

TABLE OF CONTENTS

	Pages
1 GENERAL INFORMATION	3
1.1 Product Description	6
1.2 Related Submittal Grant	6
1.3 Tested System Details	6
1.4 Test Methodology	6
1.5 Test Facility	6
2 SYSTEM TEST CONFIGURATION	7
2.1 Justification	7
2.2 EUT Exercise Software	7
2.3 Special Accessories	7
2.4 Equipment Modifications	7
2.5 Configuration of Tested System	7
3 DEACTIVATION	8
4 RADIATED SPURIOUS EMISSIONS	11
Field Strength Calculation	16
5 BANDWIDTH	17
6 DUTY CYCLE	21
7 ATTESTATION STATEMENT	33

1 GENERAL INFORMATION

1.1 Product Description

RTR-4 Power/Transceiver

EUT Name: RTR-4 WIRELESS OPTION

Model No.: 120746 Rev A

Serial No.: 0327

Power Requirements

Voltage: None

Other: Battery Powered

Typical Installation and/or Operating Environment

This optionally package is for use with the SAIC RTR-4 real-time radiography system. The typically user will be a law enforcement individual such as a bomb. The system is designed to be transported to a usage site, setup, used, and stored away until it is next needed.

EUT Power Cable: N/A

EUT Interface Ports and Cables

Interface				Shielding								
	Analog	Digital	Qty	Yes	No							
Type						Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
Ethernet/Power cable	☒	☒	1	☐	☒	CAT-5 UTP		LEMO Circular	N/A	3.4	☒	☐
X-ray Trigger	☒	☐	1	☐	☒	Unshielded 3 conductor		LEMO Circular	N/A	3.4	☒	☐

EUT Software.

Revision Level:

Description: Firmware disables unit from powering up until a preset time has elapsed since the power switch was placed in the on position. Firmware also monitors battery status to warn the user, via flashing LED, that the battery is nearly exhausted. Firmware also disconnects battery from the load to prevent damage to the battery from excessive discharge.

EUT Operating Modes to be Tested

1. Emission testing conducted using non-user accessible "Acquire Many Images" mode to maximize on time of the 418MHz transmitter.

EUT System Components

Description	Model #	Serial #	FCC ID #
RTR-4 Power/Transceiver	120746 Rev A	0327	After approval, LPR418M1

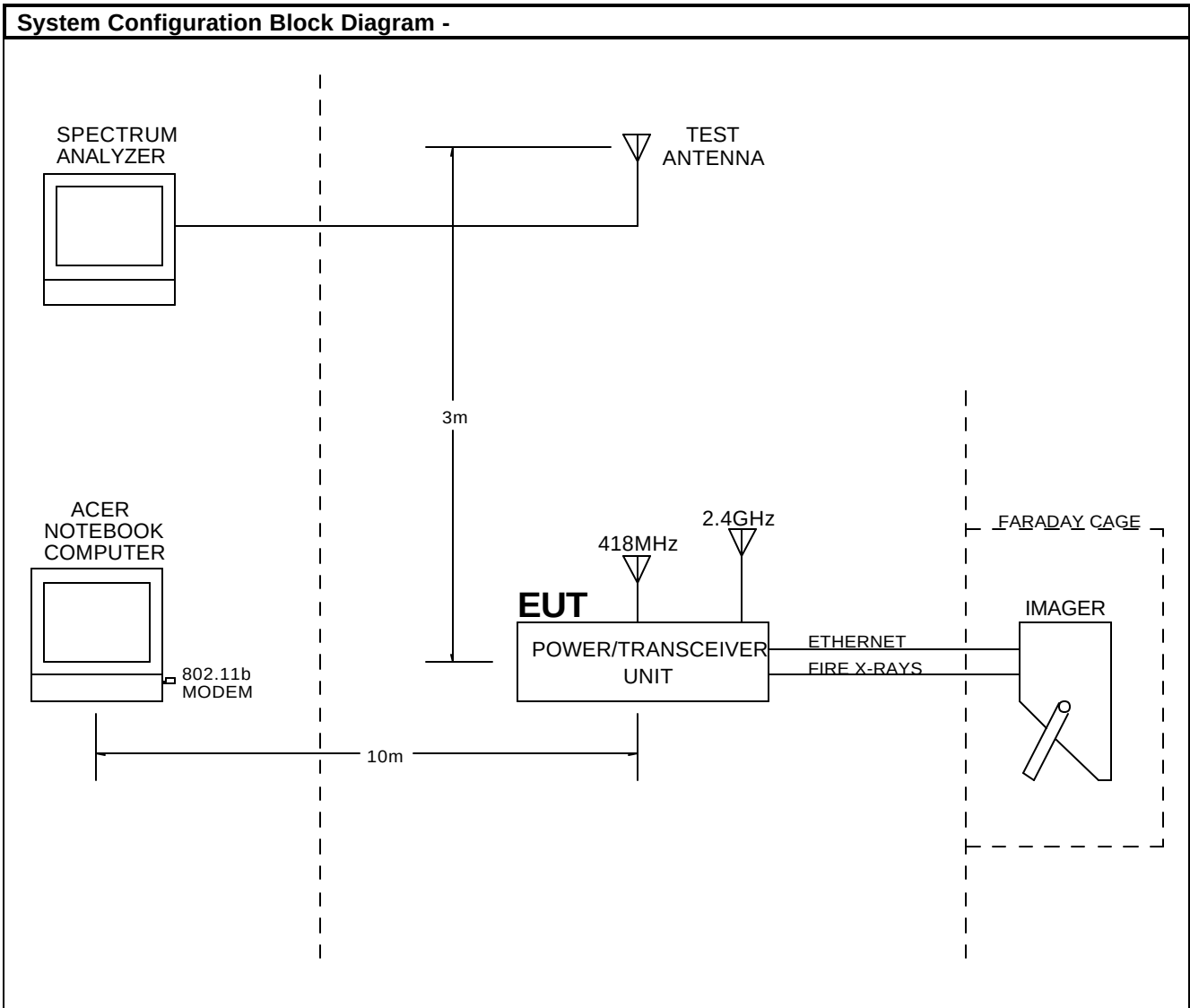
Support Equipment -

Description	Model #	Serial #	FCC ID #
Notebook PC	Acer TravelMate 520 Series model 1904	914H01CQ514800 705K000	None
RTR-4 Imager	120312-2	None	None

Oscillator Frequencies

Frequency	Derived Frequency	Component # / Location	Description of Use
418MHz	N/A	POWER/TRANSCIVER UNIT	On-Off Shift Keying Transmitter.
3.6864MHz	N/A	POWER/TRANSCIVER UNIT	Embedded Microprocessor

Power Supply: None**Power Line Filters: None****Critical EMI Components (Capacitors, ferrites, etc.): None****EMC Critical Detail: None**



1 GENERAL INFORMATION (continued)

1.2 Related Submittal/Grant

None

1.3 Tested System Details

The FCC IDs for all equipment, plus descriptions of all cables used in the tested system are:

None

1.4 Test Methodology

Purpose of Test: To demonstrate compliance with the ANSI C63.4 setup.

