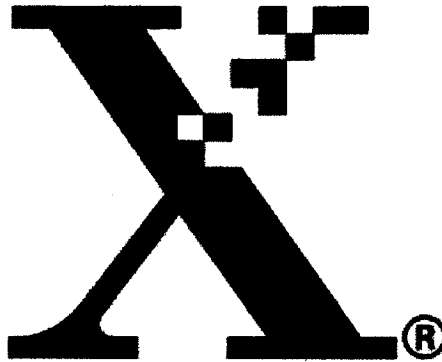


# The Document Company

## Xerox



## EMC Test Group

### Summary of Test Report

Manufacturer: Opticom Inc

Model: Clay Delay VSTW

Serial Number: 0702001

Description: Low Power Transmitter

Frequency Range: 418MHz

The Clay Delay transmitter device was found to MEET the radiated emissions specifications of Title 47 CFR FCC, Part 15, subpart C, for an intentional radiator.



Accreditation Certificate Number: 1248-01  
Electrical (EMC) Testing

This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with the laboratory's terms of accreditation unless stated otherwise in the report. The client is hereby notified that products, materials or other items in this report are in no way approved or endorsed by A2LA unless A2LA explicitly permits such endorsement or approval.

**EMC Test Report Number: PCC020013**

**Type of Report:** Electromagnetic Emissions Compliance Test Report  
**Product:** Clay Delay

**Abstract:** The following test report documents the testing completed on a Clay Delay as supplied by the client. The EUT was found to conform with the Federal Communications Commission regulatory limits as specified in CFR 47 Part 15 Subpart C, section 231. FCC is an acronym for "Federal Communications Commission. The FCC acronym is used throughout the document in lieu of the CFR 47 Part 15 Subpart C terminology.

|                    |                                                                                                                                                       |                |                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------|
| <b>Laboratory:</b> | Xerox Corporation<br>EMC Test Group<br>800 Salt Road Building 843<br>Mail Stop 843-16S<br>Webster, NY 14580<br>(585) 422-4120<br>(585) 422-6449 (fax) | <b>Client:</b> | Frank Santucci<br>Opticom<br>2077 Lakeville Rd.<br>Avon, NY 14414<br>(585) 226-3440<br>(585) 226-3610 (fax) |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------|

**Notice to Client:** This report shall not be reproduced, except in full, without the written approval of the EMC Test Group. The client is hereby notified that the results of this report relate only to the item(s) tested. The client is responsible for ensuring that the appropriate information relating to the configuration of the product tested is documented and retained for future reference in accordance with CFR 47 Parts 2 & 15. The client is also responsible for ensuring the product is properly labeled and the customer documentation has the appropriate statements as noted in CFR 47 Parts 2 and 15.

By signing below, the client certifies that the report distribution and product configuration documented in this test report is correct and that any modifications to the product noted in Section 2.6 shall be incorporated into all production units of the equipment for which this test report has been written.

**Client:** Frank C. Santucci **Date:** 08/06/02  
Frank Santucci, President/CEO  
Opticom

**Prepared By:** David H. Spencer **Date:** 08/06/02  
David Spencer, NCT EMC Technician  
CSS / EH&S / EMC Test Group

**Approved By:** Gary E. Myers **Date:** 08/06/02  
Gary E. Myers, Manager  
CSS / EH&S / EMC Group

**Distribution:** Frank Santucci  
Gary Myers  
David Spencer

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# 1 GENERAL INFORMATION

## 1.1 Product Description

The Clay Delay is a transmitter / receiver pair, that when connected to an electric target machine, will allow remote release of a target used in skeet or trap practice.

