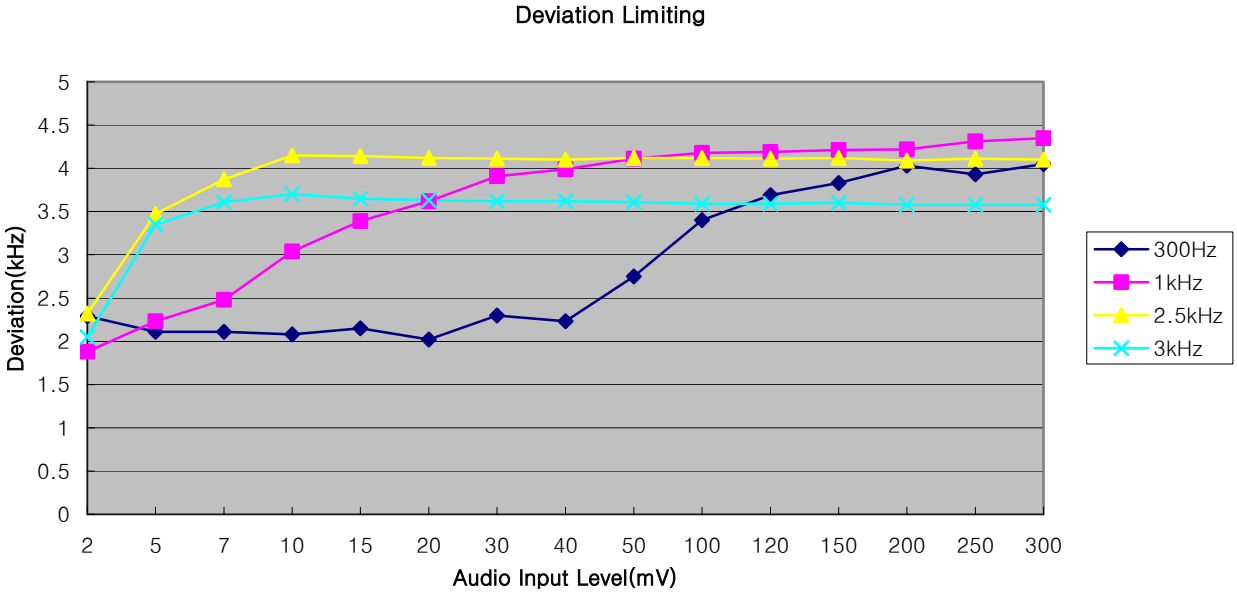


OPERATING FREQUENCY : 435.050 MHz

CHANNEL SPACING : 25.0 kHz

| Input Level (mV) | FM Deviation in kHz at Indicated Modulating Frequency | | | |
|---|---|---|---|---|
| | 300Hz | 1KHz | 2.5KHz | 3KHz |
| 2 | 2.29 | 1.88 | 2.32 | 2.05 |
| 5 | 2.11 | 2.23 | 3.47 | 3.35 |
| 7 | 2.11 | 2.48 | 3.87 | 3.61 |
| 10 | 2.08 | 3.04 | 4.15 | 3.70 |
| 15 | 2.15 | 3.39 | 4.14 | 3.65 |
| 20 | 2.02 | 3.62 | 4.12 | 3.63 |
| 30 | 2.30 | 3.91 | 4.11 | 3.62 |
| 40 | 2.23 | 3.99 | 4.10 | 3.62 |
| 50 | 2.75 | 4.11 | 4.12 | 3.61 |
| 100 | 3.40 | 4.18 | 4.12 | 3.59 |
| 120 | 3.69 | 4.19 | 4.11 | 3.59 |
| 150 | 3.83 | 4.21 | 4.12 | 3.60 |
| 200 | 4.03 | 4.22 | 4.09 | 3.58 |
| 250 | 3.93 | 4.31 | 4.11 | 3.58 |
| 300 | 4.05 | 4.35 | 4.10 | 3.58 |