TEST	FCC CFR 47 #	PASS/FAIL
Radiated	15.231(a)	Pass
Deactivation	15.231(b)	Pass
Emission Bandwidth	15.231(c)	Pass
Duty Cycle Measurements	ANSI C63.4, Appendix 14, Para. 10	Pass
Conducted Emissions	15.107(a)	Not performed
Radiated Emissions	15.109(a)	Pass

Both Conducted and radiated testing were performed according to the procedures in FCC/ANSI C63.4 and CSA 108.8 - M1983. Radiated testing was performed at an antenna-to-EUT distance of 3 meters (1 - 25 GHz).

1.5 Test Facility

The open area test site and conducted measurement data were tested by:

TÜV PRODUCT SERVICE
 10040 Mesa Rim Road
 San Diego, CA 92121-2912
 Phone: 858 546 3999
 Fax: 858 546 0364

The Test Site Data and performance comply with ANSI 63.4 and are registered with the FCC, 7435 Oakland Mills Rd, Columbia Maryland 21046. All Measurement Data is acquired according to the content of FCC Measurement Procedure and ANSI C63.4, unless supplemented with additional requirements as noted in the test report.

2. SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was initially tested for FCC emission in the following configuration:

See Block Diagram.

2.2 EUT Exercise Software

None

2.3 Special Accessories

None

2.4 Modification

None

2.5 Configuration of Tested System

See Block Diagram.

3 DEACTIVATION EQUIPMENT/DATA

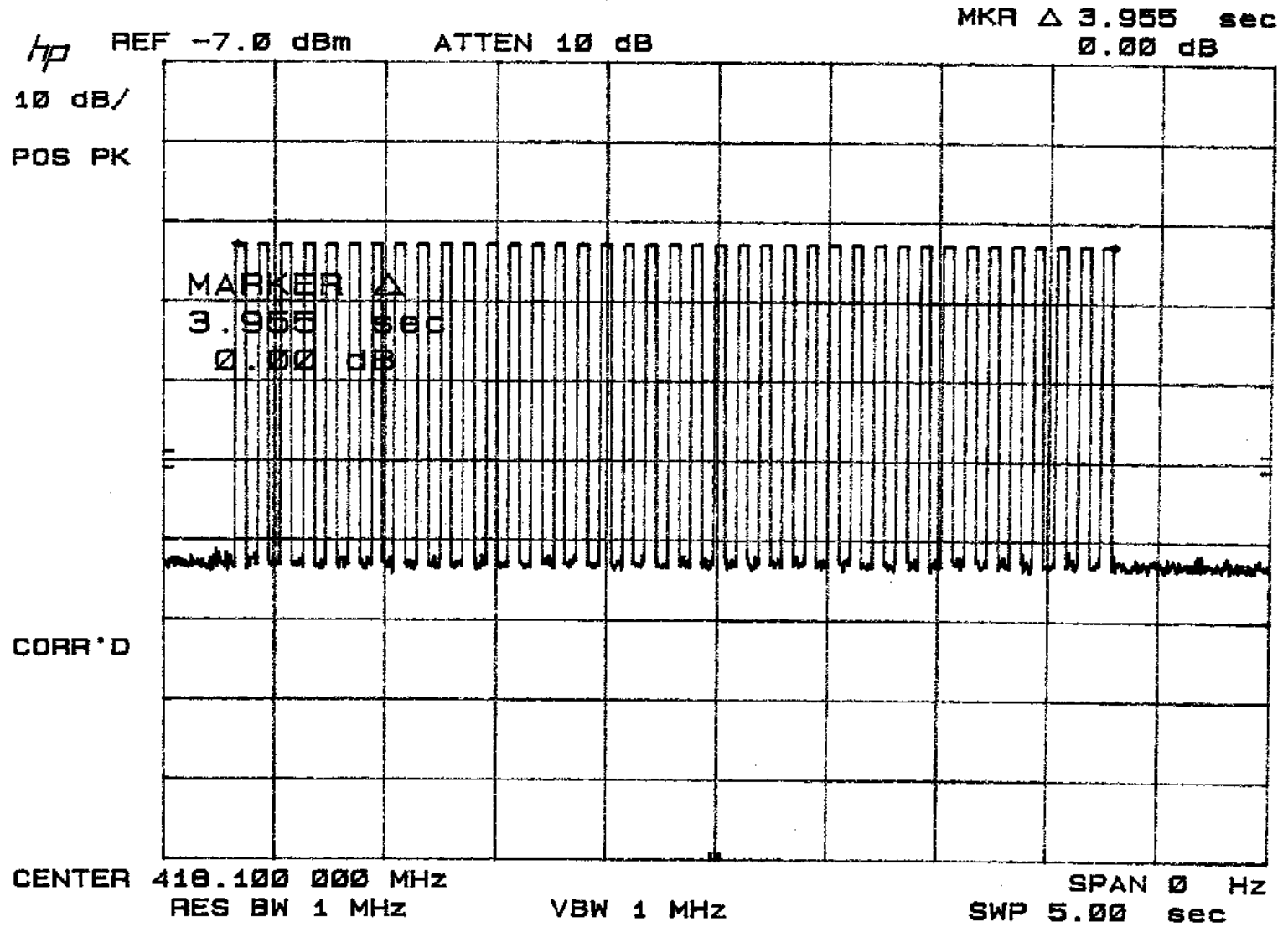
Test Equipment

TYPE	PROP #	MANUFACTURER	MODEL #	CAL DATE
Spectrum Analyzer	744	Hewlett Packard	8566B	12/17/02
Multimeter	6709	Hewlett Packard	3440A	08/21/02
Power Supply	6455	Hewlett Packard	E3611A	NCR

CUSTOMER: SAIC - W Bernardo
 EUT: RTR-4 Wireless Notebook
 TEST: FCC Subpart C Part 15.231(a)

Report No.: SC201962
 Mode: *DIAGNOSTIC MODE, 003 KAM*
DEACTIVATION 4.53 sec.