The following table reflects the EUT's RF components:

| PWBA/Component    | PART IDENTIFIER | FREQUENCY | DESCRIPTION                       |
|-------------------|-----------------|-----------|-----------------------------------|
| Transmitter board | TXE-418-KH      | 418Mhz    | Linx transmitter                  |
| Antenna           | ANT-418-PW-RA   | N/A       | Permanently attached Linx antenna |

## 1.2 Tested System Details

| Model Number<br>(Serial Number)                       | Description                    | Cable Description                                         |
|-------------------------------------------------------|--------------------------------|-----------------------------------------------------------|
| Clay Delay Transmitter<br>Model VSTW<br>(0702001)     | Voice Activated RF Transmitter | Microphone 2M unshielded cable<br>attached to phone jack. |
| Computer For Sure<br>ACM-15597842<br>(Not Serialized) | Microphone                     | Connected to Clay Delay<br>Transmitter via 2m cable       |

### ***1.3 Test Methodology / Reference Standards***

Radiated emissions testing was performed according to the procedures in ANSI C63.4-1992. Radiated testing was performed at an antenna to EUT distance of 3 meters.

The EUT was tested to the requirements specified in CFR 47 Part 15, Subpart C, Sections 15.209, and 15.231(b) and (c) for:

Radiated emissions (frequency range of 30 MHz to 4180 MHz)

Conducted emissions testing was not performed because the EUT operates from its own internal 9V battery rather than a power cord.

### **Applicable Documents**

- (a) Federal Communications Commission Rules and Regulations CFR 47, Subpart C, Section 15.231.
- (b) ANSI C63.4-1992, "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 KHz to 40 Ghz".

### ***1.4 Test Facility***

The EMC Group main offices are located at Xerox Corporation's building 843, 800 Salt Road, Webster, NY 14580. The Semi-Anechoic chamber test site, building 199, located in Webster, NY was used to collect the data. This facility has been fully described in a report submitted to the FCC and accepted in a letter dated February 7, 2001 (Registration number: 91070) for both FCC Part 15 & 18 testing.

The facility and personnel are also A2LA accredited per ISO 17025 for FCC Part 15 testing (accreditation # 1248-01).

### ***1.3 Test Methodology / Reference Standards***

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### ***2.3 Video Mode Justification***

Not Applicable

### ***2.4 EUT Exercise Software***

Not Applicable

### ***2.5 Special Accessories***

Not Applicable

### ***2.6 Equipment Modifications***

Attenuation of ~25dB was installed at the output of the Linx transmitter IC package as follows:

From output of transmitter     $51\Omega$   
Bias to ground                 $8\Omega$   
From bias / output to antenna  $51\Omega$

### 3 RADIATED EMISSION DATA

#### Test Personnel:

Tester Signature

Date of Testing: 08/05/02

David H. Spencer, NCT EMC Technician

CSS / EH&amp;S / Product Competency Center / EMC Test Group

#### 3.1 Test Procedure

The fundamental and spurious (harmonic) emissions of the transmitter were tested for compliance to Title 47CFR, FCC Part 15.231b limits for periodic devices. For the calculations used to determine the limits applicable for the test sample (at their respective operating frequencies) refer to section 3.8. These limits are expressed in decibels (dB) above 1 microvolt per meter ( $\mu\text{V/m}$ ). The sample was tested from the lowest frequency generated by the transmitter (without going below 9KHz) to the 10<sup>th</sup> harmonic of the fundamental frequency generated by the device. The appropriate limits were also observed when the fundamental or spurious signals were located within any of the restricted bands described in Part 15.205a. The sample was placed on a nonconductive (wooden) pedestal in the 10 meter chamber and the antenna mast was placed such that the antenna was 3 m from the object. A biconical antenna was used to measure emissions from 30 to 200MHz, a log periodic antenna was used to measure emissions from 200 to 1000MHz, and double ridged waveguide horn was used to measure emissions above 1GHz. The test object was configured to continuously transmit, and the resultant signals were maximized by rotating the turntable 360 degrees, and by raising and lowering the antenna between 1 and 4 meters. The test object was also given several different orientations to determine the maximum signal levels, using both horizontal and vertical antenna polarities.

No significant emissions were found aside from the transmitter fundamental and several harmonics. The unit was scanned for emissions while in continuous transmit, over the range 30-4180MHz to establish compliance with 15.209 and 15.231.

