LABORATORY MEASUREMENTS

PART B

PREFACE

This device is a security transmitter. The device was placed on a .8 meter high plat orm, three meters from the receiving antenna. Peak emissions were found by varying the antenna height from one to four meters and rotating the device 360 degrees. Emissions were taken with both vertical and horizontal polarization's.

A) TEST NOTES

1) Bandwidth measurements were made in the peak mode, using a Hewlett Packard Spectrum Analyzer Model Number (70000).

2) Duty Cycle Correction Factors = 20 log (t/T) Where t = Maximum time during any .1 second interval. T = .1 second

3) All emissions from 25 MHz were measured to the tenth harmonic were measured with an Hewlett Packard model 8566B Spectrum Analyzer.

4) Emissions below 1000MHz were measured with a 100 kHz bandwidth. Emissions above 1000MHz were measured with a 1MHz bandwidth.

5) Forbidden bands measurements were made at 1 meter distance.

6) Noise floor measurements. See AMBIENT LEVEL IN THE FORBIDDEN BANDS.

BANDWIDTH MEASUREMENT

15.205 (d) Bandwidth (see Test Notes). (.25% of Fundamental)

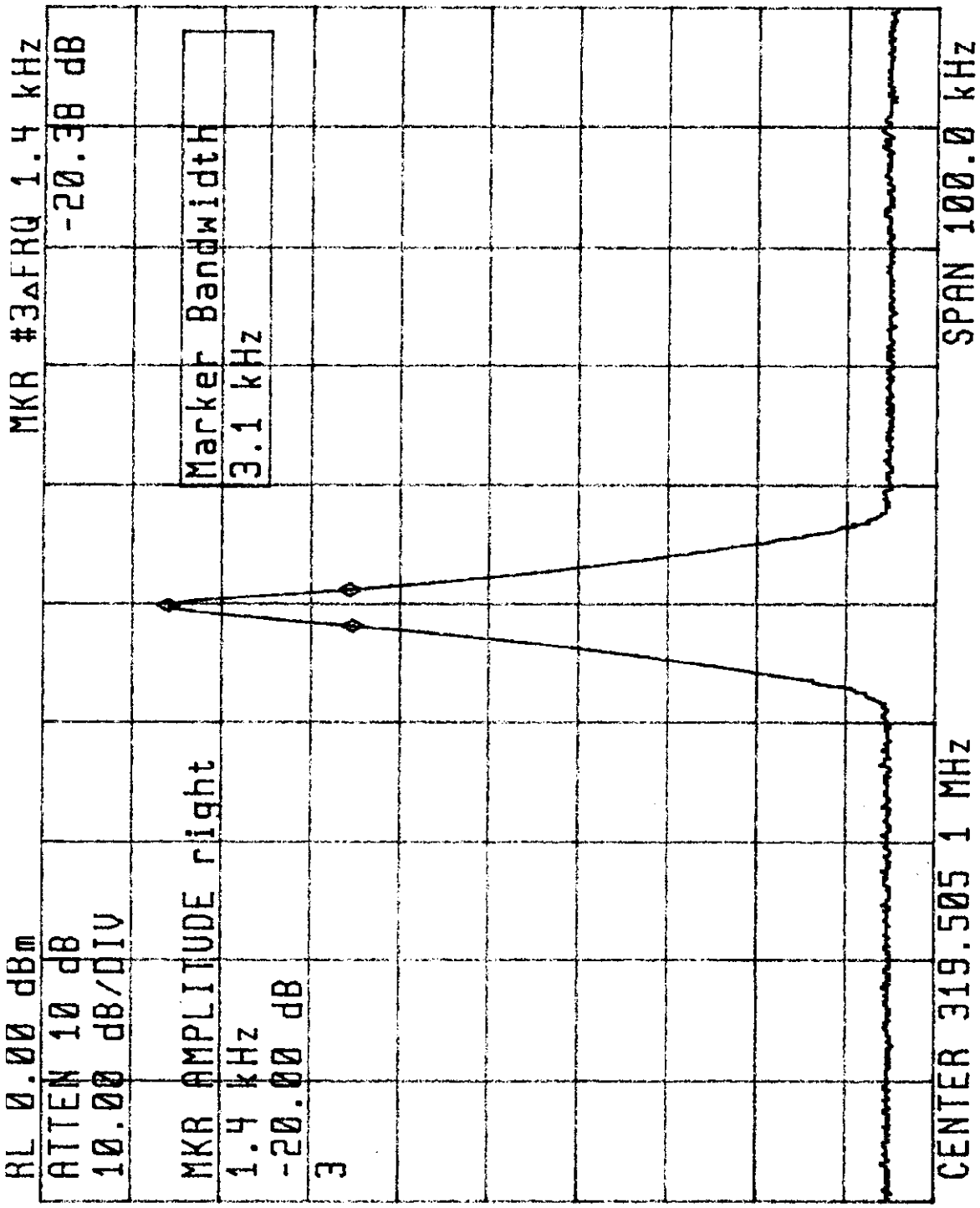
Spectrum Analyzer used: HP 70000

Spectrum analyzer skirt bandwidth (-20 dBm) 1KHz

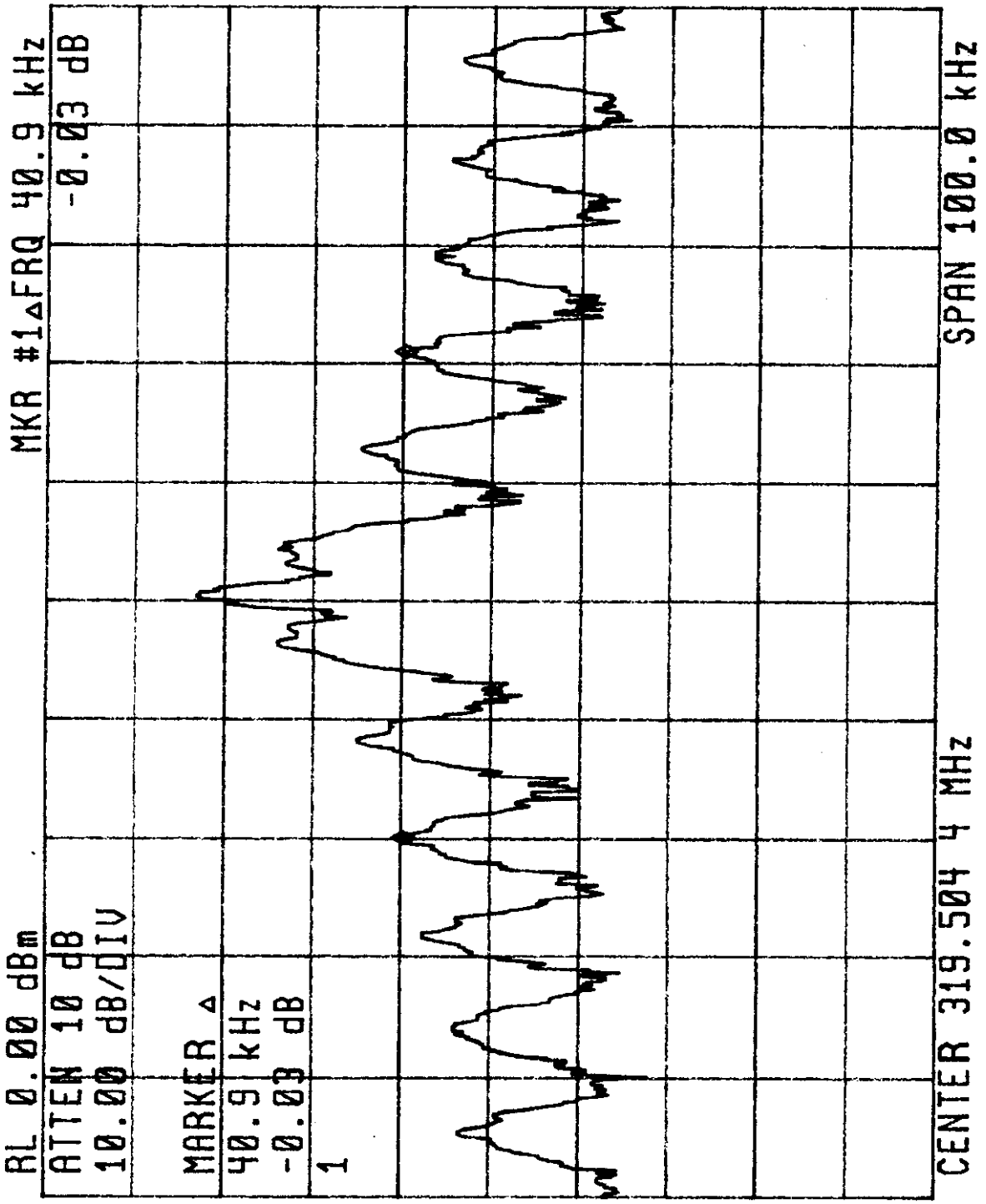
FREQUENCY (MHz)	MEASURED BANDWIDTH @ -20dBM (KHz)	*ESTIMATED SIGNAL BANDWIDTH (KHz)	FCC BANDWIDTH LIMIT (KHz)
319.5	40.9	39.9	792