Apr. 19, 2002
 TECH/ENGR. *[Signature]*



CUSTOMER: SAIC - W Bernardo

Report No.: SC201962

Apr.19, 2002

EUT: RTR-4 Wireless Notebook

Mode: *DIAGNOSTIC mode, 100 SK AM*

TECH/ENGR. *DBK*

TEST: FCC Subpart C Part 15.231 (a) *DEACTIVATION < 5 Sec.*

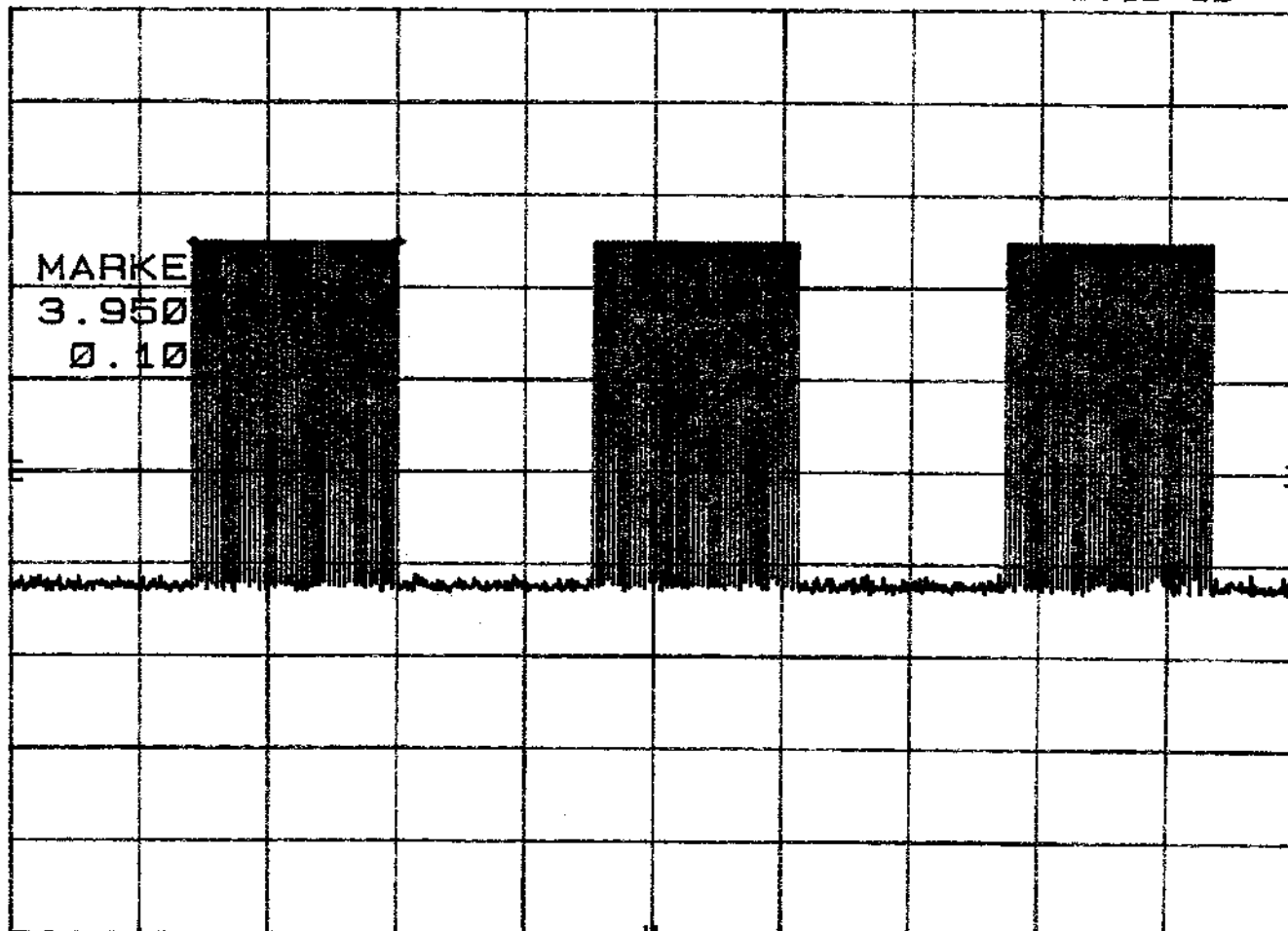
MKR Δ 3.950 sec
0.10 dB

hp REF -7.0 dBm

ATTEN 10 dB

10 dB/

POS PK



CORR'D

CENTER 418.100 000 MHz

RES BW 1 MHz

VBW 1 MHz

SPAN 0 Hz

SWP 25.0 sec

4 RADIATED EMISSION EQUIPMENT/DATA

The following data lists the significant emission frequencies, measured levels, correction factor (which includes cable and antenna corrections), the corrected reading, and the limit.

See following page(s).

See test setup photos for radiated emissions test setup.

v.beta231

[illegible]

REPORT NO:SC201962

SPEC: FCC Part 15 para 15.109(a)

COMPANY:SAIC - W Bernardo

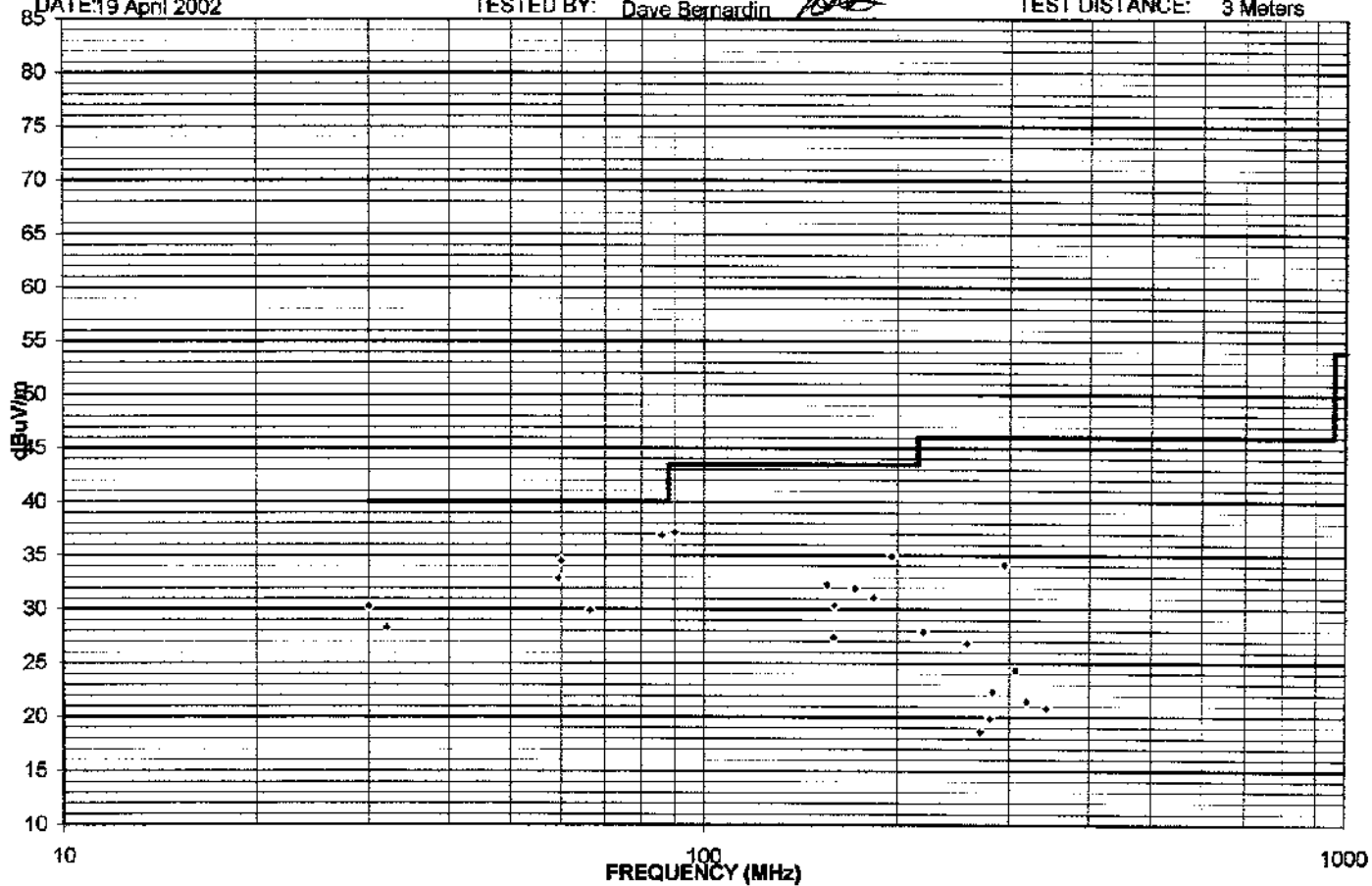
EUT:RTR- 4 Wireless Notebook

EUT MODE: OOSK AM with Imager in screened cage

DATE:19 April 2002

TESTED BY: Dave Bernardin *DB*

TEST DISTANCE: 3 Meters



Emissions Test Conditions: RADIATED SPURIOUS EMISSIONS

The *RADIATED EMISSIONS* measurements were performed at the following test location :