The following data lists the significant emission frequencies, antenna polarity, corrected reading (includes measured reading, cable correction factor, attenuator factor, preamplifier factor and antenna correction factor) and the legal limit. Explanation of the Corrected Reading is given in paragraph 3.7.

#### 3.2 Measured Data

| Freq [MHz] | Antenna Height [Meters] | Antenna Polarity [V/H] | EUT Angle [Degrees] | * Corrected Reading [dB( $\mu\text{V/m}$ )] | Part 15 Limits [dB( $\mu\text{V/m}$ )] |
|------------|-------------------------|------------------------|---------------------|---------------------------------------------|----------------------------------------|
| 35.60      | 1                       | V                      | 175                 | 23.5                                        | 40.0                                   |
| 418.00     | 2.2                     | H                      | 0                   | 77.5***/86.0**                              | 80.3/100.3                             |
| 836.00     | 1.9                     | H                      | 178                 | 29.7***/42.5**                              | 60.3/80.3                              |
| 1254.00    | 2.7                     | H                      | 14                  | 37.5***/46.1**                              | 60.3/80.3                              |
| 1672.00    | 1                       | H                      | 0                   | 29.4***/34.7**                              | 54.0/74.0                              |
| 2090.00    | 2.1                     | H                      | 350                 | 33.2***/40.6**                              | 60.3/80.3                              |
| 2926.00    | 1.7                     | H                      | 347                 | 24.7***/38.2**                              | 60.3/80.3                              |

\* All readings are quasi-peak, using a 120 KHz resolution bandwidth, unless stated otherwise.

\*\* Identifies a peak reading, using a 1 MHz resolution bandwidth.

\*\*\* Identifies an average reading, using a 1 MHz resolution bandwidth.

### 3.3 Measurement Uncertainty

Associated with data in this report is a  $\pm 2.75$  dB measurement uncertainty for radiated emissions.

### 3.4 Occupied Bandwidth Measurements

The occupied bandwidth of the transmitter was measured. In accordance with FCC part 15.231c, the 20dB bandwidth of the transmitted signal should be within a window of 0.25% of the center carrier frequency. The resolution bandwidth was set either to 120KHz or the closest available filter setting on the R&S ESIA40 EMI system that corresponded to 5% of the allowable bandwidth, without going below the resolution bandwidth of 10KHz, as dictated in ANSI C63.4-1992 section 13.1.7.

The sample was activated to transmit in a continuous mode and was placed on a pedestal within the 10 meter semi-anechoic chamber. The transmitted signal was received on a log periodic antenna and fed into the R&S ESIA40 EMI system, where the fundamental frequency was displayed, and a plot of the occupied bandwidth was produced. This plot is included in Section 4, figure 3.

From the data supplied; and an indicated -20dBc bandwidth of 340Khz at worst case, it can be seen that the test sample does meet the bandwidth requirement specified by FCC Part 15.231c.

| <b>Fundamental Frequency [MHz]</b> | <b>Measured Occupied Bandwidth (-20dB to -20dB points)[MHz]</b> | <b>Allowable Occupied Bandwidth [MHz]</b> |
|------------------------------------|-----------------------------------------------------------------|-------------------------------------------|
| 418.00                             | 0.340                                                           | 1.045                                     |

### 3.5 Five Second Maximum Transmit Time

The Clay Delay was tested to ensure that the unit met the five second maximum transmit time requirement specified in FCC 15.231a. The Clay Delay transmitter was shown to meet this requirement, with a measured transmit time of 580mSec. See attachment in section 4, figure 4

