TEST NUMBER - 288-01

1999 CFR TITLE 47 PART 15.209 SUBPART C
IC RSS 210, ISSUE 3 Section 6.2
TESTING

for

Kronos, Inc.
300 Billerica Road
Chelmsford, MA 01824
978-244-1500

of

Kronos Proximity Card Reader

PROX CARD READER

on

October 5,2001

Tested by

Clifton P. Brick
Clifton P. Brick

Reviewed by

Larry K. Stillings
Larry K. Stillings

TABLE OF CONTENTS

- Test Description
- Test Results and Conclusions
- Test Procedures
- RSS 210 & FCC 15.209 Test Limits
- Test Facility Description
- Test Setup and Connection Information
- Test Measurements and Results
  - Radiated Measurements
  - Conducted Measurements
- Notes and Comments

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TEST DESCRIPTION

1. TEST OBJECTIVE

To test the Kronos Proximity Card Reader to FCC 15.209 and RSS 210 limits and write a report.

2. E.U.T. DESCRIPTION

GENERAL

The Kronos Proximity Card Reader PROX CARD READER is a time clock/ access control system that utilizes a transceiver module coupled with a microprocessor based system to read an access card.

SERIAL NUMBERS:

Pre-Production Unit

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Test Number - 288-01
Kronos, Inc.
Kronos Proximity Card Reader - PROX CARD READER

TEST RESULTS AND CONCLUSIONS

PRODUCT TESTED - Kronos Proximity Card Reader

MODEL NUMBER - PROX CARD READER

RADIATED TEST RESULTS

The test results show that the emissions radiated from this equipment are in compliance with **FCC 15.209 and RSS 210 Section 6.2** Rules.

CONDUCTED TEST RESULTS

The test results show that the emissions conducted from this equipment are in compliance with **FCC 15.209 and RSS 210 Section 6.2** Rules.

ANALYSIS AND CONCLUSIONS

Based upon the radiated and conducted measurements we find that this equipment is within the limits of the **FCC 15.209 and RSS 210 Section 6.2** rules. All results are based on a test of one sample, and represent other production units, only in as much as a sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required.

NOTES (Special conditions unique to this test)

None

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TEST PROCEDURES AND EQUIPMENT

1. TEST EQUIPMENT

   A. HP 8546A (9 kHz - 6.5 GHz) EMI Receiver w/ RF Filter Section
      Calibration Date: 8-28-2001, Calibrated annually.

   B. Com-Power Biconilog Antenna, Model AC220, S/N 25509.
      Calibration Date 12-9-2000, calibrated annually.

   C. EMCO LISN, Model EM 3825/2, S/N 9109-1860.
      Calibration Date: 2-22-2001, calibrated annually.

   D. EMCO 6502 Loop Antenna, Model EM6502 S/N 2197.
      Calibration Date: 6-27-2001, calibrated annually.

2. FREQUENCY RANGES TO BE SCANNED.

   A. Radiated Test from 100 kHz to 30 MHz

   B. Conducted Test 450 kHz to 30 MHz.

3. TEST PROCEDURES.

Radiated test procedure:

The EUT, associated cables and peripheral devices are placed on the supporting table with any support equipment placed off the site. The EUT is turned on and any necessary operating or test software installed and is allowed to warm up. The frequency band from 100 kHz to 1 GHz is scanned. When a signal is found the emission is maximized by varying the bundle position of the connecting cables, antenna height, antenna polarization (vertical and horizontal), the EUT is examined in 3 orthogonal planes and the table orientation (360 degrees). The maximum reading is recorded and the next signal is searched for.

All measurements are made according to the procedures defined in: "ANSI C63.4 – 1991/92 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9kHz to 40GHz."

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FCC 15.209 & IC RSS 210 Section 6.2 TEST LIMITS

Class C Radiation Limits:

Frequency MHz	Distance meters	Limit dBuV/m	Limit μV/m
0.009 – 0.490	300	20 Log (2400/F)	2400/F (kHz) Avg
0.490 – 1.705	30	20 Log (24000/F)	24000/F (kHz)
1.705 - 30	30	29.5	30
30 – 88	3	40.0	100
88 – 216	3	43.5	150
216 – 960	3	46.0	200
960 and above	3	54.0	500

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TEST FACILITY DESCRIPTION

Compliance Worldwide is located on 357 Main Street in Sandown, New Hampshire. The conducted and radiated test sites, located at C.W. are used for Federal Communications Commission (FCC) testing and Industry Canada Testing. A site description is on file with the FCC in Columbia, MD USA. Site information is also on file with Industry Canada, anyone wishing to review this Test Facility Description is referred to file number **IC 3023**. This is currently on file at Industry Canada, 1241 Clyde Avenue, Ottawa, ON K2C 1Y3.