☐ - Test not applicable

Canyon #2 (3- and 10-Meter Open Area Test Site), Carroll Canyon, San Diego
 Roof Site

Testing was performed at a test distance of:

- ☐ - 1 meters
☒ - 3 meters
☐ - 10 meters

Test Equipment Used :

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Date
3115	453	Antenna, Horn	EMCO	5412-4364	21/01/02
3146	6670	Antenna, Log Periodic Dipole	EMCO	1063	05/21/02
8566B	823	Spectrum Analyzer	Hewlett Packard	--	07/24/02
3115	251	Antenna, Horn	EMCO	2595	10/20/02
AA-190-30.00.0	733	Cable	United Microwave	--	N/A
AA-190-30.00.0	656	Cable	United Microwave	-	N/A
AA-190-30.00.0	657	Cable	United Microwave	--	N/A
83592C	186	Generator	Hewlett Packard	2328A00112	04/20/02
8445B	809	Preselector	Hewlett Packard	1442A01127	N/A
AMF-5D-010180-35-10P	719	Pre-amplifier	Miteq	--	N/A
LPB2520/A	739	Log Periodic	Antenna Research	--	04/21/02
ESVS30	427	Receiver	Rohde & Schwarz	--	12/08/02

Remarks: _____

Field Strength Calculation

If a preamplifier was used during the Radiated Emission Testing, it is required that the amplifier gain must be subtracted from the Spectrum Analyzer (Meter) Reading. In addition, a correction factor for the antenna, cable used and a distance factor, if any, must be applied to the Meter Reading before a true field strength reading can be obtained. In the automatic measurement, these considerations are automatically presented as a part of the print out. In the case of manual measurements and for greater efficiency and convenience, instead of using these correlation factors for each meter reading, the specification limit was modified to reflect these correlation factors at each frequency value so that the meter readings can be compared directly to the modified specification limit. This modified specification limit is referred to as the "Corrected Meter Reading Limit" or simply the CMRL, which is the actual field strength present at the antenna. The quantity can be derived in the following manner:

$$\text{Corrected Meter Reading Limit (CMRL)} = \text{SAR} + \text{AF} + \text{CL} - \text{AG} - \text{DC}$$

Where, SAR = Spectrum Analyzer Reading

AF = Antenna Factor

CL = Cable Loss

AG = Amplifier Gain (if any)

DC = Distance Correction (if any)

Assume the following situation: A meter reading of 29.4 dBuV was obtained from a Class A computing device measured at 83 MHz. Assume an antenna factor of 9.2 dB, a cable loss of 1.4 dB and amplifier gain of 20.0 dB at 83 MHz. The final field strength would be determined as follows:

$$\text{CMRL} = 29.4 \text{ dBuV} + 9.2 \text{ dB} - 1.4 \text{ dB} - 20 \text{ dB/M} - 0.0 \text{ dB}$$

$$\text{CMRL} = 20.0 \text{ dBuV/M}$$

This result is well below the FCC and CSA Class A limit of 29.5 dBuV/m at 83 MHz.

For the manual mode of measurement, a table of corrected meter reading limit was used to permit immediate comparison of the meter reading to determine if the measure emission amplitude exceeded the specification limit at that specific frequency.