**3.6 Test Instruments Used, Radiated Measurements**

| Type                                   | EMC Group Barcode | Manufacturer / Model Number | Serial Number | Last Cal Date (M/D/Y) | Cal Interval |
|----------------------------------------|-------------------|-----------------------------|---------------|-----------------------|--------------|
| EME Receiver                           | 24086             | Rohde & Schwarz / ESI40     | 100090        | 01/16/2002            | 1 Year       |
| RF Preamplifier                        | 34471             | Hewlett Packard / 8447D     | 1937A03331    | 04/11/2002            | 1 Year       |
| RF 6dB Attenuator                      | 30833             | Hewlett Packard / 8491A     | 34366         | 04/09/2002            | 1 Year       |
| Biconical Antenna                      | 38024             | EMCO / 3109                 | 9304-2717     | 08/06/2001            | 1 Year       |
| Log Periodic Antenna                   | 25009             | EMCO / 3146                 | 1832          | 04/12/2002            | 1 Year       |
| Double Ridged Waveguide Horn           | 24082             | EMCO 3115                   | 6707          | 12/10/2001            | 1 Year       |
| RF Preamplifier                        | 24086             | Rohde & Schwarz TS-ANA 4    | 22002/001     | 01/16/2002            | 1 Year       |
| Temperature & Relative Humidity Sensor | 101224            | Omega / CT485               | 412000738W1   | 11/07/2001            | 1 Year       |

This equipment complies with the requirements of ANSI C63.4-1992.

### 3.7 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, Attenuator Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows.

$$FS = RA + AF + CF + ATF - AG$$

where FS = Field Strength  
 RA = Receiver Amplitude  
 AF = Antenna Factor  
 CF = Cable Attenuation Factor  
 ATF = Attenuator Factor  
 AG = Amplifier Gain

Assume a receiver reading of 52.5 dB $\mu$ V/m is obtained. The Antenna Factor of 6.4 dB, a Cable Factor of 1.1 dB and an Attenuator Factor of 1 dB is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dB $\mu$ V/m.

$$FS = 52.5 + 6.4 + 1.1 + 1 - 29 = 32 \text{ dB}\mu\text{V/m}$$

The 32 dB $\mu$ V/m value can be mathematically converted to its corresponding level in  $\mu$ V/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm} [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

### 3.8 Calculation of Radiated Emissions Limits for FCC Part 15.231(b) (260-470MHz)

#### Field Strength of Fundamental Frequency

The calculation involves a linear interpolation of 3750 to 12500 $\mu$ V/m over 260-470MHz, where field strength of the fundamental frequency ( $f_0$ ) when,  $260 < f_0 < 470$ , can be found by:

$$3750.0 + 41.667(f_0 - 260), \text{ where } f_0 \text{ is in MHz.}$$

#### Field Strength of Spurious Harmonic Frequencies

The calculation involves a linear interpolation of 375-1250 $\mu$ V/m over 260-470MHz, where field strength of the harmonic frequencies ( $2f_0, 3f_0$ ), when  $260 < f_0 < 470$ MHz, can be found by:

$$375.0 + 4.1667(f_0 - 260), \text{ where } f_0 \text{ is in MHz.}$$

Where  $f_0 = 418$ MHz:

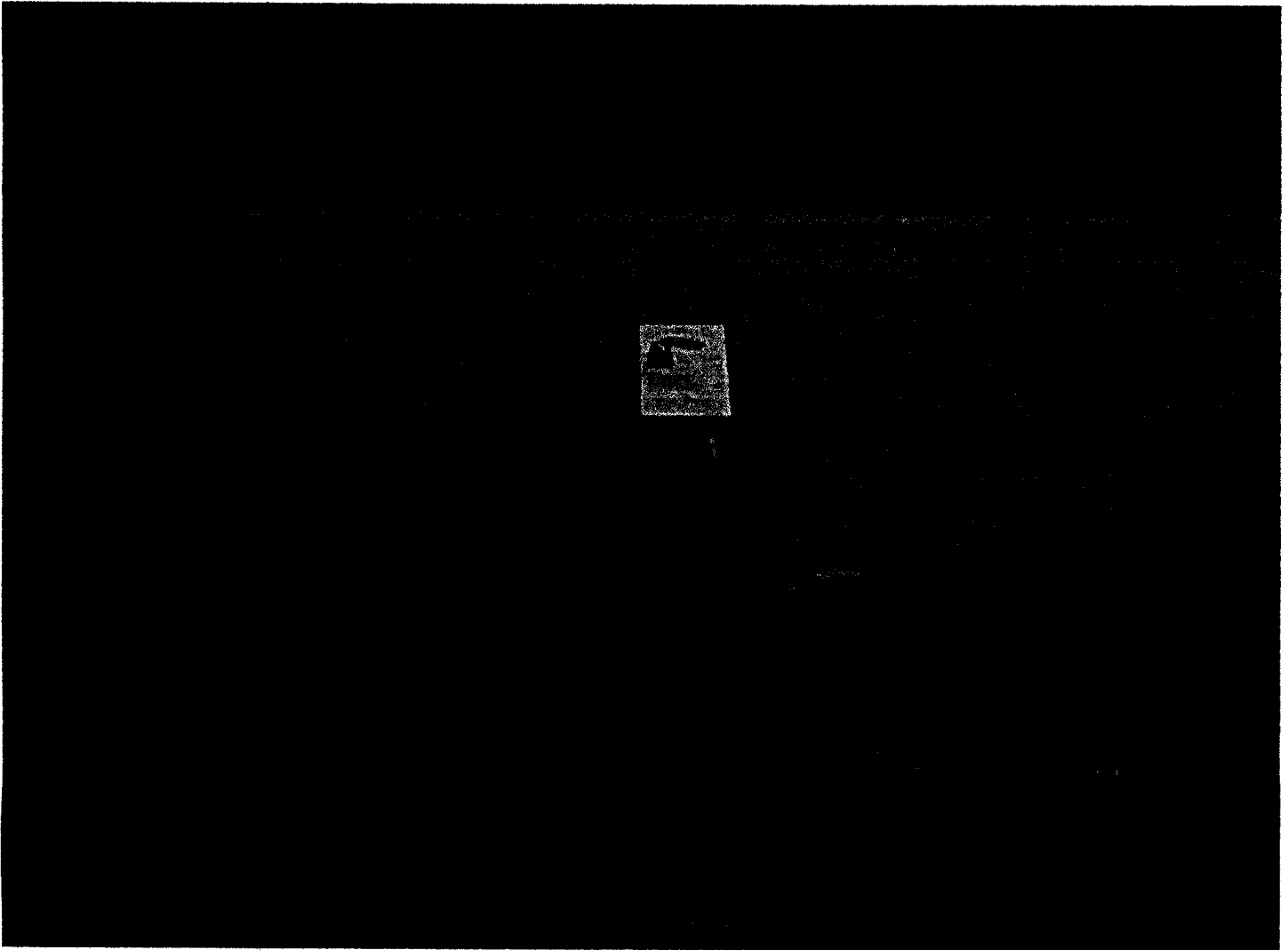
$$\text{Fundamental: } 3750 + 41.667(418 - 260) = 10333.386 \mu\text{V/m} = 80.3 \text{ dB}\mu\text{V/m}$$

$$\text{Harmonic: } 375.0 + 4.1667(418 - 260) = 1033.338 \mu\text{V/m} = 60.3 \text{ dB}\mu\text{V/m}$$

