25D82T

CKC LABORATORIES, INC.
Testing the Future

EXHIBIT D

CKC TEST REPORT

5473A CLOUDS REST • MARIPOSA, CALIFORNIA 95338 • (209) 966-5240 • FAX (209) 966-4257

ACCREDITED

CERTIFICATION TEST REPORT

FOR THE

TRANSMITTER, 8072

FCC PART 15 SUBPART C

COMPLIANCE

DATE OF ISSUE: OCTOBER 12, 1998

PREPARED FOR:

DoorKing
120 Glasgow Avenue
Inglewood, CA 90301

P.O. No: 24822
W.O. No: 69774

Report No: **FC98-025**

PREPARED BY:

Joyce Walker
CKC Laboratories, Inc.
5473A Clouds Rest
Mariposa, CA 95338

Date of test: September 4 & 17

DOCUMENTATION CONTROL:

Tracy Phillips
Documentation Control Supervisor
CKC Laboratories, Inc.

APPROVED BY:

Dennis Ward
Director of Laboratories
CKC Laboratories, Inc.

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ADMINISTRATIVE INFORMATION

DATE OF TEST:	September 4 & 17
PURPOSE OF TEST:	To demonstrate the compliance of the Transmitter, 8072, with the FCC Part 15 Subpart C devices.
MANUFACTURER:	DoorKing 120 Glasgow Avenue Inglewood, CA 90301
REPRESENTATIVE:	Patrick Kochie
TEST LOCATION:	CKC Laboratories, Inc. 110 Olinda Place Brea, CA 92621
TEST PERSONNEL:	Stu Yamamoto
TEST METHOD:	ANSI C63.4 1992
FREQUENCY RANGE TESTED:	30 MHz – 4180 MHz
EQUIPMENT UNDER TEST:	**Garage Door Opener Transmitter** Manuf: DoorKing, Inc. Model: 8072 Serial: 1012345

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SUMMARY OF RESULTS

The DoorKing Transmitter, 8072, was tested in accordance with ANSI C63.4 1992 for compliance with FCC Part 15 Subpart C.

As received, the above equipment was found to be fully compliant with the limits of FCC Part 15 Subpart C. The results in this report apply only to the items tested, as identified herein.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Hand held remote garage door transmitter.

MEASUREMENT UNCERTAINTY

Associated with data in this report is a ±4dB measurement uncertainty.

EUT OPERATING FREQUENCY

The EUT was operating at 417 – 418 MHz.

TEMPERATURE AND HUMIDITY DURING TESTING

The temperature during testing was within +15°C and + 35°C.
The relative humidity was between 20% and 75%.

PERIPHERAL DEVICES

The EUT was not tested with any peripheral devices.

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REPORT OF MEASUREMENTS

The following Tables 1 - 3 report the highest emissions levels recorded during the tests performed on the Transmitter, 8072. The data sheets from which these tables were compiled are contained in Appendix B.

Table 1: Highest Fundamental Maximized Emission Readings

FREQUENCY MHz	METER READING dBµV	CORRECTION FACTORS Ant dB	Amp dB	Cable dB	Dist DB	CORRECTED READING DBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
417.059	78.9	15.8	-28.2	5.0		71.5	79.4	-7.9	HA
417.059	94.3	15.8	-28.2	5.0		86.9	79.4	7.5	H
417.155	77.5	15.8	-28.2	5.0		70.1	79.4	-9.3	VA
417.155	92.9	15.8	-28.2	5.0		85.5	79.4	6.1	V

Test Method: ANSI C63.4 1992
Spec Limit : 15.231 (b)
Test Distance: 3 Meters

NOTES:
H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: The EUT is the transmitter portion (418 MHz) of a garage door opening system. The EUT is stand alone on the tabletop. Power to EUT is supplied by an internal battery. The EUT was tested in 3 different orthogonal planes. The transmitter is transmitting at 418 MHz. Temperature: 20°C Humidity: 62%.

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Table 2: Six Highest Spurious Maximized Emission Levels

FREQUENCY MHz	METER READING dBµV	CORRECTION FACTORS Ant dB	Amp DB	Cable dB	Dist dB	CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
1668.368	58.3	28.9	-40.2	7.1		54.1	59.4	-5.3	H
2085.664	53.8	31.3	-40.0	8.0		53.1	59.4	-6.3	V
2919.576	48.3	32.6	-39.4	9.4		50.9	59.4	-8.5	H
3337.184	47.5	33.5	-39.7	10.0		51.3	59.4	-8.1	V
4587.728	45.7	35.0	-40.0	11.1		51.8	59.4	-7.6	V
4589.072	45.6	35.0	-40.0	11.1		51.7	59.4	-7.7	H

Test Method: ANSI C63.4 1992
Spec Limit : 15.231 (b)
Test Distance: 3 Meters

NOTES:
H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: The EUT is the transmitter portion (418 MHz) of a garage door opening system. The EUT is stand alone on the tabletop. Power to EUT is supplied by an internal battery. The EUT was tested in 3 different orthogonal planes. The transmitter is transmitting at 418 MHz. Temperature: 20°C Humidity: 62%.

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Table 3: Six Highest Radiated Emission Levels

FREQUENCY MHz	METER READING dBµV	CORRECTION FACTORS Ant dB	Amp DB	Cable dB	Dist dB	CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
36.101	31.1	17.4	-28.1	1.2		21.6	40.0	-18.4	V
39.711	33.2	16.0	-28.1	1.2		22.3	40.0	-17.7	V
43.325	33.0	13.9	-28.0	1.2		20.1	40.0	-19.9	H
45.126	31.3	12.9	-28.0	1.4		17.6	40.0	-22.4	V
46.931	36.1	12.2	-28.0	1.4		21.7	40.0	-18.3	V
48.736	35.1	11.5	-27.9	1.4		20.1	40.0	-19.9	V

Test Method: ANSI C63.4 1992
Spec Limit : FCC Class B
Test Distance: 3 Meters

NOTES:
H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: The EUT is the transmitter portion (418 MHz) of a garage door opening system. The EUT is stand alone on the tabletop. Power to EUT is supplied by an internal battery. The transmitter is transmitting at 417 MHz. The data below represents the worst case of EUT emissions from either standby or transmit mode. The EUT was tested in 3 different orthogonal planes. Temperature: 22°C Humidity: 60%.