* Estimated Bandwidth = Measured bandwidth minus analyzer bandwidth

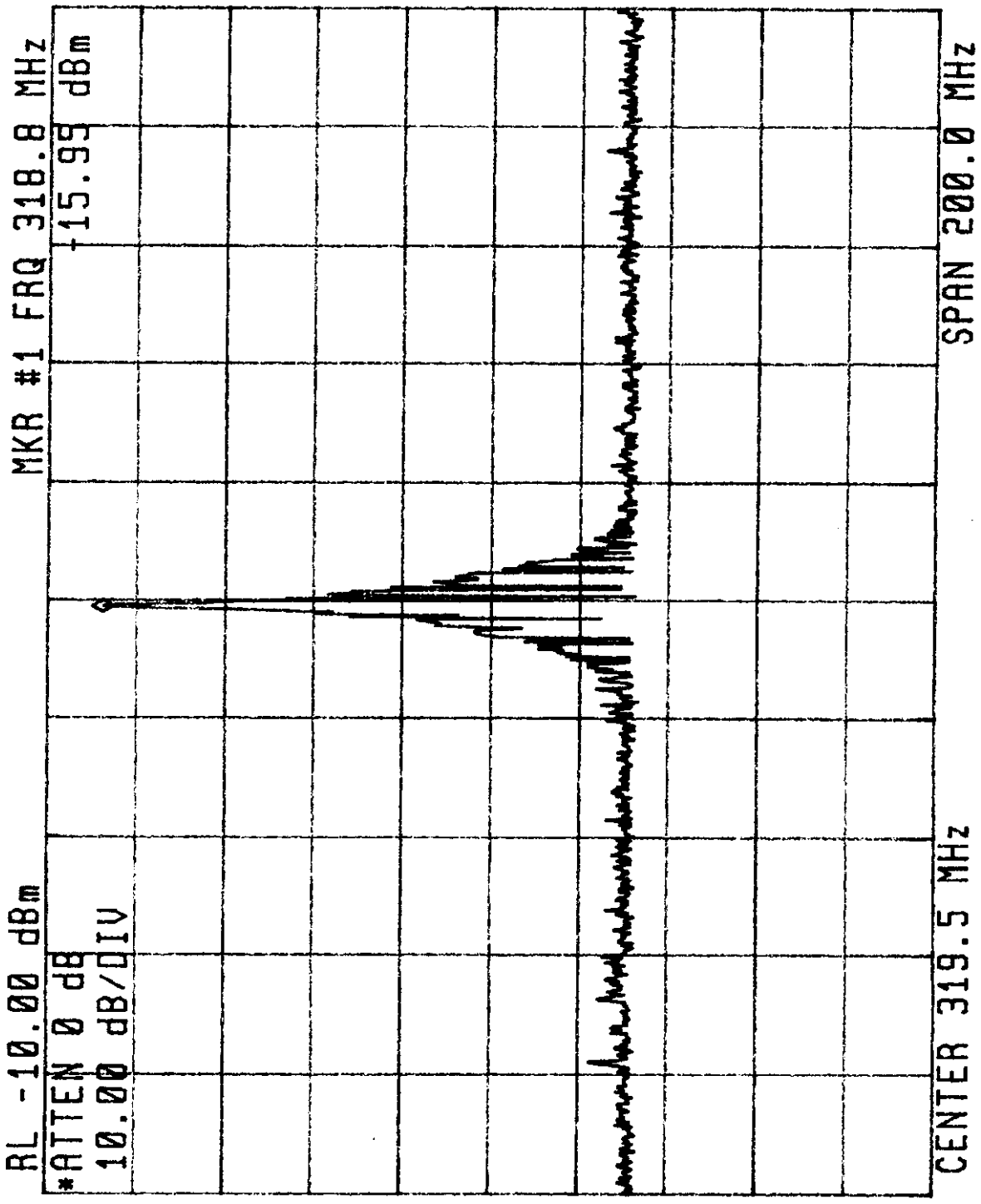
BANDWIDTH MEASUREMENT



BANDWIDTH MEASUREMENT



BANDWIDTH MEASUREMENT



DUTY CYCLE CALCULATION

The Learnmode format transmission time varies from 18.1 milliseconds to 21.8 milliseconds. The maximum on time is 8.662 milliseconds. The interval between packets will vary in a pseudo-random manner from about 99 milliseconds to 458 milliseconds.

SUPERVISORY CALCULATION

If an hour elapses without a data transmission, the chip will trigger itself and send a group of three supervisory data packets. The actual supervisory interval will vary in a pseudo-random manner from about 64 to 68 minutes. The supervisory signal consists of three packet transmissions. Therefore, the maximum supervisory duration is 981.4 milliseconds in duration. 21.9 milliseconds x 3 = 65.4 milliseconds + 2 x 458 millisecond interval time in between packets = 981.4 milliseconds maximum time.

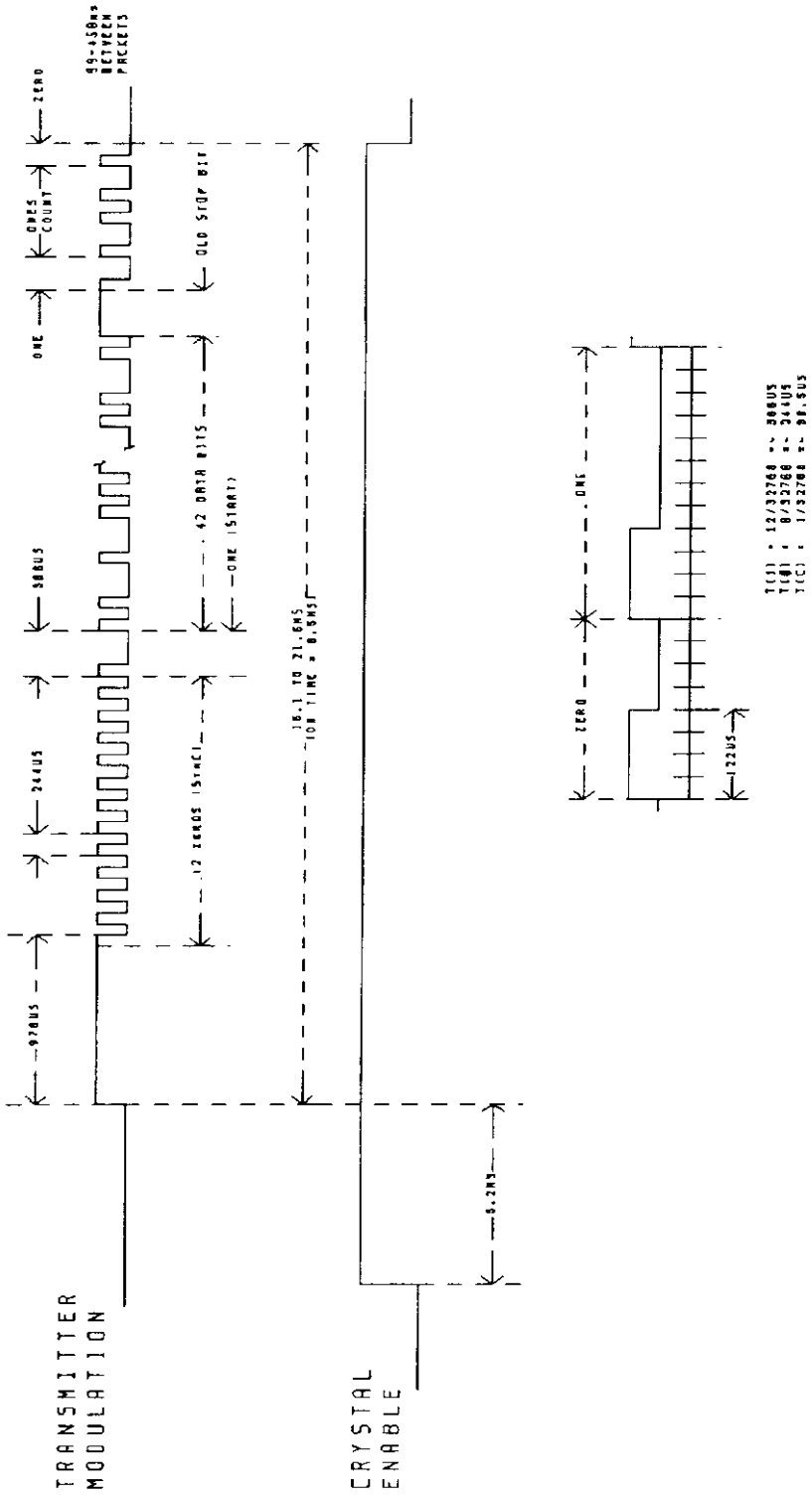
The calculation for the " Duty Cycle Correction Factor " is as follows:

DATA FORMATON TIME

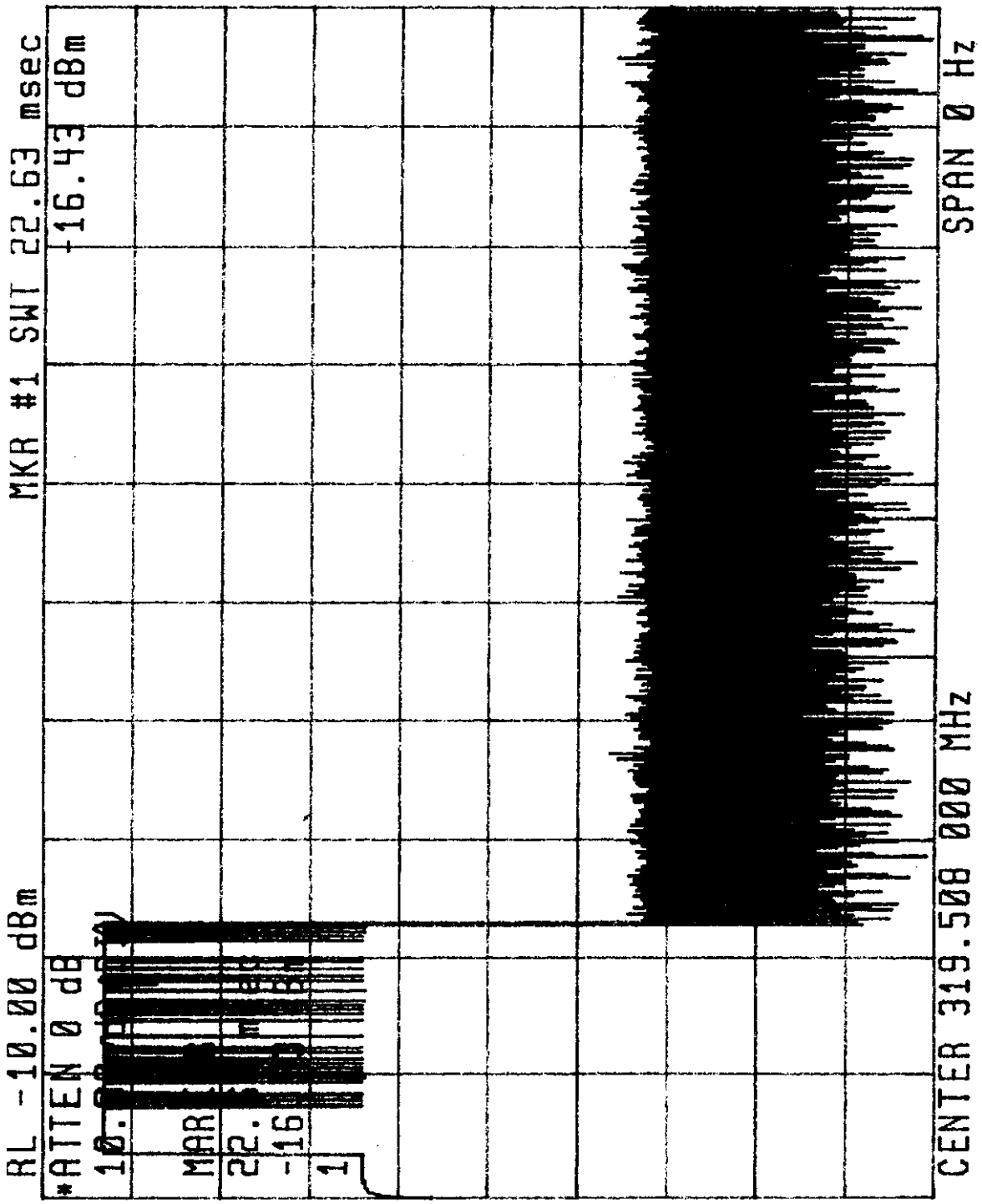
1-976uSec AGC Pulse	976uSec ON
12-244uSec Sync Pulses	1.464mSec ON
1-366uSec Start Pulse	122uSec ON
42-366uSec Data Pulses	5.124mSec ON
366uSec Old Stop Bit	366uSec ON
366uSec One	122uSec ON
3-366uSec MSB	366uSec ON
244uSec New Stop Bit	122uSec ON
21.716mSec Total Time	8.662mSec Total On Time