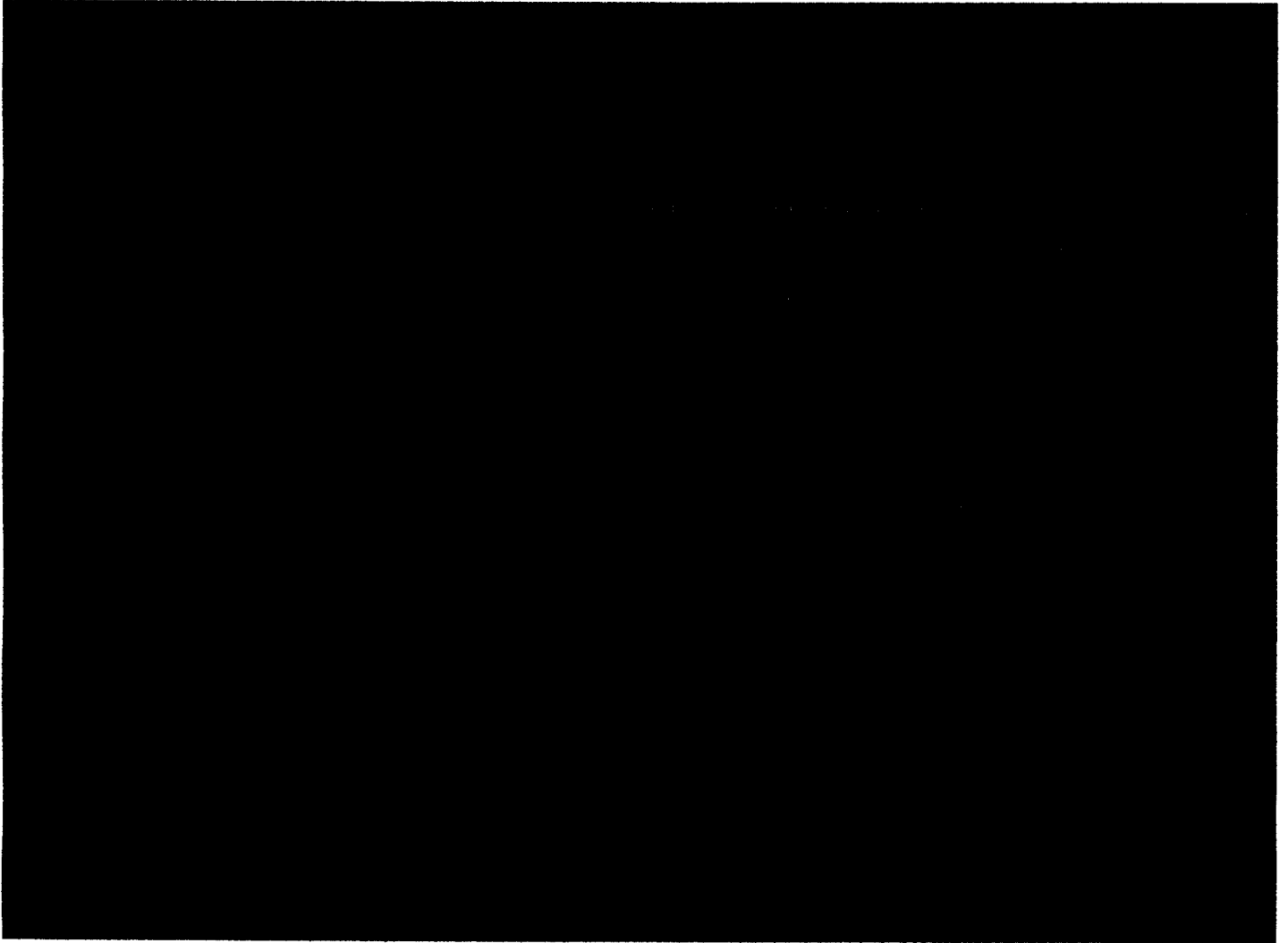
### 3.9 Environmental Conditions

| Temperature (°C) | Relative Humidity (%) |
|------------------|-----------------------|
| 20               | 47                    |