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TABLE A

LIST OF TEST EQUIPMENT

1. Spectrum Analyzer, Hewlett Packard, Model No. 8568A, S/N 2049A01287. Display 85680A S/N 2106A02109.
2. Preamp, Hewlett Packard, Model No. 8447D, S/N 1937A02548.
3. Quasi-Peak Adapter, Hewlett Packard, Model No. 85650A, S/N – 3303A01884.
4. Biconical Antenna, A & H Systems, Model No. SAS-200/540, S/N 220.
5. Log Periodic Antenna, A & H Systems, Model No. SAS-200/516, S/N 331.
6. Horn Antenna, Emco, Model No. 3115, S/N 4683.
7. LISN, Solar Electronics, Model No. 50 uH, S/N Brea #2.
8. Test software, EMI Test 2.91.

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EUT SETUP

The equipment under test (EUT) was setup in a manner that represented their normal use. Any special conditions required for the EUT to operate normally are identified in the comments that accompany Tables 1 for fundamental emissions, Table 2 for spurious emissions and Table 3 for maximized emissions.

During radiated emissions testing, the EUT was mounted on a nonconductive, rotating table 80 cm above the conductive grid. The nonconductive table dimensions were 1 meter by 1.5 meters. This configuration is typical for radiated emissions testing of table top devices.

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Table A were used to collect radiated emissions data for the Transmitter, 8072. For radiated measurements below 300 MHz, the biconical antenna was used. For frequencies from 300 to 1000 MHz, the log periodic antenna was used. For frequencies above 1000 MHz, the horn antenna was used. All antennas were located at a distance of 3 meters from the edge of the EUT.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dBμV, and a vertical scale of 10 dB per division.

TABLE B : ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE

TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	4.18 GHz	1 MHz

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SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in Tables 1 - 3 indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the six highest readings, this is indicated as a "Q" or an "A" in Tables 1 – 3. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data for the Transmitter, 8072.

Peak

In this mode, the Spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP 85650A Quasi-Peak Adapter for the HP 8568B Spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual were followed.

Average

When the frequencies exceed 1 GHz, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

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TEST METHODS

The radiated emissions data of the Transmitter, 8072, was taken with the HP Spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the "Sample Calculations". The corrected data was then compared to the FCC Part 15, Subpart C, Section B emissions limits to determine compliance.

Preliminary and final measurements were taken in order to better ensure that all emissions from the EUT were found and maximized.

Radiated Emissions Testing

During the preliminary radiated scan, the EUT was powered up and operating in its defined FCC test mode. The frequency range of 30 MHz - 88 MHz was then scanned with the biconical antenna located about 1.5 meter above the ground plane in the vertical configuration. During this scan, the turntable was rotated and all peaks which were at or near the limit were recorded. The frequency range of 100 - 300 MHz was scanned with the biconical antenna in the same manner, and the peaks recorded. Lastly, a scan of the FM band from 88 - 110 MHz was made, using a reduced resolution bandwidth and a reduced frequency span. The biconical antenna was changed to the horizontal polarity and the above steps were repeated. After changing to the log periodic antenna in the horizontal configuration, the frequency range of 300 - 1000 MHz was scanned. The log periodic antenna was changed to the vertical polarity and the frequency range of 300 - 1000 MHz was again scanned. For frequencies above 1000 MHz, the horn antenna was used. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

A thorough scan of all frequencies was manually made using a small frequency span, rotating the turntable as needed. Comparison with the previously recorded measurements was then made.

Using the peak readings from both scans as a guide, the test engineer then maximized the readings with respect to the table rotation and antenna height. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

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SAMPLE CALCULATIONS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in Tables 1 - 3. For radiated emissions in dBμV/m, the spectrum analyzer reading in dBμV was corrected by using the following formula:

Meter reading (dBμV)
+ Antenna Factor (dB)
+ Cable Loss (dB)
- Distance Correction (dB)
- Pre-amplifier Gain (dB)

= Corrected Reading(dBμV/m)

This reading was then compared to the applicable specification limit to determine compliance.

A typical data sheet will display the following in column format:

#	Freq MHz	Rdng dBuV	Cable	Pream	Bicon	Horn	Log	Dist	Corr dBuV/m	Spec	Margin	Polar

means reading number
Freq MHz is the frequency in MHz of the obtained reading.
Rdng dBuV is the reading obtained on the spectrum analyzer in dBμV.
Pream is short for the preamplifier factor or gain in dB.
Bicon is the biconical antenna factor in dB.
Log is the log periodic antenna factor in dB.
Horn is the horn antenna factor in dB.
Cable is the cable loss in dB of the coaxial cable on the OATS.
Dist is the distance factor (in dB). It is used when testing at a different test distance than the one stated in the spec.
Corr dBμV/m is the corrected reading which is now in dBμV/m (field strength).
Spec is the specification limit (dB) stated in the agency's regulations.
Margin is the closeness to the specified limit in dB; + is over and - is under the limit.
Polar is the Polarity of the antenna with respect to earth.

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TRANSMITTER CHARACTERISTICS

FCC Part 15.231 (c) - Occupied Bandwidth Measurements

In accordance with Part 15.231 (c), the bandwidth of the emission was not wider than 0.25% of the center frequency.

Frequency Range of Transmitter: 417-418

In accordance with Part 15.231 (b), the field strength of the emissions for periodic operation in the band above 70 MHz did not exceed the limits specified in 15.231 (b) at 3 meters. For average emissions measurments the provisions in 15.35 for averaging pulsed emissions and for limiting peak emissions were applied.

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APPENDIX A

INFORMATION ABOUT THE EQUIPMENT UNDER TEST

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I/O PORTS	
Type	#
None	

CRYSTAL OSCILLATORS	
Type	Freq. In MHz
SAW	418

PRINTED CIRCUIT BOARDS				
Function	Model & Rev	Clocks, MHz	Layers	Location
Main Board	8072-010	3.58	2	

REQUIRED EUT CHANGES TO COMPLY:
Install into the open C2 position, a 1pF capacitor.