5 BANDWIDTH EQUIPMENT/DATA

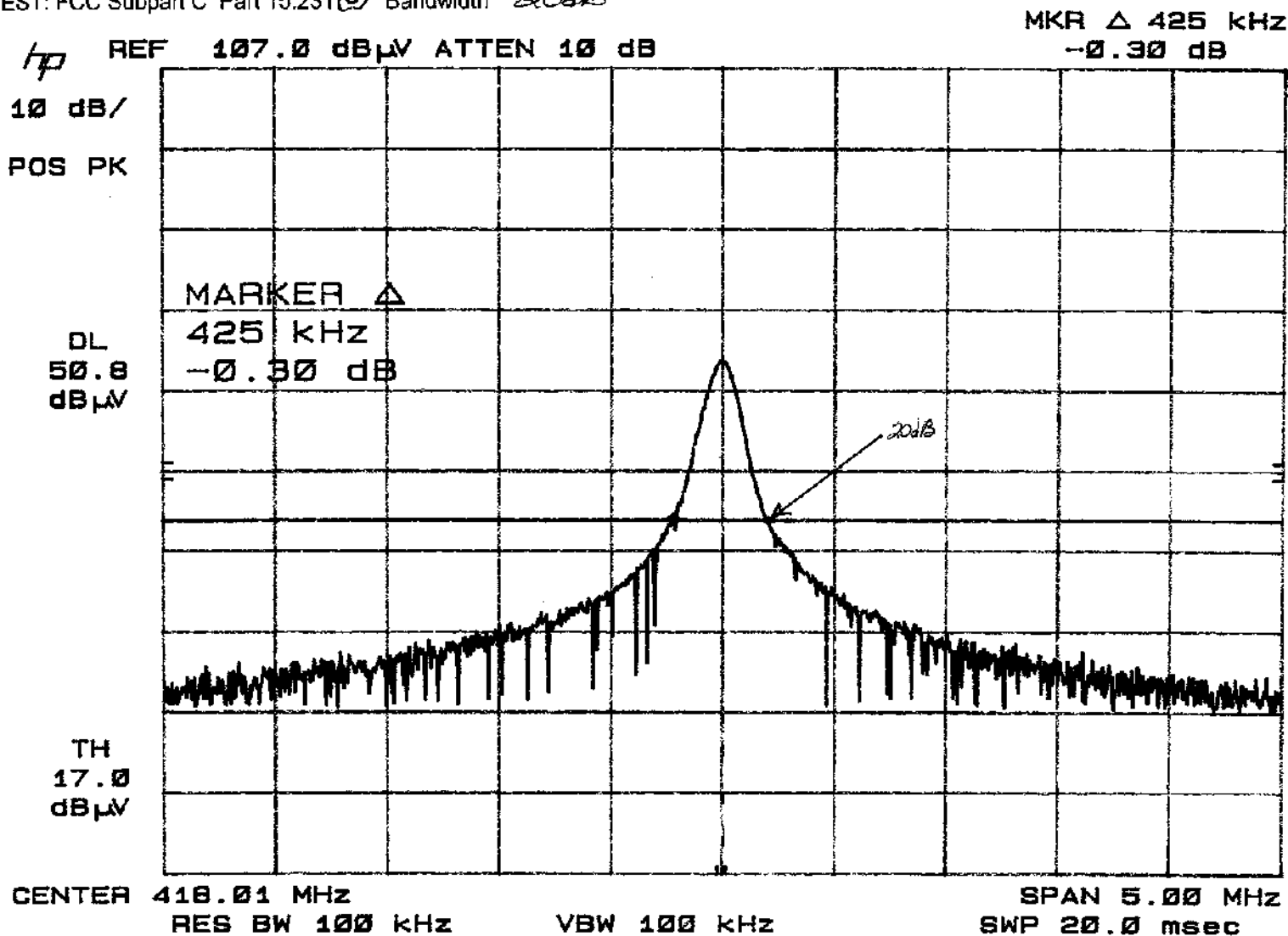
Test Equipment

MODEL	PROP #	EQUIPMENT TYPE	MANUFACTURER	S/N	CAL DATE
8566B	823	Spectrum Analyzer	Hewlett Packard	--	07/24/02

CUSTOMER: SAIC - W Bernardo
 EUT: RTR-4 Wireless Notebook
 TEST: FCC Subpart C Part 15.231(e)

Report No.: SC201962
 Mode: *OOK AM*
 Bandwidth: *20dB*

Apr 08, 2002
 TECH/ENGR. *DJS*

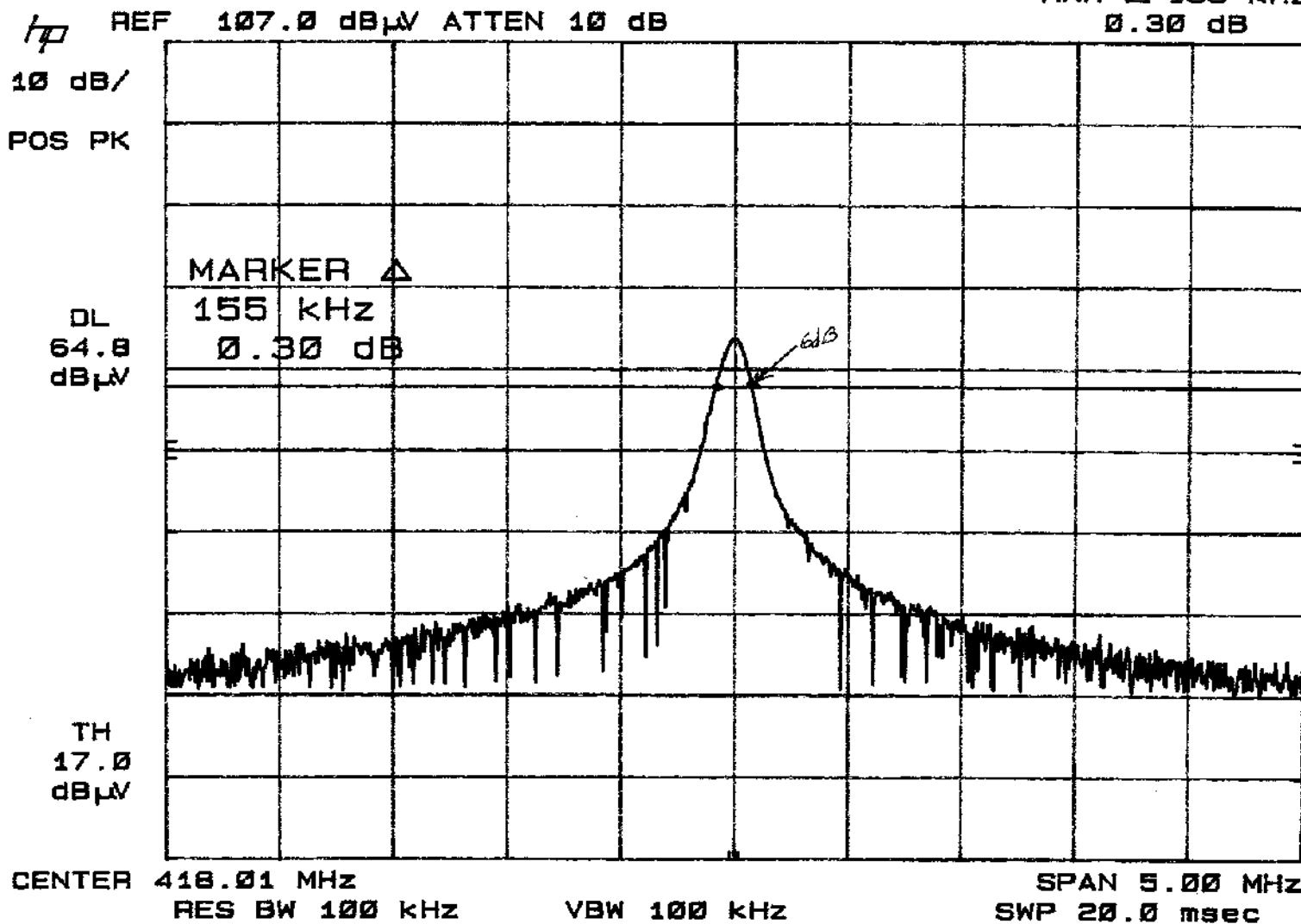


CUSTOMER: SAIC - W Bernardo
 EUT: RTR-4 Wireless Notebook
 TEST: FCC Subpart C Part 15.231(c)