## 4 MEASUREMENT PHOTOGRAPH(S) / DIAGRAM(S)



**Figure 1**

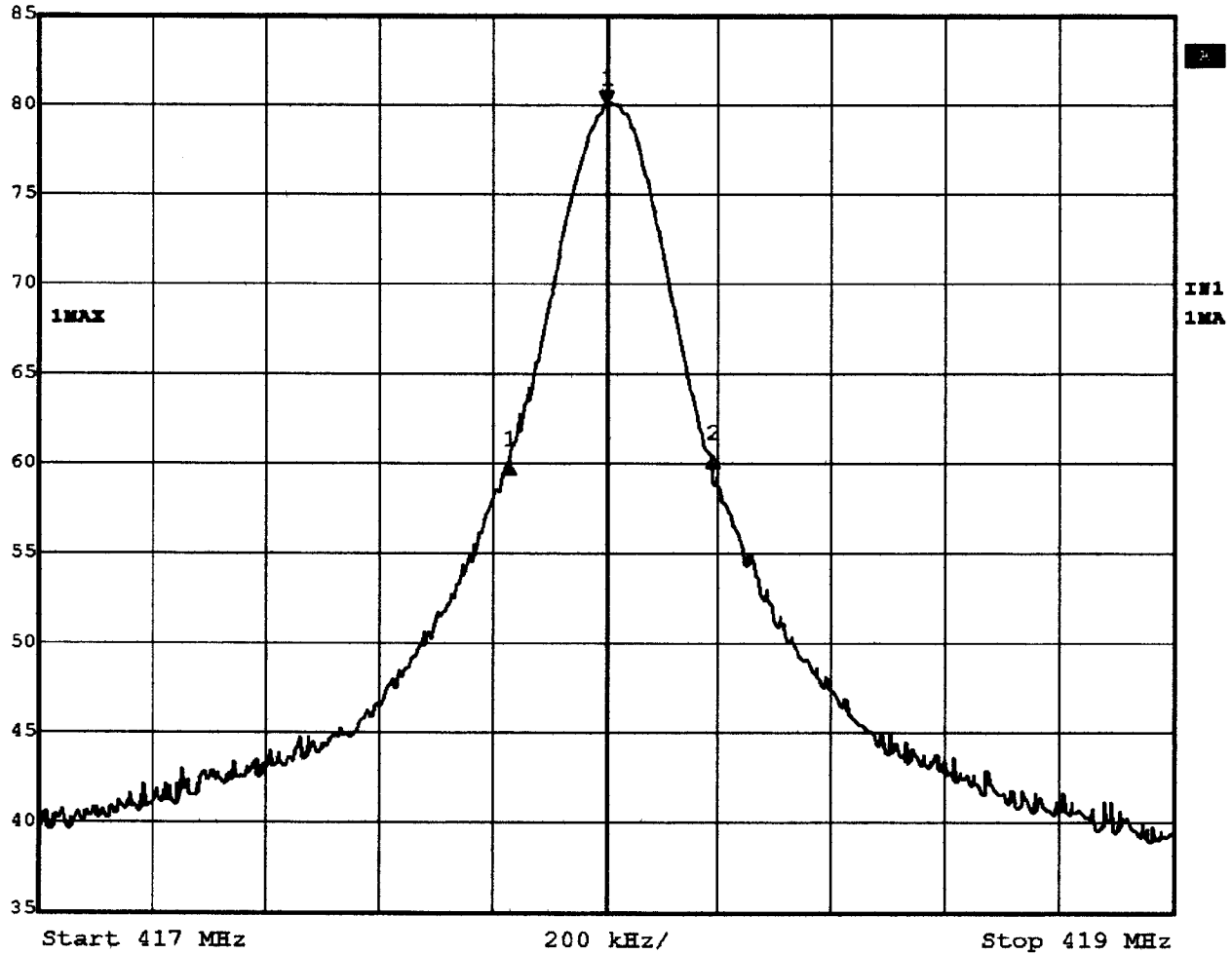


**Figure 2**

# EMC Test Report Number: PCC020013



|         |                   |     |         |        |       |
|---------|-------------------|-----|---------|--------|-------|
| Ref Lvl | Delta 1 [T1]      | RBW | 100 kHz | RF Att | 10 dB |
| 85 dBμV | -20.04 dB         | VBW | 30 kHz  |        |       |
|         | -170.34068136 kHz | SWT | 20 ms   | Unit   | dBμV  |