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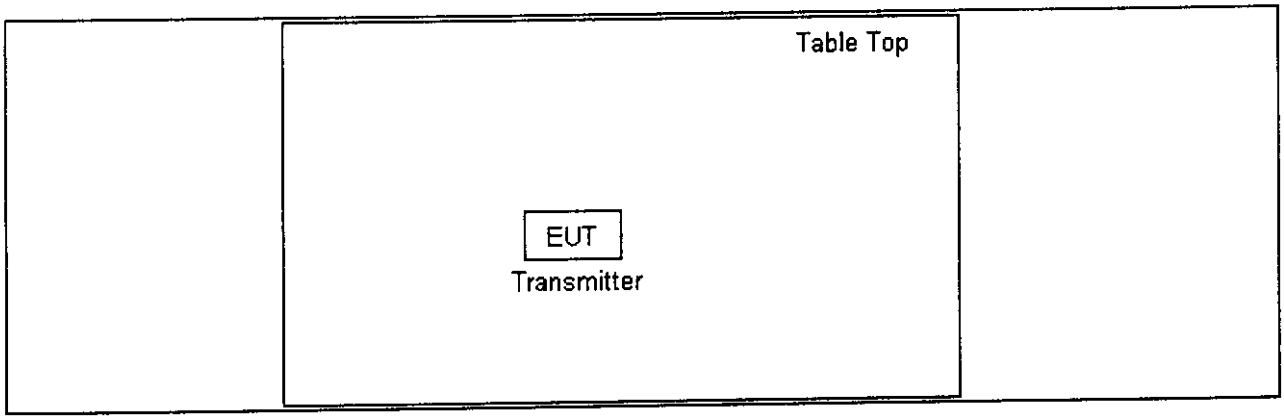
EQUIPMENT CONFIGURATION BLOCK DIAGRAM



Block Diagram

NOTES:

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APPENDIX B

MEASUREMENT DATA SHEETS

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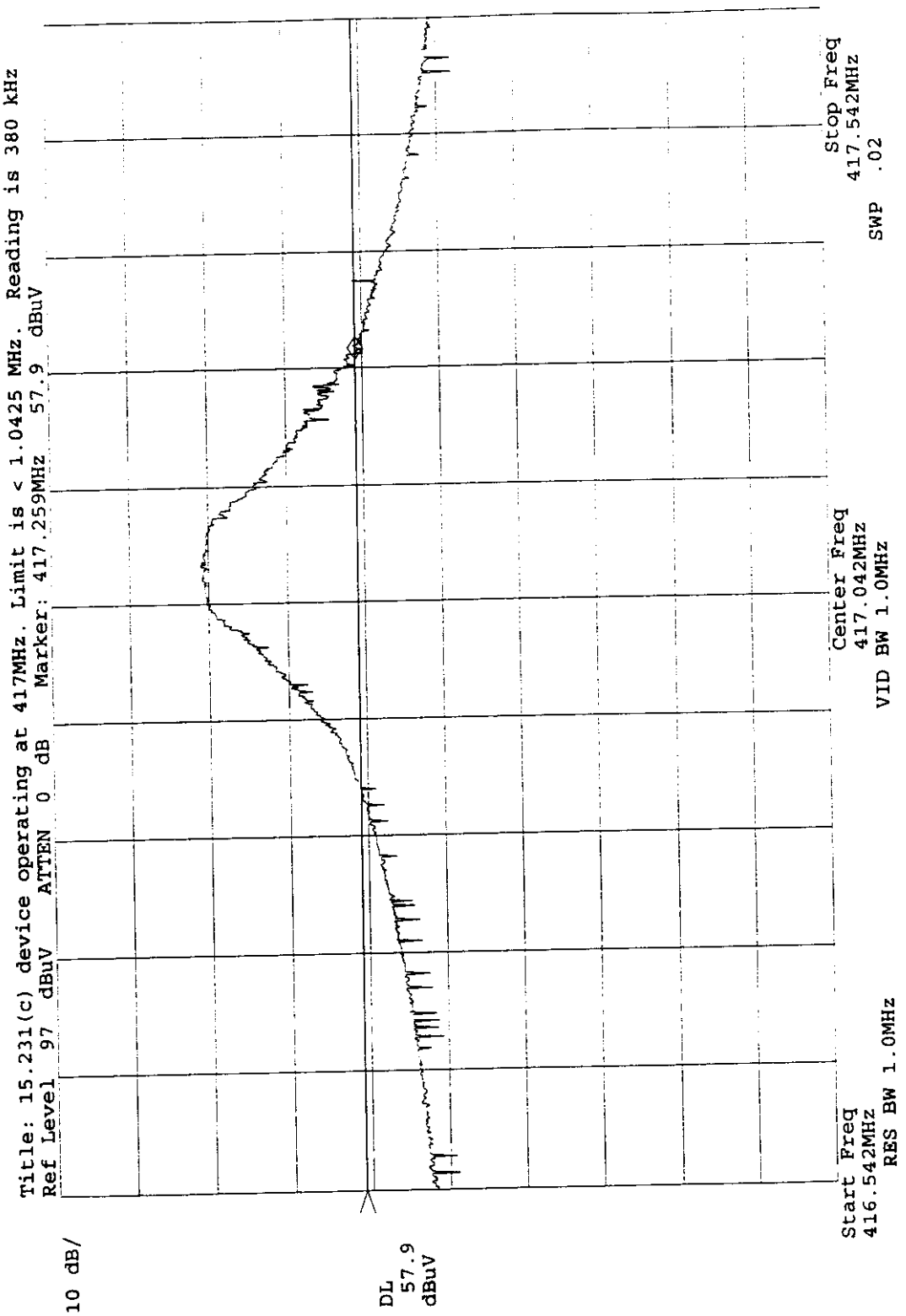
Occupied Bandwidth Plot 15.231 (c)