Report No.: SC201962
 Mode: *005K AM*
 Bandwidth: *6 dB*

Apr 08, 2002
 TECH/ENGR: *[Signature]*

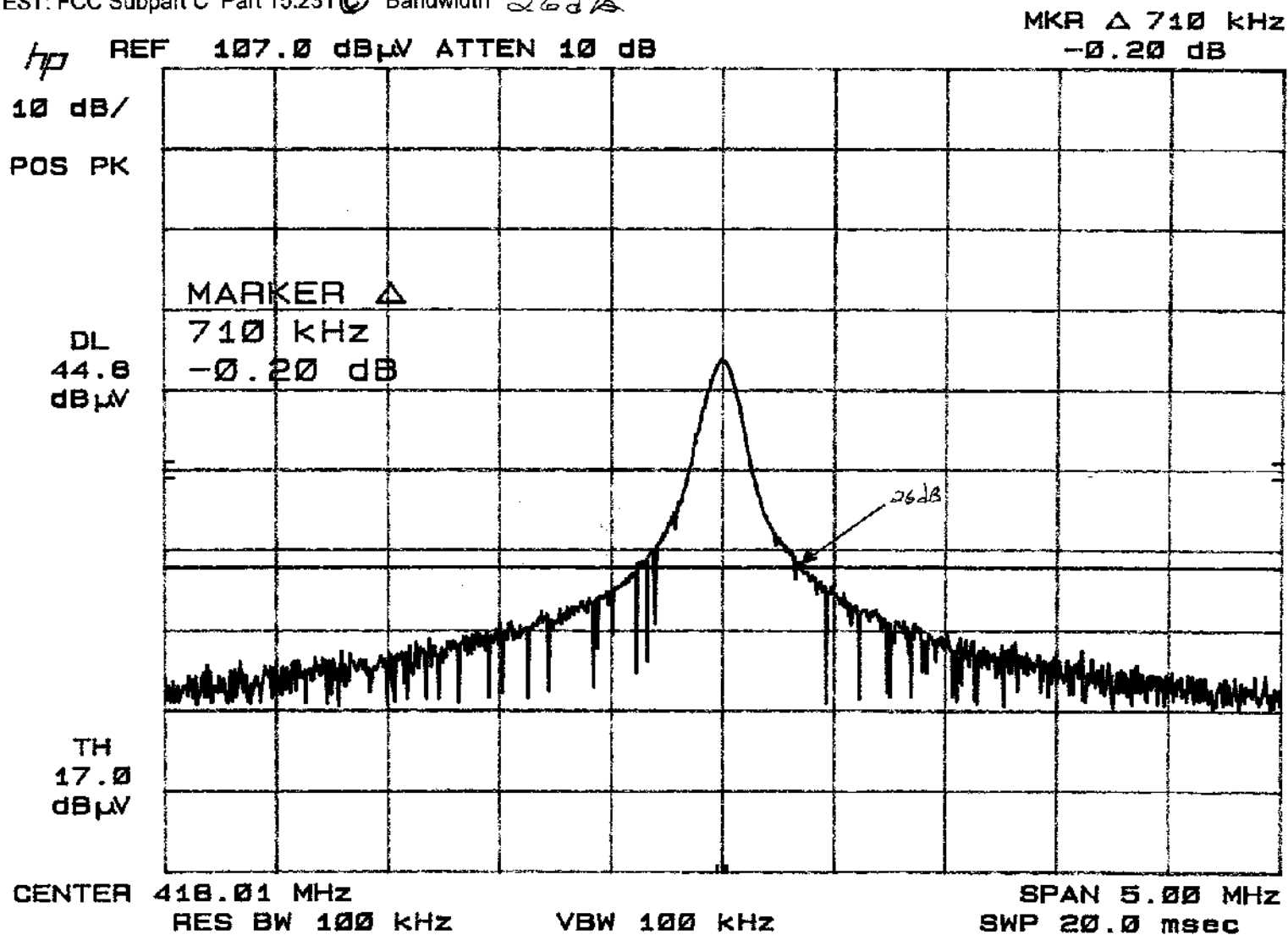
MKR Δ 155 kHz
 0.30 dB



CUSTOMER: SAIC - W Bernardo
EUT: RTR-4 Wireless Notebook
TEST: FCC Subpart C Part 15.231(c)

Report No.: SC201962
Mode: *008K AM*
Bandwidth *26dB*

Apr 08, 2002
TECH/ENGR. *EdB*



6 DUTY CYCLE EQUIPMENT/DATA

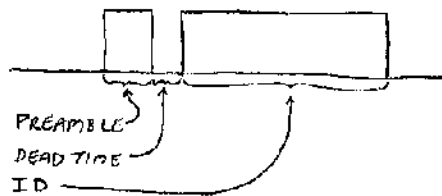
Test Equipment

MODEL	PROP #	EQUIPMENT TYPE	MANUFACTURER	S/N	CAL DATE
640a	6710	Scope	Tektronix	--	04/25/03

See following page(s).

418MHz TRANSMITTER DUTY CYCLE CALCULATIONS (100ms WINDOW)

BASIC WAVEFORM AND SECTION ID



$$44 \text{ ms} = t_{\text{PREAMBLE}} + t_{\text{DEAD TIME}} + t_{\text{ID}}$$

$$t_{\text{PREAMBLE}} = 4.6 \text{ ms}$$

$$t_{\text{DEAD TIME}} = 1.9 \text{ ms}$$

$$t_{\text{ID}} = 37.6 \text{ ms}$$

PREAMBLE DUTY CYCLE:

PREAMBLE PULSES AND SPACING ARE IDENTICAL

$$\text{DUTY CYCLE}_{\text{PREAMBLE}} = \frac{170 \mu\text{s ON TIME}}{380 \mu\text{s CYCLE TIME}} = 0.4474$$

ID DUTY CYCLE

ID PULSES VARY IN WIDTH FOR "0" AND "1" DATA. ASSUMING NARROW PULSES ARE "0"...

$$\text{DUTY CYCLE}_{\text{"0"}} = \frac{170 \mu\text{s ON TIME}}{580 \mu\text{s CYCLE TIME}} = 0.2931$$

$$\text{DUTY CYCLE}_{\text{"1"}} = \frac{360 \mu\text{s ON TIME}}{570 \mu\text{s CYCLE TIME}} = 0.6358$$

THE TRANSMITTER MODULATION COMES FROM A MICROCHIP 16C600 ENCODER. THIS ENCODER USES A ROLLING CODE SCHEME WHICH RESULTS IN 50% "0" AND 50% "1" PULSES IN THE ID PULSE STREAM. TOTAL ON TIME CAN BE CALCULATED AS FOLLOWS

$$\text{ON TIME}_{\text{PREAMBLE}} = 4.6 \text{ ms} \times 0.4474 = 2.058 \text{ ms}$$

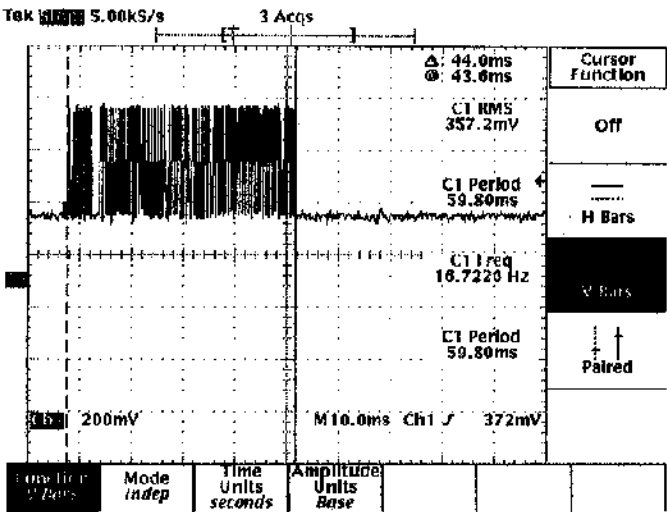
$$\text{ON TIME}_{\text{"0"}} = 37.6 \text{ ms} \times \frac{1}{2} \times 0.2931 = 5.510 \text{ ms}$$