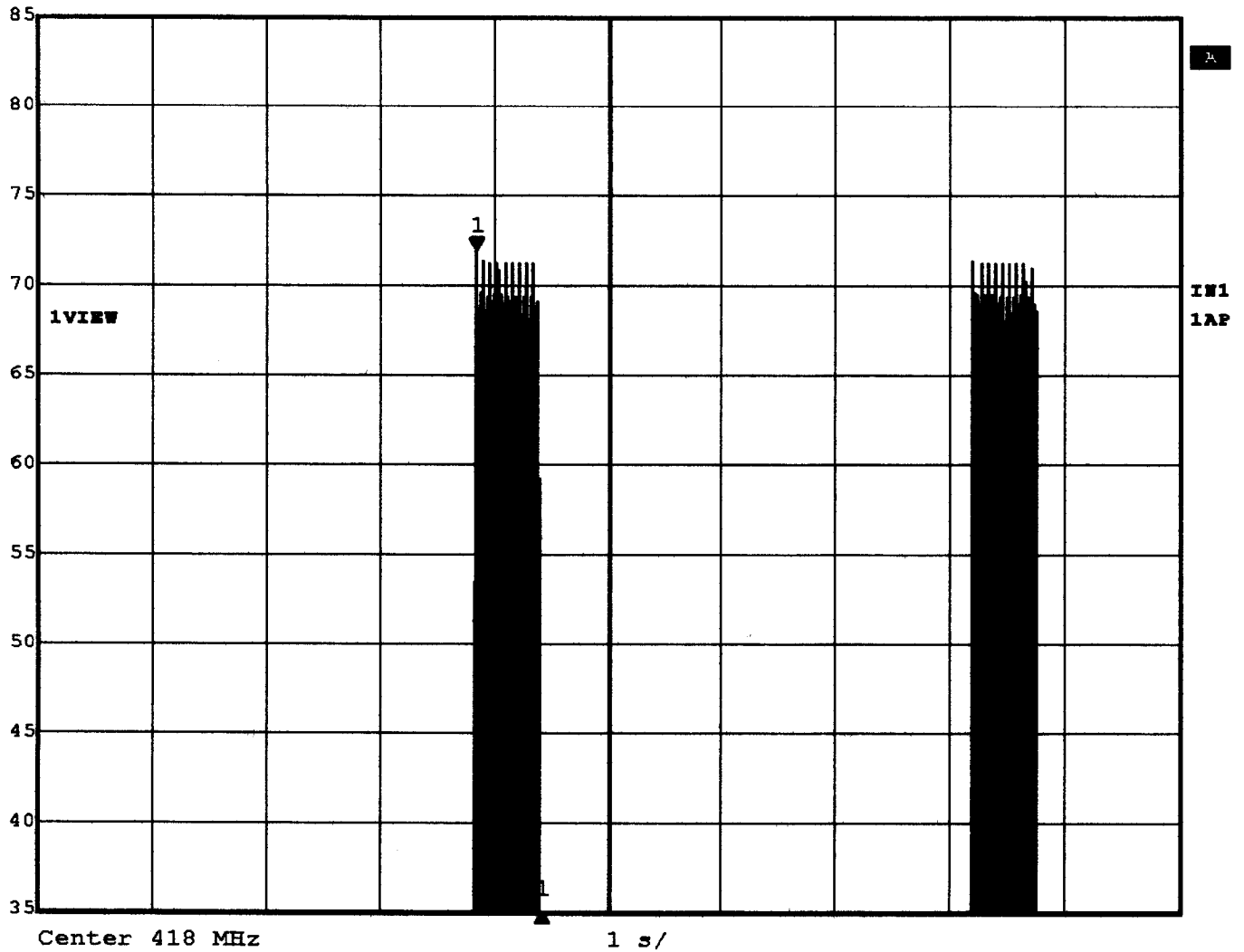
Date: 5.AUG.2002 05:09:49

**Figure 3**  
**Occupied Bandwidth Measurement**

# EMC Test Report Number: PCC020013



|              |               |         |        |           |
|--------------|---------------|---------|--------|-----------|
| Delta 1 [T1] | RBW           | 100 kHz | RF Att | 10 dB     |
| Ref Lvl      | -41.51 dB     | VBW     | 30 kHz |           |
| 85 dBμV      | 581.162325 ms | SWT     | 10 s   | Unit dBμV |



Date: 5.AUG.2002 05:34:35

**Figure 4**  
**Five Second Maximum Transmit Time**