8.662mSec TOTAL ON TIME / 100mSec = .08662 (LOG) x 20 = -21.25dB

NOTE: 20dB is the maximum allowable DUTY CYCLE CORRECTION FACTOR

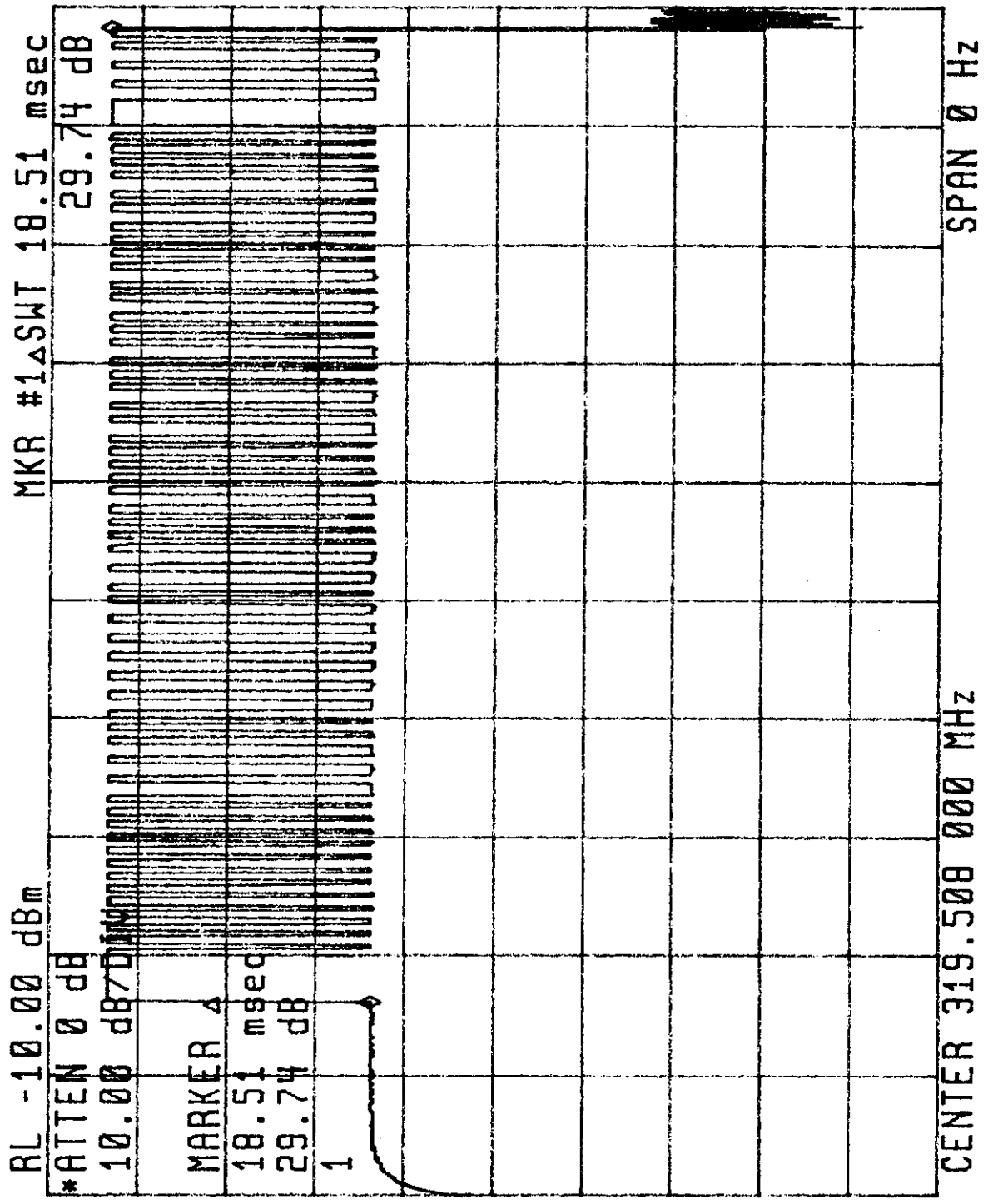

TRANSMITTER
MODULATION
CRYSTAL
ENABLE
ZERO
ONES
COUNT
ONE
SEBUS
244US
97BUS
ONE
ZERO
122US

SINGLE ALARM PACKET (100 MILLISECOND PLOT)