The radiated site is a 3/10 meter indoor site with an enclosure for the product and a basement for the personnel, support equipment and test equipment.

The conducted site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical metal wall required by EN 55022.

Both sites are designed to test products or systems 1.5 meter x 1.0 meter, floor standing or table top.

DATE ON FILE FCC: August 10, 2000

DATE ON FILE IC: August 11, 2000

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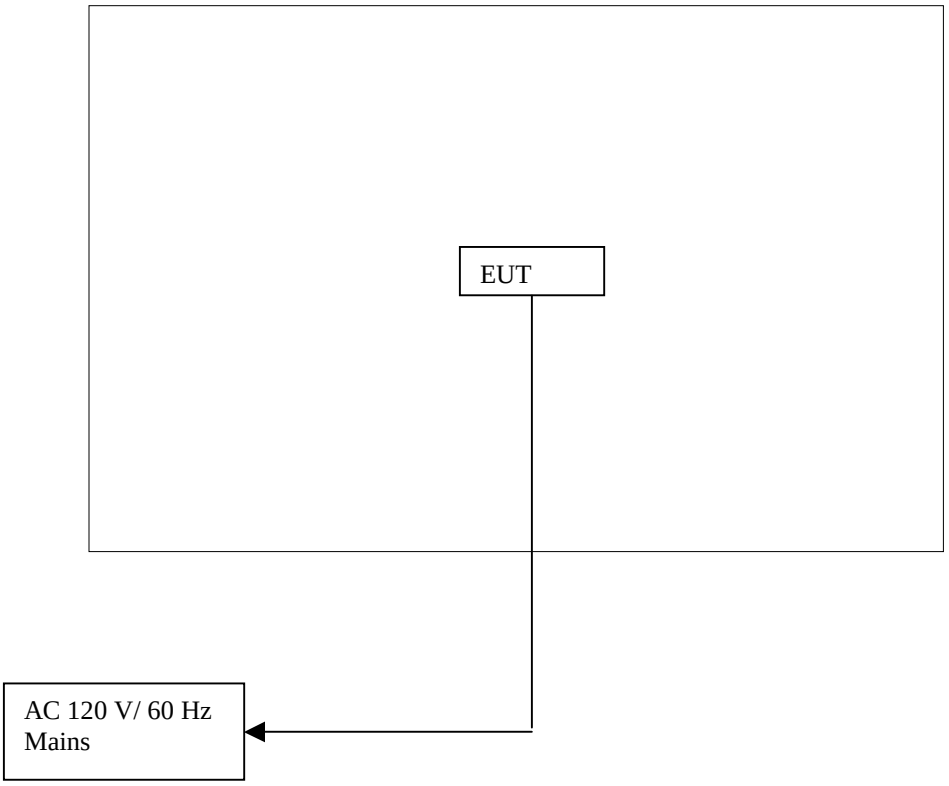
TEST SET UP
AND
PERIPHERAL CONNECTION INFORMATION



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The cables directly connected to this equipment are listed below.

Connection Descriptions

1. _____Power Cord_____
(description)

_____EUT_____
(from device)

_____AC Mains_____
(to device)

CABLE LENGTH __2m__ (S) SHIELDED or (U) UNSHIELDED _U__

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RADIATED TEST RESULTS

Frequency Range:	100kHz - 1000 MHz.
Measurement Distance:	As Noted.
Bandwidth:	120 kHz, Per CISPR 16.1 9 kHz below 30MHz
Detector Functions:	Peak, Quasi Peak.
Video Filter:	300 kHz
Table Height:	0.8 meters
Antenna Height Variation:	1 - 4 Meters.

Horizontal and Vertical Polarization Measurements Taken.