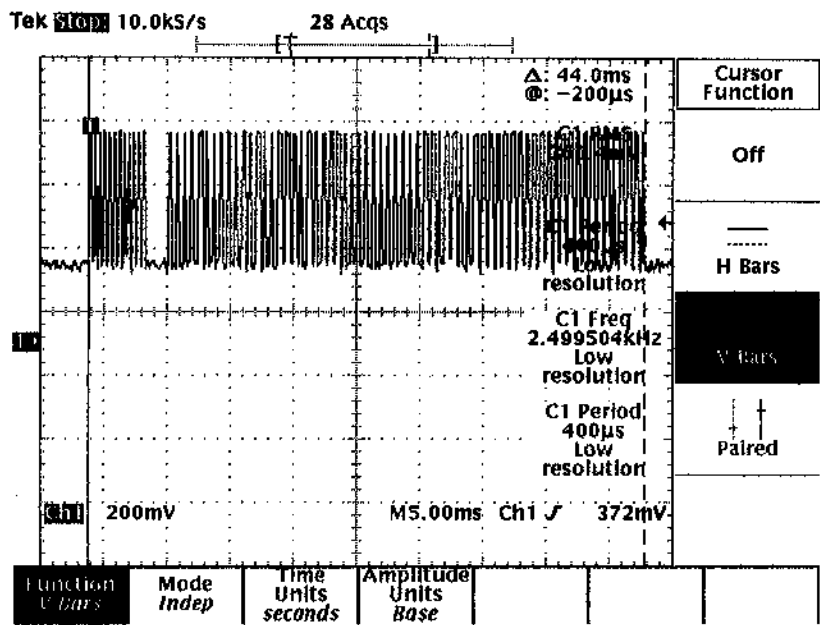
$$\text{ON TIME}_{\text{"1"}} = 37.6 \text{ ms} \times \frac{1}{2} \times 0.6358 = 11.953 \text{ ms}$$

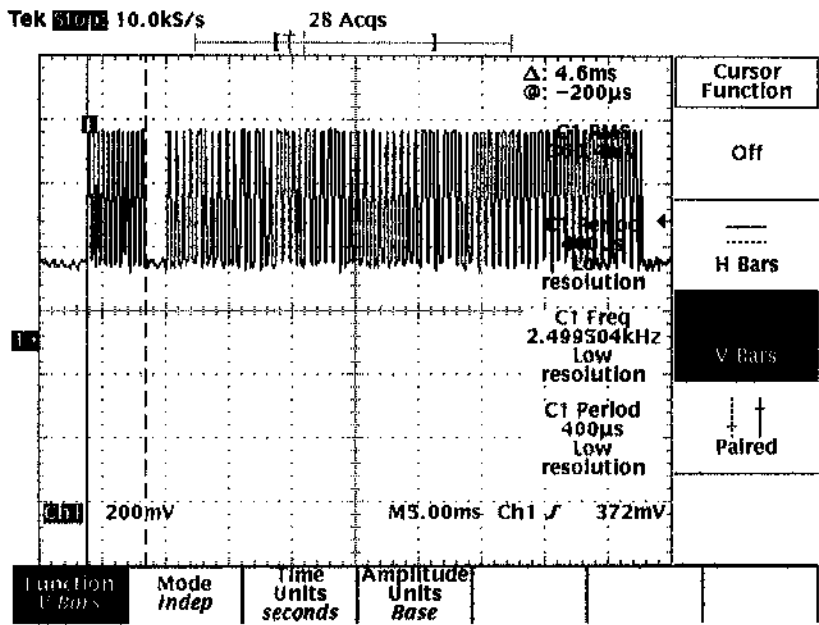
$$\text{TOTAL ON TIME} = 19.521 \text{ ms}$$

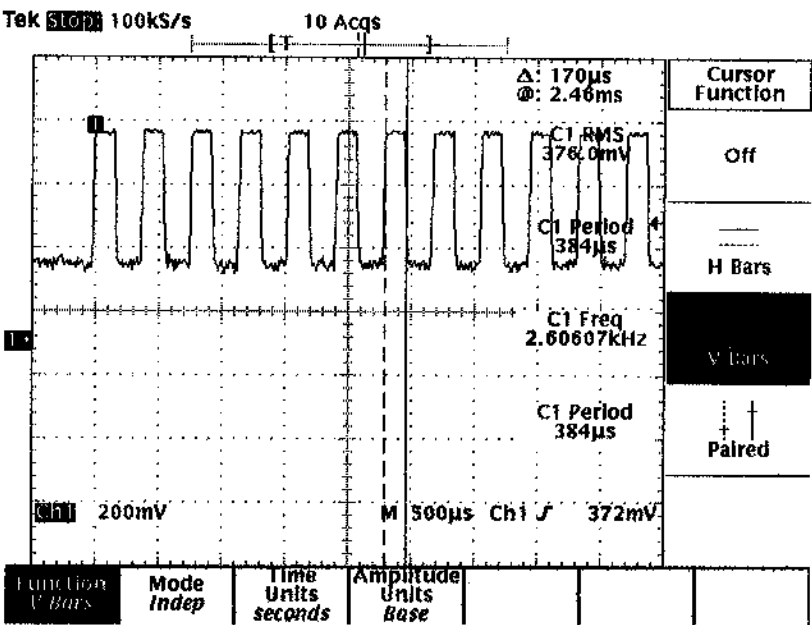
GIVEN THE 100ms WINDOW AND THE TOTAL ON TIME OF 19.521ms THE DUTY CYCLE FOR 15.231 IS 19.521%

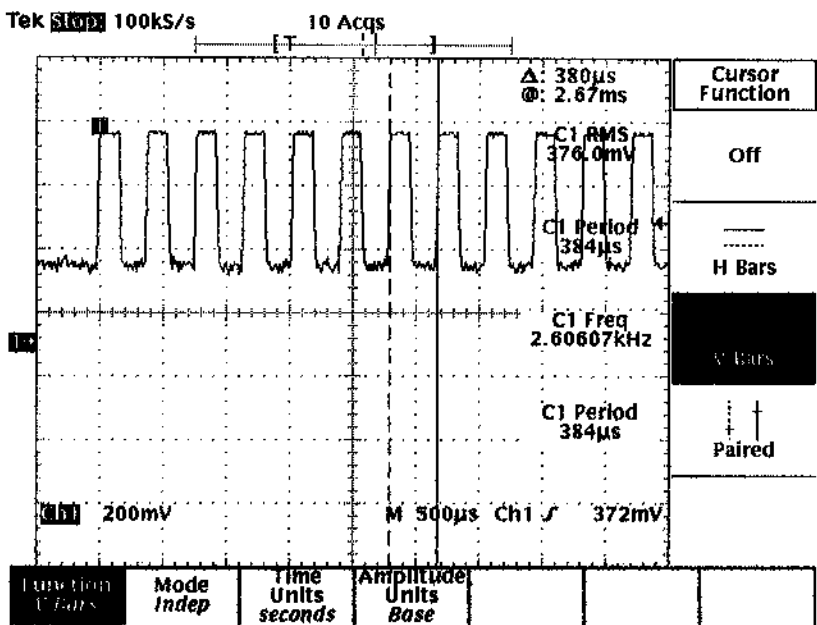
$$\text{DUTY CYCLE FACTOR} = 20 \log(0.19521) = -14.2 \text{ dB}$$