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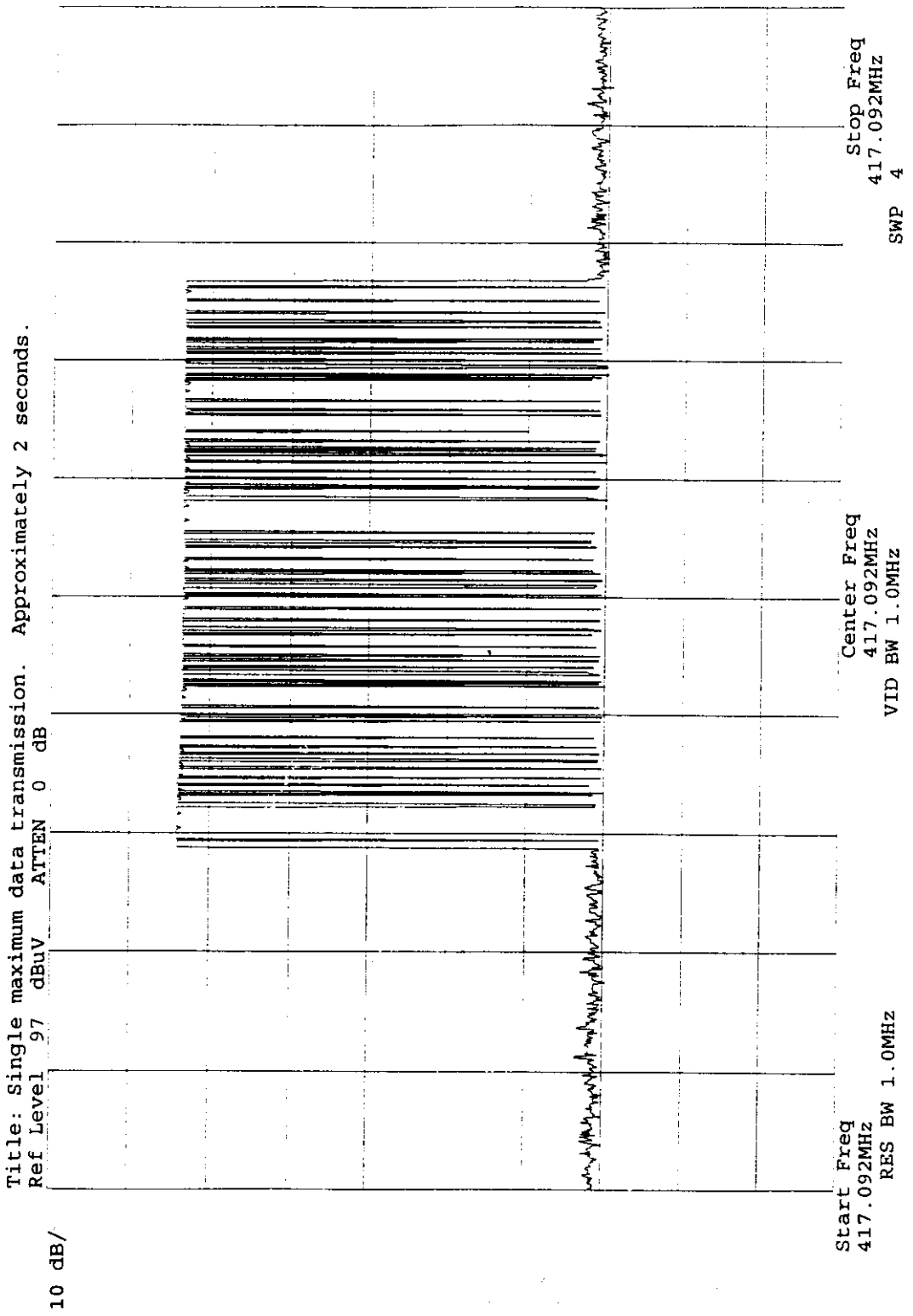
Single Maximum Data Transmission



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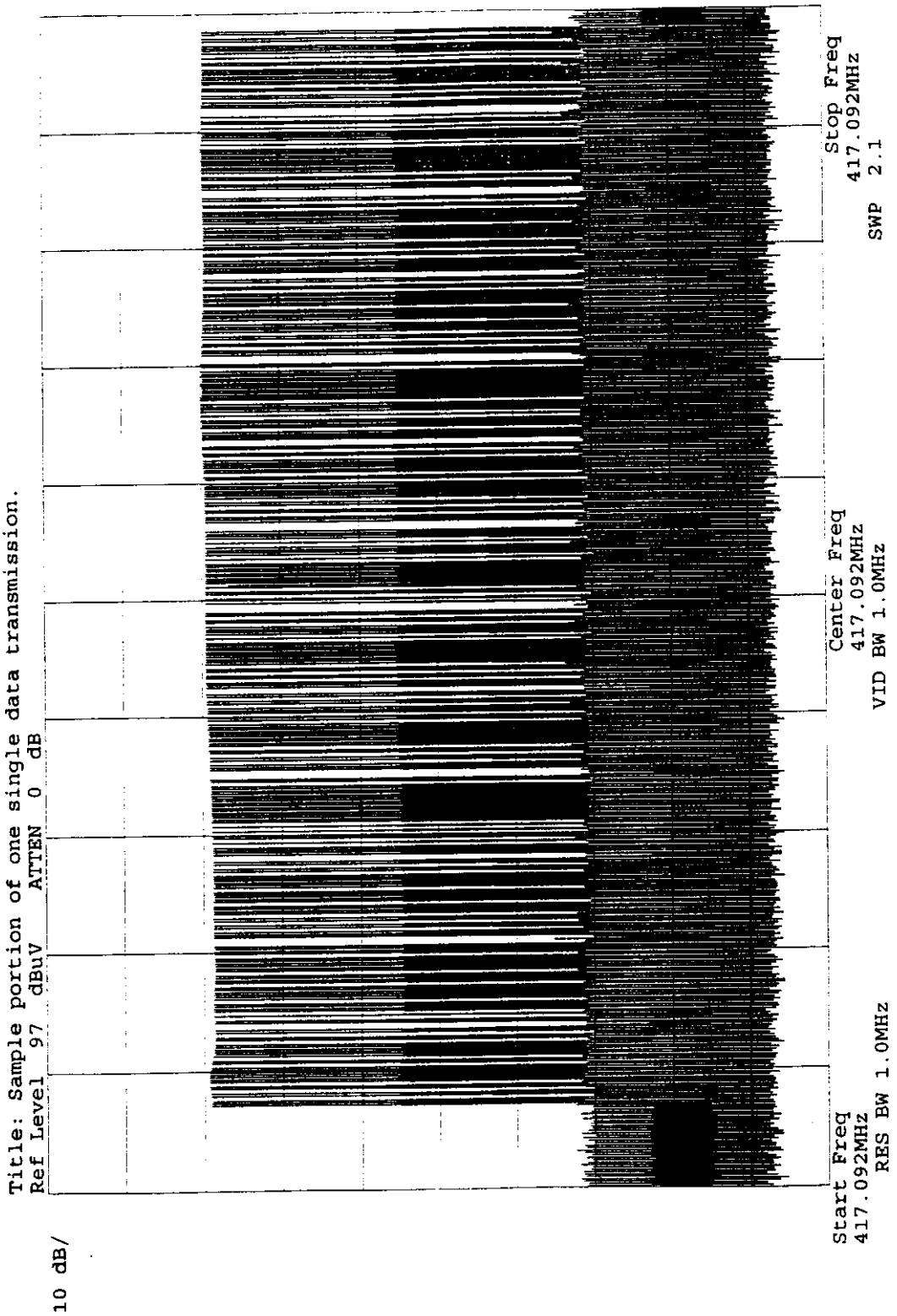
Sample Portion of One Single Data Transmission