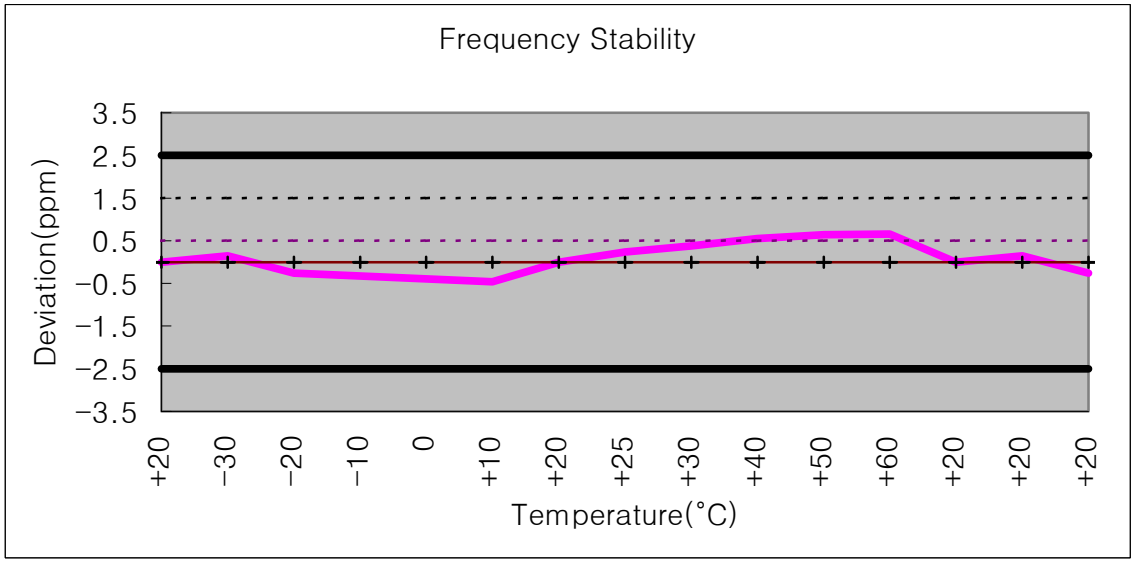
**Frequency Stability Measurement Data:**

OPERATING FREQUENCY :435.049938 MHz

REFERENCE VOLTAGE:7.5 VDC CHANNEL SPACING:12.5 kHz

DEVIATION LIMIT: ± 0.00025 % or 2.5ppm

| **VOLTAGE** (%) | **POWER** (VDC) | TEMP (dB) | **FREQ** (Hz) | **Deviation** (%) |
|---|---|---|---|---|
| 100% | 7.5 | +20(Ref) | 435,049,938 | 0.000000 |
| 100% | | -30 | 435,049,873 | 0.000029 |
| 100% | | -20 | 435,050,050 | -0.000011 |
| 100% | | -10 | 435,050,080 | -0.000018 |
| 100% | | 0 | 435,050,110 | -0.000025 |
| 100% | | +10 | 435,050,138 | -0.000032 |
| 100% | | +20 | 435049938 | 0.000000 |
| 100% | | +25 | 435,049,836 | 0.000038 |
| 100% | | +30 | 435,049,773 | 0.000052 |
| 100% | | +40 | 435,049,698 | 0.000069 |
| 100% | | +50 | 435,049,660 | 0.000078 |
| 100% | | +60 | 435,049,654 | 0.000065 |
| 85% | 6.38 | +20 | 435,049,938 | 0.000000 |
| 115% | 8.63 | +20 | 435,049,873 | 0.000015 |
| BATT.ENDPOINT | 5.85 | +20 | 435,050,050 | -0.000026 |



OPERATING FREQUENCY : 435.049943 MHz

REFERENCE VOLTAGE: 7.5 VDC CHANNEL SPACING: 25.0 kHz

DEVIATION LIMIT: ± 0.00025 % or 2.5ppm

| **VOLTAGE** (%) | **POWER** (VDC) | TEMP (dB) | **FREQ** (Hz) | **Deviation** (%) |
|---|---|---|---|---|
| 100% | 7.5 | +20(Ref) | 435,049,943 | 0.000000 |
| 100% | | -30 | 435,049,908 | 0.000008 |
| 100% | | -20 | 435,050,055 | -0.000026 |
| 100% | | -10 | 435,050,100 | -0.000036 |
| 100% | | 0 | 435,050,130 | -0.000043 |
| 100% | | +10 | 435,050,148 | -0.000047 |
| 100% | | +20 | 435,049,943 | 0.000000 |
| 100% | | +25 | 435,049,912 | 0.000007 |
| 100% | | +30 | 435,049,748 | 0.000045 |
| 100% | | +40 | 435,049,663 | 0.000064 |
| 100% | | +50 | 435,049,668 | 0.000063 |
| 100% | | +60 | 435,049,672 | 0.000062 |
| 85% | 6.38 | +20 | 435,049,915 | 0.000006 |
| 115% | 8.63 | +20 | 435,049,915 | 0.000006 |
| BATT.ENDPOINT | 5.85 | +20 | 435,049,913 | 0.000007 |