PLEASE SEE NEXT PAGE FOR RADIATED TEST DATA

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Worst Case Radiated Data and Transmitter output Power

Freq. (MHz)	Azimuth (Degrees)	Antenna Height (Meters)	Measure Distance (Meters)	Peak Amplitude (dBuV)	QP Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
.12538*	10	1.0	1	106.5	N/M	125.6#	-19.1
.2508	10	1.0	1	66.26	N/M	119.6#	-53.3
.3768	10	1.0	1	65.63	N/M	116.1#	-50.5
.504	10	1.0	1	60.38	N/M	93.6#	-33.2
.627	10	1.0	1	57.50	N/M	91.7#	-34.2
.878	10	1.0	1	50.65	N/M	88.7#	-38.1
1.129	10	1.0	1	46.38	N/M	86.6#	-40.2

*Fundamental Transmitter output.

#Limit is extrapolated at 40 dB per decade.

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CONDUCTED TEST RESULTS

Frequency Range:	150 kHz to 30.0 MHz.
Bandwidth:	9 kHz per CISPR 16.1
Detector Functions:	Peak, Quasi-Peak, Average
Table Height:	0.8 meters
Video Bandwidth:	30 kHz.

All conducted emission found are related to the associated equipment in the system, and are found to be compliant with EN 55022:1998 Limits for a class A digital device. Per Section 7.1 of IC ES 003, Issue 3 and FCC Part 15.107e & 15.109g, EN 55022 limits and test procedures may be used in lieu of IC ES 003 and FCC Part 15 rule limits.

See the following pages for detailed conducted data.

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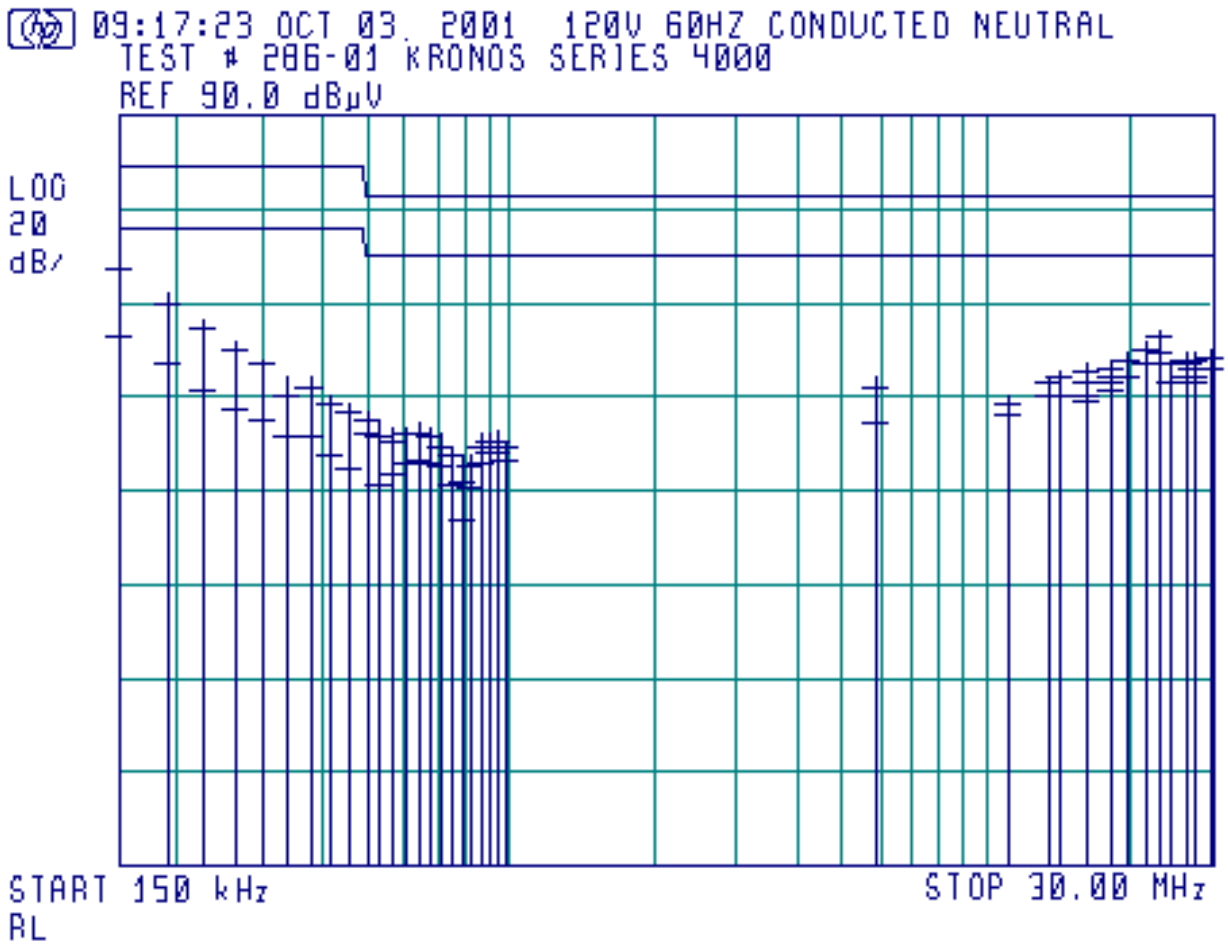
Test Number - 288-01