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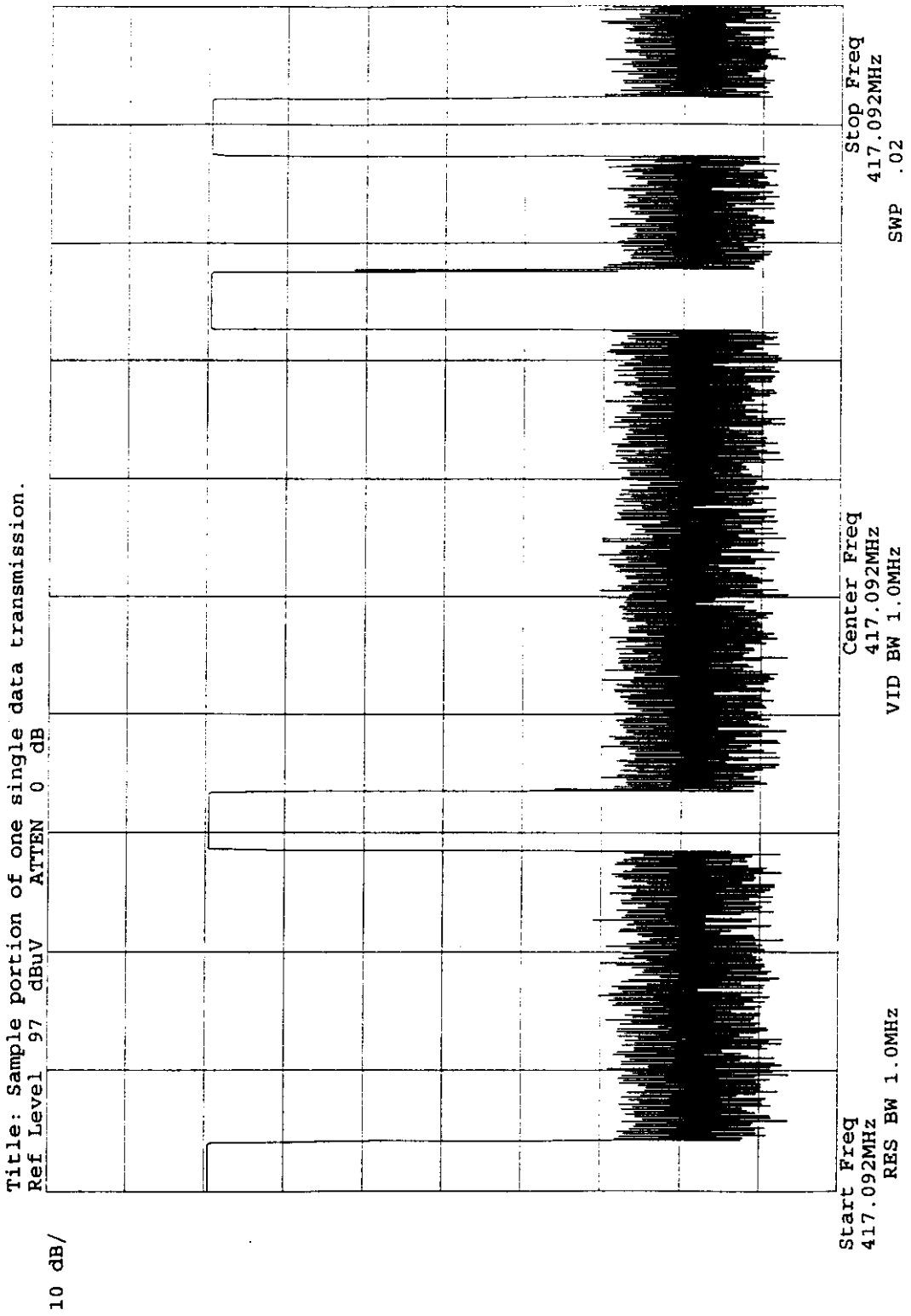
Sample Portion of One Single Data Transmission