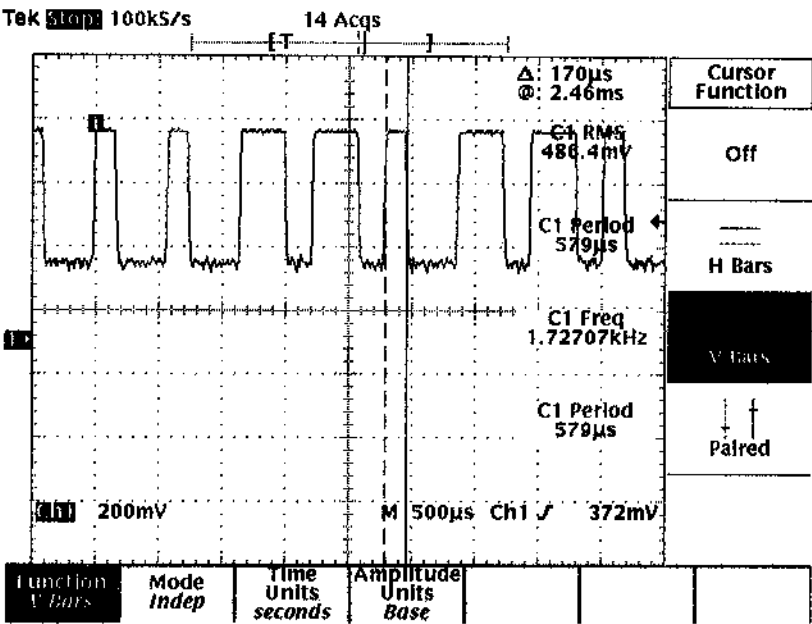


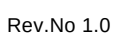


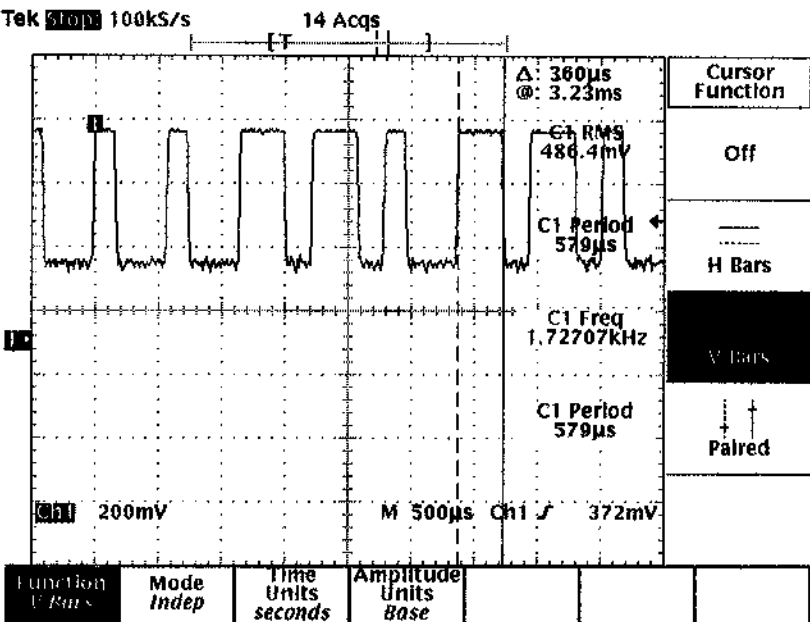


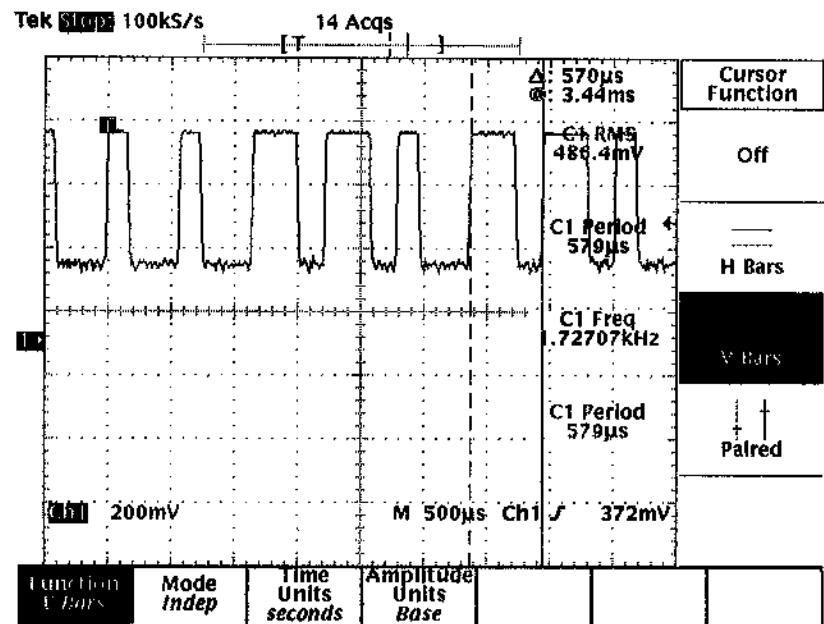


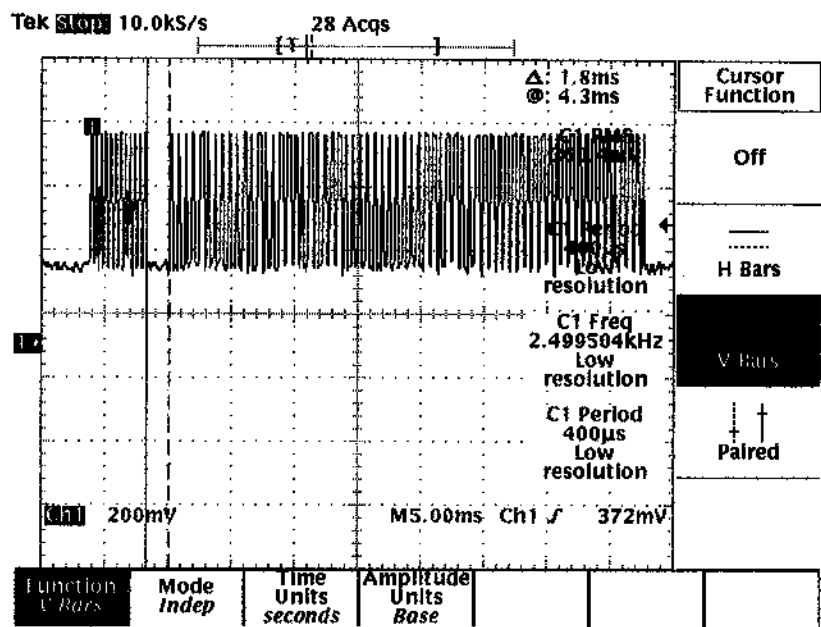












7 ATTESTATION STATEMENT

GENERAL REMARKS:

SUMMARY:

All tests were performed per CFR 47, *FCC Part 15, Paragraphs 15.231(a), (b), (c); 15.107(a); 15.209(a)*

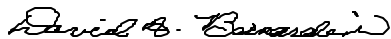
■ - Performed

The Equipment Under Test

■ - **Fulfills** the requirements of CFR 47, *FCC Part 15, Paragraphs 15.231(a), (b), (c); 15.107(a); 15.209(a)*.

- TÜV PRODUCT SERVICE, INC. -

Responsible Engineer:



(EMC Engineer)