Conducted 120V 60Hz Neutral Log Plot



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Conducted 120V 60Hz Neutral Tabular Data

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
0.151185	58.58	57.36	43.70	79.00	66.00	-21.64	-22.30
0.190895	52.10	50.95	37.56	79.00	66.00	-28.05	-28.44
0.226586	46.53	44.84	31.76	79.00	66.00	-34.16	-34.24
0.266535	42.10	40.46	28.00	79.00	66.00	-38.54	-38.00
0.304188	38.18	36.93	25.41	79.00	66.00	-42.07	-40.59
0.341926	33.86	31.16	21.62	79.00	66.00	-47.84	-44.38
0.378910	34.18	32.65	21.86	79.00	66.00	-46.35	-44.14
0.416273	31.17	28.89	17.75	79.00	66.00	-50.11	-48.25
0.455508	28.45	27.01	14.92	79.00	66.00	-51.99	-51.08
0.505476	27.25	25.74	22.69	73.00	60.00	-47.26	-37.31
0.532508	24.86	21.46	11.76	73.00	60.00	-51.54	-48.24
0.568601	23.65	20.87	13.82	73.00	60.00	-52.13	-46.18
0.607054	24.17	22.32	16.05	73.00	60.00	-50.68	-43.95
0.645251	24.73	22.55	16.74	73.00	60.00	-50.45	-43.26
0.683936	23.68	21.80	16.44	73.00	60.00	-51.20	-43.56
0.720878	22.63	20.26	15.33	73.00	60.00	-52.74	-44.67
0.759591	19.58	17.42	11.31	73.00	60.00	-55.58	-48.69
0.796304	18.02	12.17	3.98	73.00	60.00	-60.83	-56.02
0.832619	17.70	15.27	10.62	73.00	60.00	-57.73	-49.38
0.871958	22.70	19.61	16.59	73.00	60.00	-53.39	-43.41
0.910414	22.54	20.64	18.58	73.00	60.00	-52.36	-41.42
0.947434	23.05	20.75	18.71	73.00	60.00	-52.25	-41.29
0.987575	21.26	19.04	16.74	73.00	60.00	-53.96	-43.26
5.876391	34.49	32.70	24.99	73.00	60.00	-40.30	-35.01
11.072374	30.54	28.64	26.71	73.00	60.00	-44.36	-33.29
13.420241	35.28	33.35	30.03	73.00	60.00	-39.65	-29.97
14.214345	36.00	34.27	31.00	73.00	60.00	-38.73	-29.00
14.274253	34.68	33.84	30.75	73.00	60.00	-39.16	-29.25
16.167230	35.17	33.20	29.40	73.00	60.00	-39.80	-30.60
16.228269	37.29	35.60	31.17	73.00	60.00	-37.40	-28.83
18.243271	38.02	36.62	33.12	73.00	60.00	-36.38	-26.88
18.304533	36.24	35.18	31.67	73.00	60.00	-37.82	-28.33
19.709085	39.34	37.71	34.57	73.00	60.00	-35.29	-25.43
21.664308	41.69	40.71	37.23	73.00	60.00	-32.29	-22.77
23.129174	44.46	43.20	39.50	73.00	60.00	-29.80	-20.50
24.350579	38.18	36.94	33.43	73.00	60.00	-36.06	-26.57
26.488010	38.44	37.24	34.29	73.00	60.00	-35.76	-25.71
26.610486	39.80	37.80	34.70	73.00	60.00	-35.20	-25.30
27.158866	38.24	36.80	34.75	73.00	60.00	-36.20	-25.25
27.342725	39.84	38.07	33.73	73.00	60.00	-34.93	-26.27