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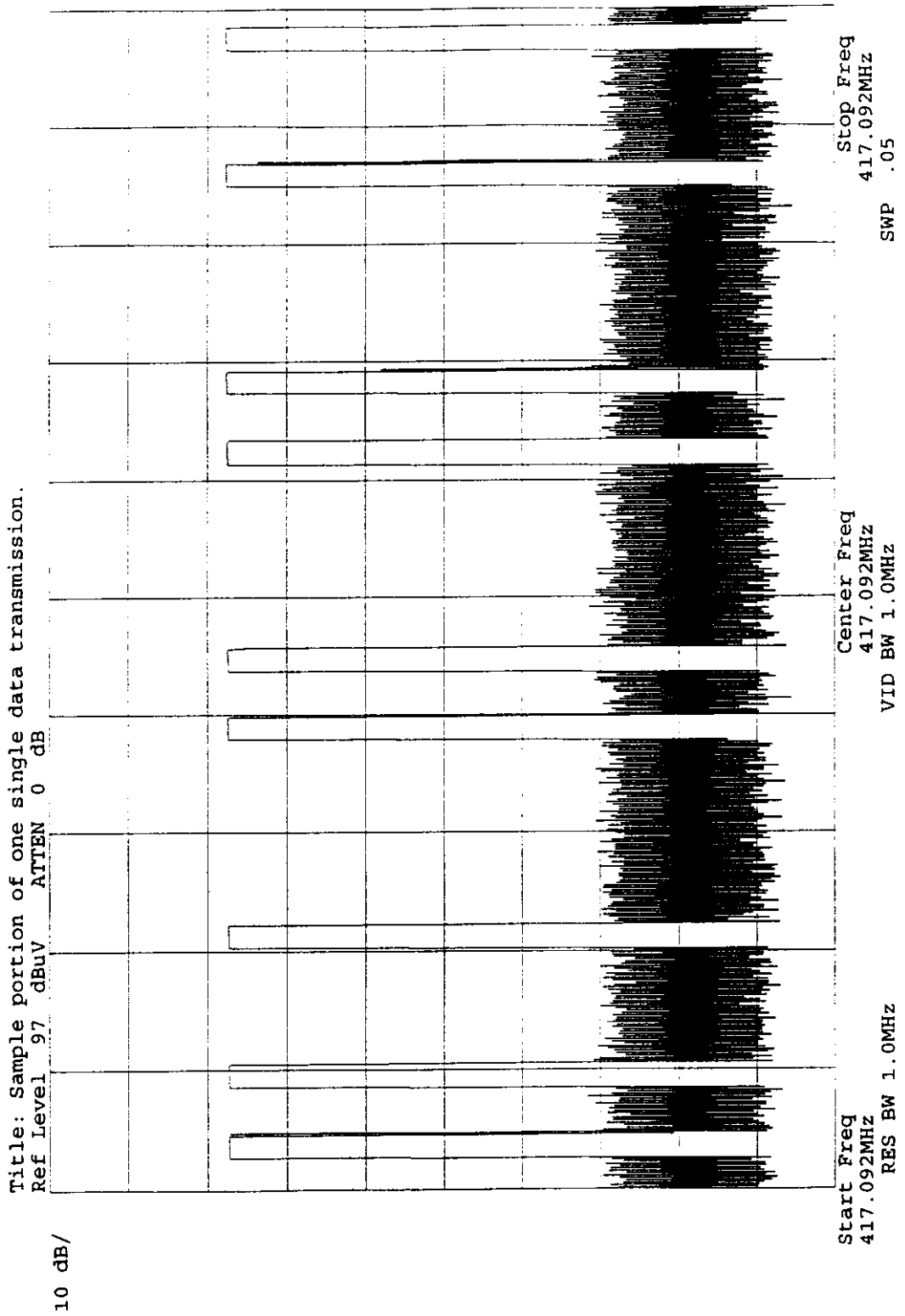
Sample Portion of One Single Data Transmission



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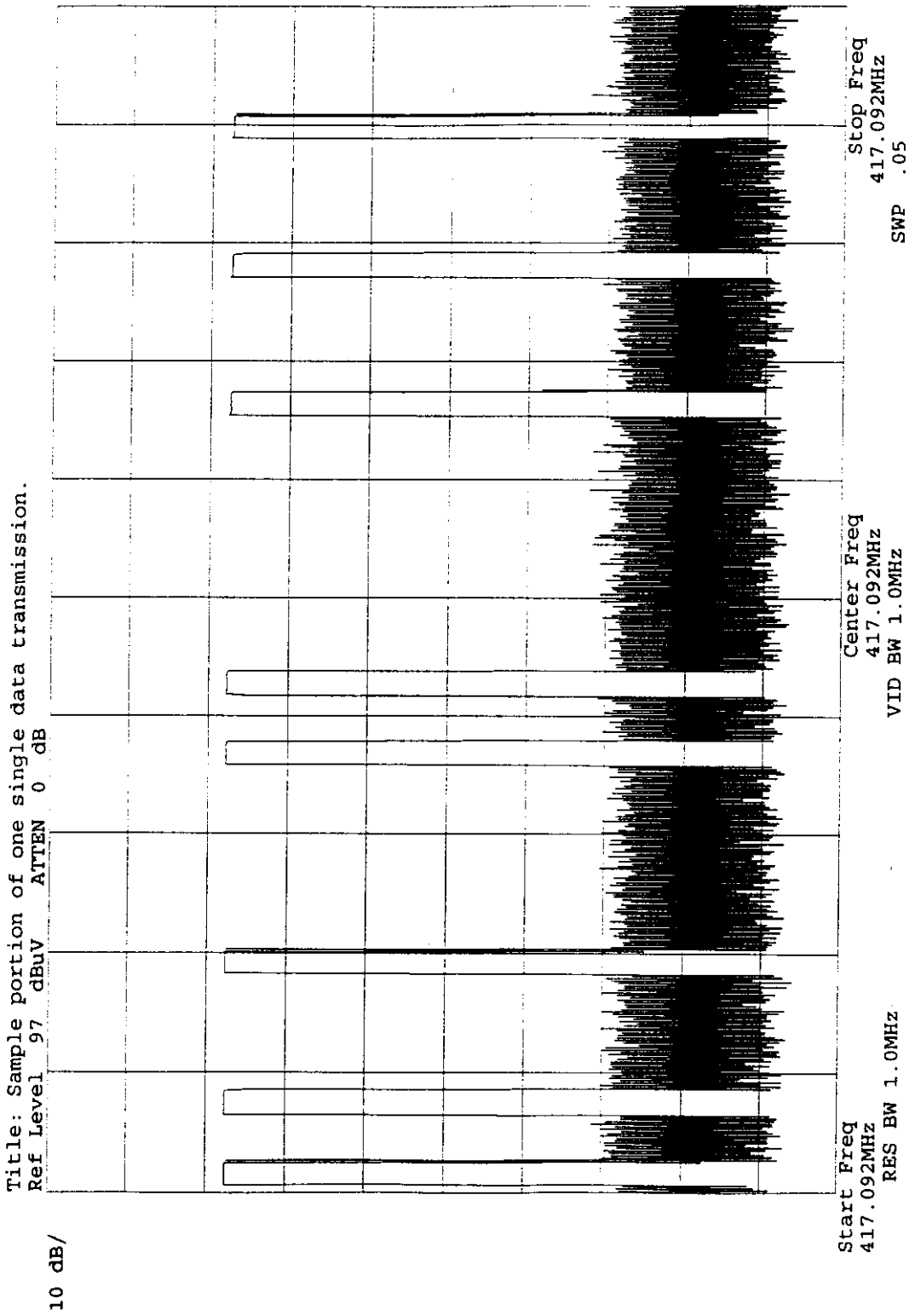
Sample Portion of One Single Data Transmission