SINGLE ALARM PACKET

MAXIMUM PACKET DURATION IS 21.8 MILLISECONDS



A COMPLETE TRANSMISSION OF EIGHT INDIVIDUAL ALARM PACKETS

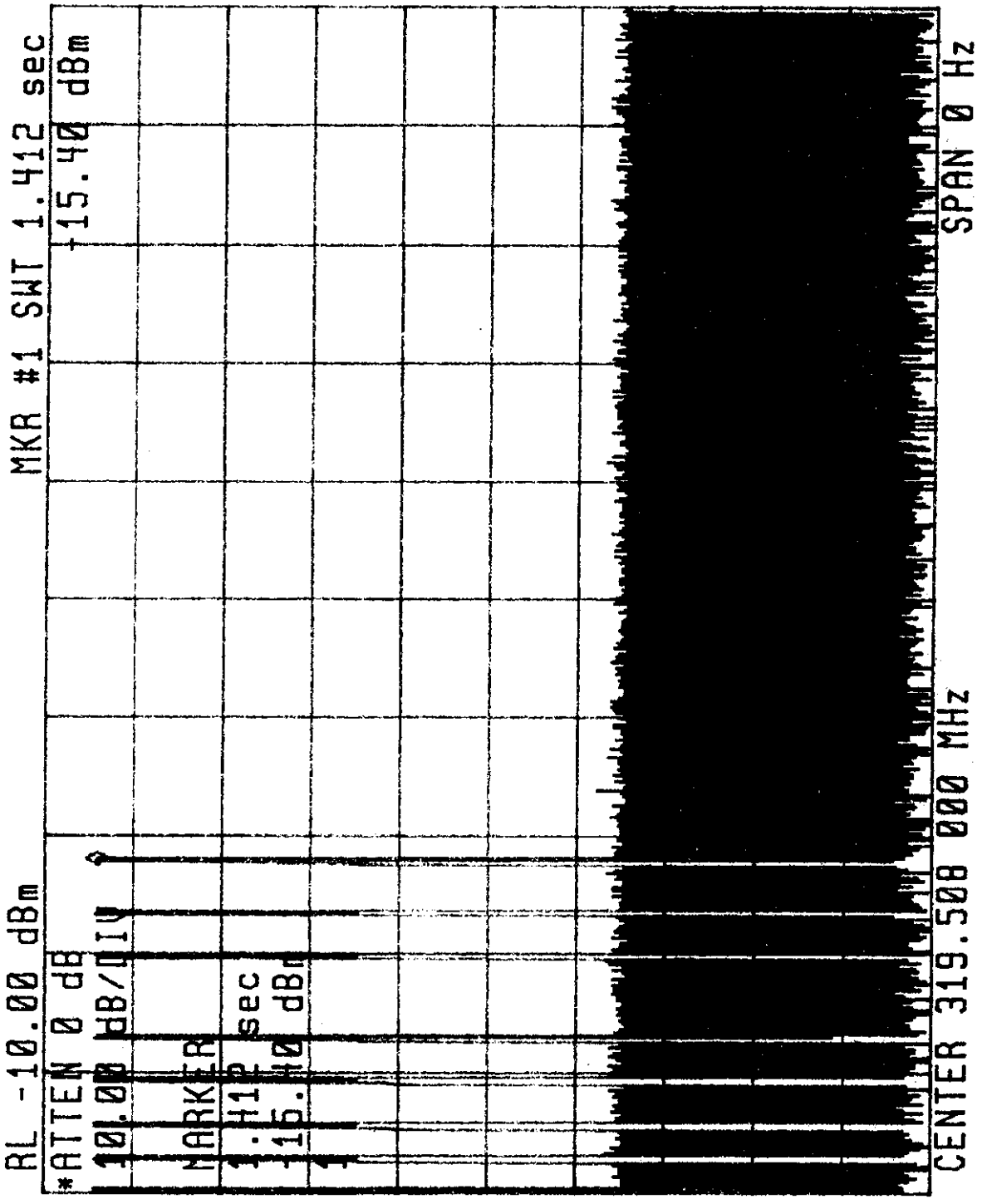
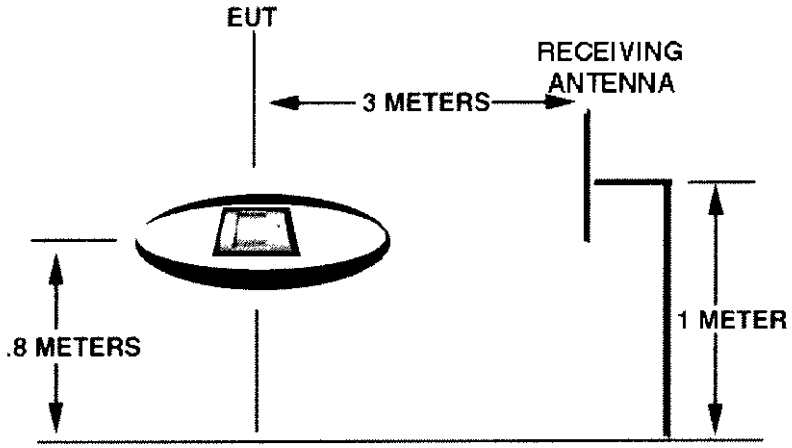


EXHIBIT 4

LABORATORY MEASUREMENT SKETCHES

RADIATED EMISSIONS



RADIATED EMISSIONS SUMMARY

The SIMON TOUCH TALK TOUCHPAD passes FCC Rules Part 15, Subpart C, Paragraph 15.231. The highest fundamental radiated emission measurement was 9.14dB below the FCC limit at 319.5MHz. The highest spurious emission measurement was 10.79dB below the FCC limit at 213MHz. The highest forbidden band emission was 28.93dB below the FCC limit at 1065MHz.

FCC EMISSIONS CALCULATION

TERMS:

ANALYZER READING (AR) (dBuV)
TOTAL LOSS FACTOR (TLF) (dB) = (ANTENNA FACTOR (AF) + CABLE LOSS (CL))
DUTY CYCLE CORRECTION (DC) (dB) = AVERAGE ON TIME OF DATA

EXAMPLE:

ANALYZER READING = 70dBuV
ANTENNA FACTOR = 18.4dB
CABLE LOSS = 4.1dB
DUTY CYCLE CORRECTION = 20dB

(AR + TLF (AF + CL)) - DC = dBuV / M (70dBuV + 22.5) - 20 = 72.5dBuV / M

INVERSE LOG (dBuV/M / 20) = uV / M (72.5dBuV/M /20) = 4217uV / M

LABORATORY MEASUREMENTS

RADIATED EMISSIONS

PRODUCT DESCRIPTION: SIMON TOUCHTALK TOUCHPAD
MODEL NUMBER: B4Z-741-HHTP
FUNDAMENTAL 319.5MHz
POLARIZATION: HORIZONTAL & VERTICAL

The highest fundimental emission along with, the three highest spurious and restricted band emissions are listed below as per ANSI C63.4 paragraph 10.1.8.2.

Emissions from .009MHz to the tenth harmonic were measured as per FCC Rules Part 15, Subpart C, paragraph 15.33 (a).

FREQUENCY MHz	ANALYZER READING dBuV	20*LOG DUTY CYCLE -dB	ANTENNA FACTOR dB	FIELD STRENGTH dBM	FIELD STRENGTH uV/m	FCC LIMIT uV/M
319.5	70.55	20	16.2	66.8	2175.2	6229.7
213	50.9	20	14.2	45.1	179.9	623
426	47.25	20	17.8	45.1	178.9	623
106.5	54.4	20	10.5	44.9	175.8	623
1065	16.35	20	28.7	25.1	17.9	500
1491	13.1	20	31.1	24.2	16.2	500
1704	11.85	20	32.2	24.1	15.9	500

75.9

AMBIENT LEVEL IN FORBIDDEN BANDS

Noise floor of spectrum analyzer with antenna factors and duty cycle correction converted to uV/M at approximately one meter. 15.205(a) All forbidden band information is listed below. All measurements were taken with an HP 8566B Spectrum Analyzer. The bandwidth was 100kHz for measurements below 100MHz. The bandwidth was 1MHz for measurements above 1000MHz. The video filter was off. *Calculated based on 2400/F (kHz) x 300. (See Rule 15.209.)