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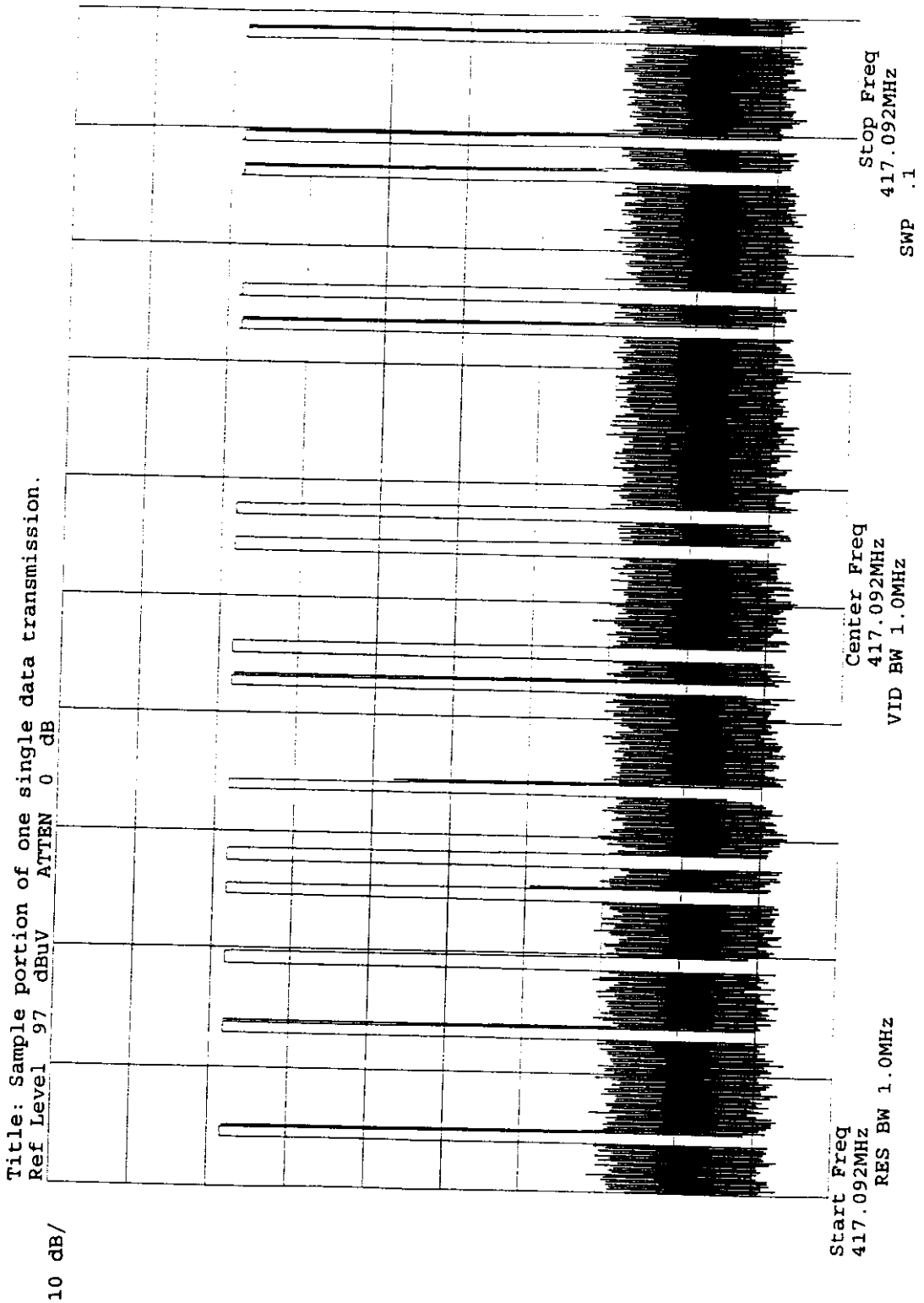
Sample Portion of One Single Data Transmission



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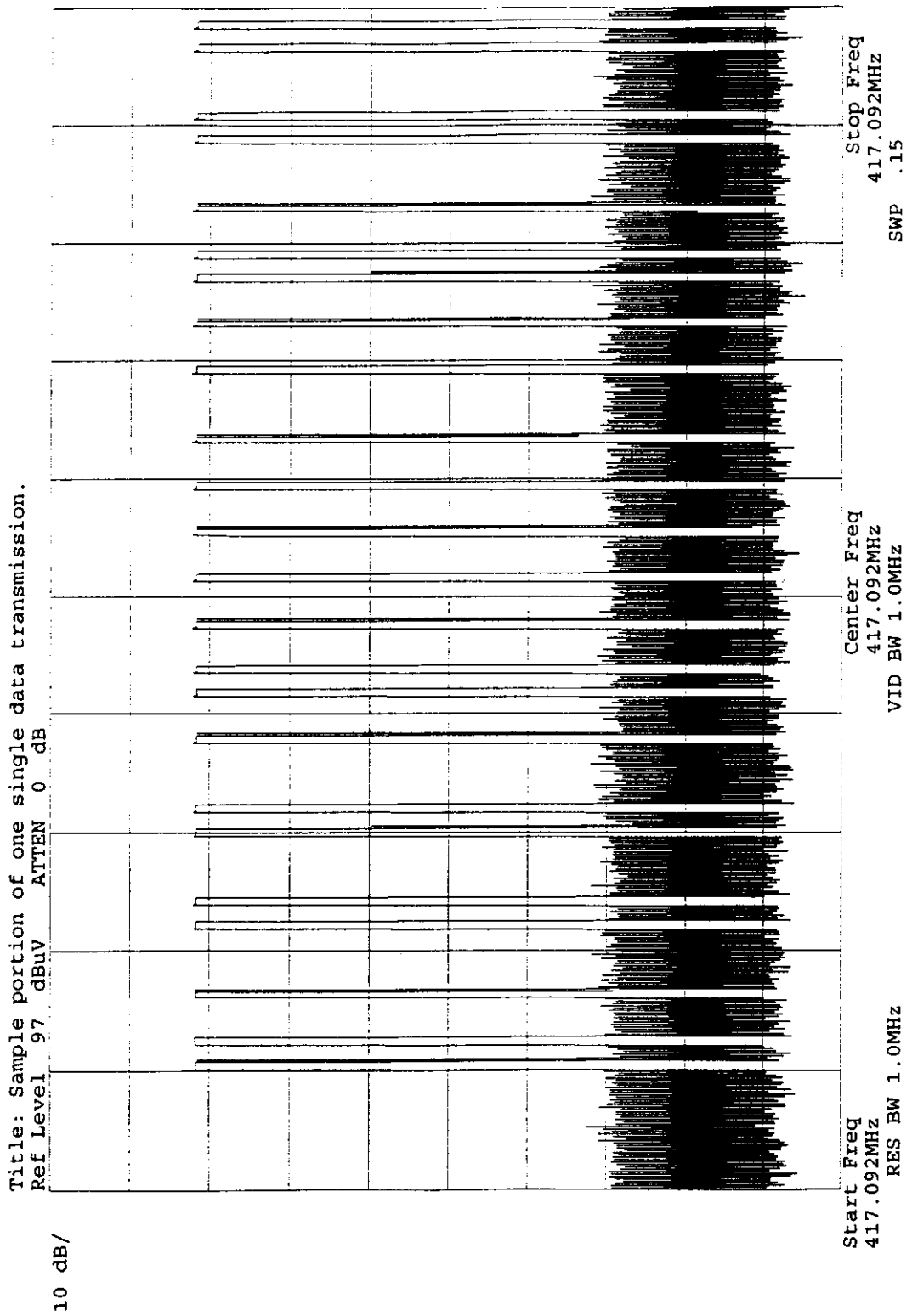
Sample Portion of One Single Data Transmission



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Test Location: CKC LABORATORIES INC • 110 N. OLINDA PL. • BREA, CA 92823 • 714-993-6112

Customer: **DoorKing, Inc.**
Specification: **15.231(b) Fundamental**
Test Type: **Maximized Emissions**
Equipment: **Garage Door Opener Transmitter**
Manufacturer: DoorKing, Inc.
Model: 8072
S/N: 1012345

Date: Sep-17-98
Time: 11:52
Sequence#: 3
Tested By: Stu Yamamoto

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Garage Door Opener Transmitter*	DoorKing, Inc.	8072	1012345

Support Devices:

Function	Manufacturer	Model #	S/N
None			

Test Conditions / Notes:

The EUT is the transmitter portion (418 MHz) of a garage door opening system. The EUT is stand alone on the tabletop. Power to EUT is supplied by an internal battery. The transmitter is transmitting at 418 MHz. The EUT was tested in 3 different orthogonal planes. Temperature: 20°C Humidity: 62%.

Measurement Data: Sorted by Margin Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV		Cable DB	Cable dB	LOG dB	Dist dB	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar
1	417.059	78.9		+4.2	+0.8	+15.8	+0.0	71.5	79.4	-7.9	Horiz
	Average		-28.2								
	15.4dB correction factor due to 17% duty cycle.										
^	417.059	94.3		+4.2	+0.8	+15.8	+0.0	86.9	79.4	+7.5	Horiz
			-28.2								
3	417.155	77.5		+4.2	+0.8	+15.8	+0.0	70.1	79.4	-9.3	Vert
	Average		-28.2								
	15.4dB correction factor due to 17% duty cycle.										
^	417.155	92.9		+4.2	+0.8	+15.8	+0.0	85.5	79.4	+6.1	Vert
			-28.2								

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11	1251.038	58.5	+1.9	+4.2	-41.0	+26.3	+0.0	49.9	59.4	-9.5	Horiz
12	3753.576	45.8	+3.0	+7.5	-40.2	+33.8	+0.0	49.9	59.4	-9.5	Vert
13	4170.952	45.1	+3.0	+7.8	-40.3	+34.2	+0.0	49.8	59.4	-9.6	Horiz
14	3752.904	45.6	+3.0	+7.5	-40.2	+33.8	+0.0	49.7	59.4	-9.7	Horiz
15	2503.016	47.6	+2.5	+6.0	-39.7	+31.8	+0.0	48.2	59.4	-11.2	Horiz
16	1250.346	53.3	+1.9	+4.2	-41.0	+26.3	+0.0	44.7	59.4	-14.7	Vert

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11	41.436	28.7	+15.0 -28.1	+1.1	+0.1	+0.0	16.8	40.0	-23.2	Horiz
12	41.517	28.5	+15.0 -28.1	+1.1	+0.1	+0.0	16.6	40.0	-23.4	Vert
13	37.907	26.4	+16.7 -28.1	+1.1	+0.1	+0.0	16.2	40.0	-23.8	Horiz
14	43.320	29.0	+13.9 -28.0	+1.1	+0.1	+0.0	16.1	40.0	-23.9	Vert
15	45.135	29.4	+12.9 -28.0	+1.2	+0.2	+0.0	15.7	40.0	-24.3	Horiz
16	63.176	30.5	+7.9 -28.0	+1.5	+0.3	+0.0	12.2	40.0	-27.8	Vert
17	79.421	30.1	+7.4 -28.2	+1.6	+0.3	+0.0	11.2	40.0	-28.8	Vert
18	66.796	29.4	+7.6 -28.0	+1.6	+0.3	+0.0	10.9	40.0	-29.1	Horiz
19	61.399	29.0	+8.1 -28.1	+1.4	+0.3	+0.0	10.7	40.0	-29.3	Horiz
20	79.382	29.3	+7.4 -28.2	+1.6	+0.3	+0.0	10.4	40.0	-29.6	Horiz

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