FREQUENCY MHz	NOISE FLOOR READING dBuV	20 LOG DUTY CYCLE dB	LOSS FACTOR dB	FIELD STRENGTH uV/M	FCC LIMIT uV/M
.09-.11	N.A.	N.A.	N.A.	N.A.	*
.49-.51	N.A.	N.A.	N.A.	N.A.	*
2.1735-2.1905	N.A.	N.A.	N.A.	N.A.	300
8.362-8.366	N.A.	N.A.	N.A.	N.A.	300
13.36-13.41	N.A.	N.A.	N.A.	N.A.	300
25.5-25.67	N.A.	N.A.	N.A.	N.A.	300
37.5-38.25	N.A.	N.A.	N.A.	N.A.	300
73-75.4	N.A.	N.A.	N.A.	N.A.	300
108-121.94	N.A.	N.A.	N.A.	N.A.	450
123-138	N.A.	N.A.	N.A.	N.A.	450
149.9-150.05	N.A.	N.A.	N.A.	N.A.	450
156.7-156.9	N.A.	N.A.	N.A.	N.A.	450
162.0125-167.17	N.A.	N.A.	N.A.	N.A.	450
167.72-173.2	N.A.	N.A.	N.A.	N.A.	450
240-285	N.A.	N.A.	N.A.	N.A.	600
322-335.4	-5.2	-20	23.8	0.9	600
399.9-410	-6.8	-20	22.1	0.6	600
608-614	-5.6	-20	24.6	0.9	600
960-999	-5.75	-20	33.4	2.4	600
999-1240	-4.85	-20	26	1.1	1500
1300-1427	-4.85	-20	28	1.4	1500
1435-1626.5	-6.7	-20	28	1.2	1500
1660-1710	-6.7	-20	28	1.2	1500
1717.8-1722.2	-6.7	-20	28	1.2	1500
2200-2300	-5.75	-20	32	2.1	1500
2310-2390	-5.75	-20	32	2.1	1500
2483.5-2500	-4.65	-20	32	2.3	1500
2655-2900	-4.65	-20	34	2.9	1500
3260-3267	NA	NA	NA	NA	1500
3332-3339	NA	NA	NA	NA	1500
3345.8-3358	NA	NA	NA	NA	1500
3600-4400	NA	NA	NA	NA	1500

TEST FACILITY DATA SHEETS
NOISE FLOOR MEASUREMENTS

T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

Large Test Site
10 Meter Antenna Distance
Equipment Under Test:
ITI
SIMON TOUCH TALK TOUCHPAD
Notes: MODEL: 55-741.

Report W8374 Run 2
Date 08-17-98 Page 1
Engineer _____
Tech: JCS_____
Requester_____

Frequency MHz	Level dBuV	Factor dB	Cable dB	Final dBuV/m	Az deg	Polar\ Height	Delta	Delta
106.5	34.4	9.3	1.2	45	--	V --		
106.42	54.5	9.3	1.2	65.1	--	H --		
212.92	50.9	12.5	1.7	65.1	--	H --		
319.42	70.55	14	2.1	86.6	--	H --		
425.92	47.25	15.5	2.6	65.3	--	H --		
532.43	28.4	17.2	2.8	48.4	--	H --		
638.93	28.35	21.1	3	52.5	--	H --		
745.43	22.2	21.1	3.6	46.9	--	H --		
851.93	21.65	21.4	3.7	46.8	--	H --		
958.44	7.95	22.8	4.2	35	--	H --		

NOTE: THE ABOVE MEASUREMENTS WERE MADE WITH REW BW = 100 KHZ

THE FOLLOWING MEASUREMENTS ARE WITH 1 MHZ RES BW:

1064.9	16.35	23.9	4.8	45.1	--	V --		
1171.4	8.6	24.3	5	37.9	--	V --		
1277.9	14.8	24.7	5.2	44.7	--	H --		
1384.4	11.75	25.1	5.4	42.2	--	H --		
1490.9	13.1	25.5	5.6	44.2	--	H --		
1597.4	7.85	25.9	5.8	39.5	--	H --		
1703.9	11.85	26.2	6	44.1	--	H --		
1810.4	11.5	26.6	6.2	44.3	--	H --		
1916.9	5.4	27	6.4	38.8	--	H --		

T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

Large Test Site
3 Meter Antenna Distance
Equipment Under Test:
ITI
SIMON TOUCH TALK TOUCHPAD
Notes: MODEL: 55-741.

Report W8374 Run 3
Date 08-17-98 Page 1
Engineer _____
Tech: JCS_____
Requester_____

Frequency MHz	Level dBuV	Factor dB	Cable dB	Final dBuV/m	Az deg	Polar\ Height		Delta	Delta
2023.4	3.25	27.4	6.4	37	--	H	--		
2129.9	8.05	27.6	9.3	45	--	H	--		
2236.4	.35	27.8	12	40.1	--	H	--		
2342.9	3.3	28.1	12.1	43.5	--	H	--		
2449.4	1.9	28.3	9.9	40.1	--	H	--		
2555.9	4.25	28.7	7.5	40.4	--	V	--		
2555.9	4.6	28.7	7.5	40.8	--	H	--		
2662.4	7.7	29.2	6.3	43.2	--	H	--		
2768.9	7.55	29.7	5.6	42.9	--	H	--		
2875.4	-.9	30.2	5.4	34.7	--	H	--		
2981.9	3	30.7	5.4	39.1	--	H	--		
3088.4	2.8	30.9	5.3	39.1	--	V	--		
3194.8	2.45	31.1	5.4	38.9	--	H	--		

END OF HARMONIC MEASUREMENTS.

T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

Large Test Site
3 Meter Antenna Distance
Equipment Under Test:
ITI
NOISE FLOOR
Notes:

Report W8374 Run 6
Date 08-17-98 Page 1
Engineer _____
Tech: JCS _____
Requester _____

Frequency MHz	Level dBuV	Factor dB	Cable dB	Final dBuV/m	Az deg	Polar\ Height		Delta	Delta
1499.9	-6.7	25.5	3.8	22.6	--	H	--		
2000	-5.75	27.3	6.1	27.6	--	H	--		
2499.9	-4.65	28.4	8.6	32.4	--	H	--		
2999.9	-4.8	30.8	5.4	31.4	--	H	--		
3500	-2.6	31.5	5.6	34.5	--	H	--		
4000	-6.05	32.6	6.3	32.9	--	H	--		
4500	-3.65	32.3	6.5	35.1	--	H	--		
300	-5.2	14.1	1.5	10.4	--	H	--		
400	-6.8	17.8	1.8	12.8	--	H	--		
500	-4.35	18.2	2	15.9	--	H	--		
600	-5.6	19.6	2.2	16.2	--	H	--		
700	-6.3	20	2.4	16.1	--	H	--		
800	-7.4	21.6	2.6	16.8	--	H	--		
900	-5.75	22.3	2.8	19.4	--	H	--		
1000	-4.85	24.2	3	22.3	--	H	--		
30	-4.4	12.6	.5	8.7	--	H	--		
106.35	-5.65	10.2	.9	5.5	--	H	--		
200	-8.45	14.5	1.3	7.3	--	H	--		

END OF NOISE FLOOR MEASUREMENTS.

PRODUCT DESCRIPTION

The Touchtalk transmitter is on off keyed transmitting pulse width encoded digital data packets. The transmitter is based on a simple phase lock loop (PLL) synthesizer deriving a 319.5 MHz carrier from a 13.3125 MHz crystal. A single integrated circuit (U2) contains the phase detector, programmable counters, voltage controlled oscillator (VCO), and rf amplifiers. The PLL is turned on by the microprocessor prior to the rf amplifiers being enabled to allow time for the loop to lock. The carrier signal outputted at U2, pin 5 is applied to the amplifier through a band- pass filter consisting of L4 and C11. The rf amplifiers are on off keyed by the tranmitter data signal applied to Q3.

NOTE: See schematic on page 37.

EM MICROELECTRONIC-MARIN SA

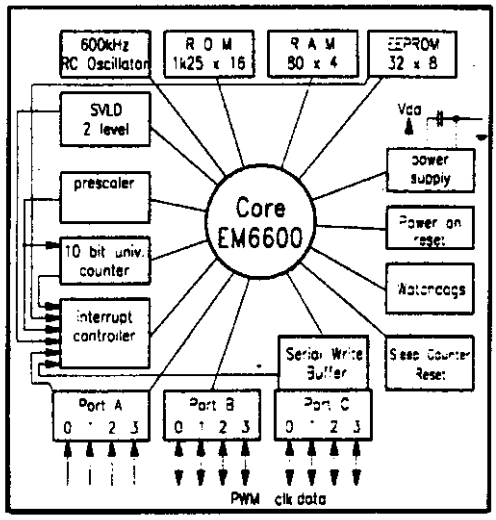
une société de la SMH

EM6640 4 bit Microcontroller

Features

- Low Power - 28µA active mode
  - 11µA standby mode
  - 0.3µA sleep mode
  @ 1.8V, 600kHz, 25°C, typ
- Voltage Range - 1.8 to 3.6 V
- Supply voltage level detection (SVLD)
- ROM - 1k25 × 16
- RAM - 80 × 4
- EEPROM - 32 x 8
- 2 clocks per instruction cycle
- 72 basic instructions
- RC oscillator
- Oscillation detection circuit / Digital watchdog timer reset.
- max. 12 inputs (3 ports)
- max. 8 outputs (2 ports)
- Serial Write Buffer - 256 bits (SWB)
- 10 bit up/down counter with PWM capability
- frequency output 600kHz, 37.5kHz, 2.3kHz, PWM
- Sleep Counter Reset (SCR) programmable.
- 8 internal interrupt sources (3×prescaler, 2×timer ,1xSWB, 1×SVLD, 1xEEPROM)
- 4 external interrupt sources (port A)
- Reset with input combinations

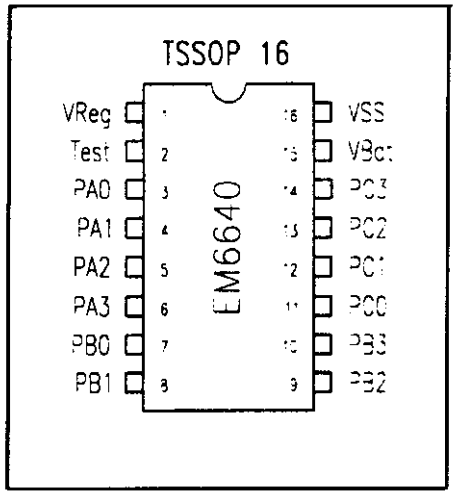
Figure 1 Architecture



Description

The EM66XX series is an advanced single chip low cost CMOS 4-bit microcontroller. It contains ROM, RAM, EEPROM, watchdog timer, oscillation detection circuit, 10 bit up/down counter, prescaler, supply voltage level detector (SVLD), sleep counter reset (SCR), frequency output and SWB.
The low voltage feature and low power consumption make it the most suitable controller for battery, stand alone and mobile equipment. The EM66XX series is manufactured using EM's Advanced Low Power (ALP) CMOS Process.

Figure 2 Pin Configuration



Typical Applications

- remote controls
- medical applications
- domestic appliance
- safety and security devices
- measurement equipment
- interactive system
- keyless entry with rolling code

PRODUCT SCHEMATICS

* **NOTE:** Schematics give pertinent information on oscillators, frequency blocks and microprocessors.