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29.235619	40.67	39.00	36.31	73.00	60.00	-34.00	-23.69

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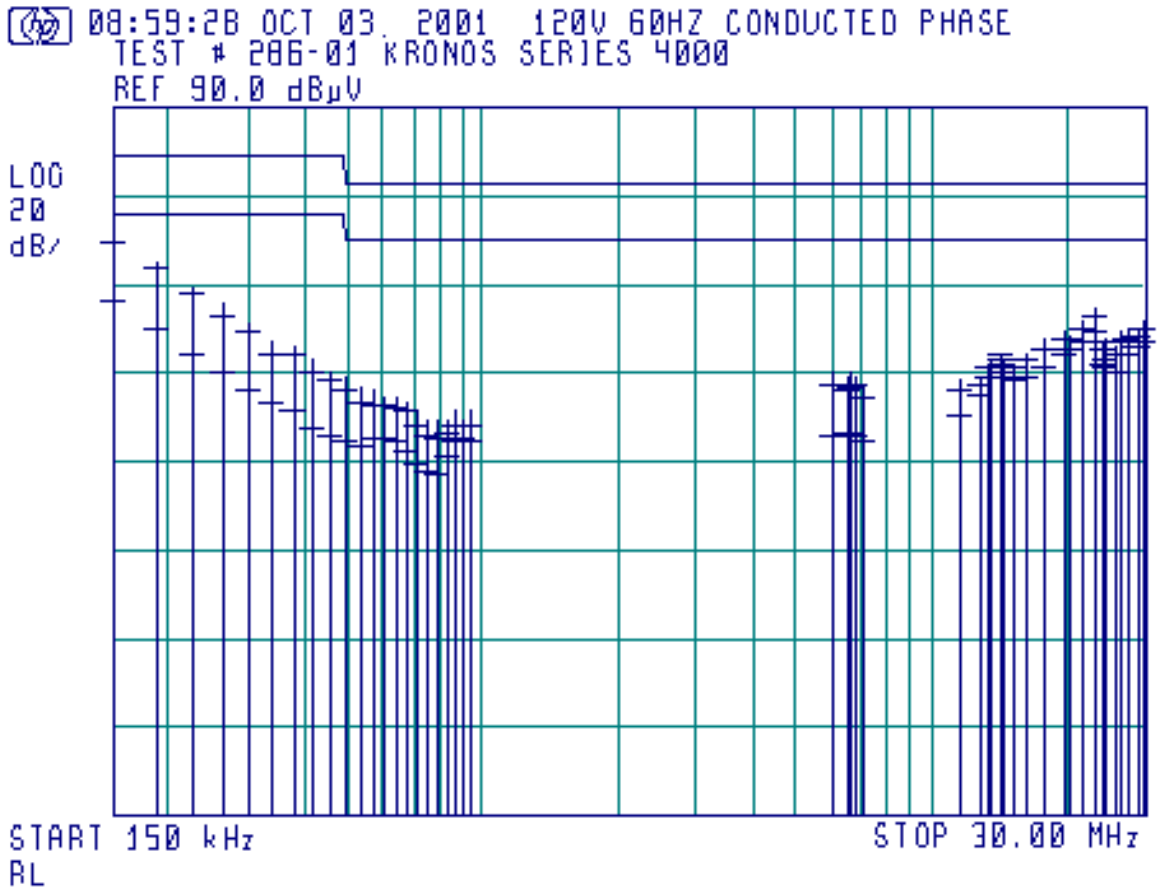
Test Number - 288-01

Conducted 120V 60Hz Phase Log Plot



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Test Number - 286-01

Conducted 120V 60Hz Phase Tabular Data

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
0.150959	61.42	60.22	46.58	79.00	66.00	-18.78	-19.42
0.189610	55.56	54.36	40.77	79.00	66.00	-24.64	-25.23
0.227514	49.87	48.08	34.57	79.00	66.00	-30.92	-31.43
0.266019	45.54	43.51	30.51	79.00	66.00	-35.49	-35.49
0.304136	41.50	39.81	26.72	79.00	66.00	-39.19	-39.28
0.343134	37.02	34.45	23.85	79.00	66.00	-44.55	-42.15
0.380870	36.55	34.85	21.88	79.00	66.00	-44.15	-44.12
0.417250	33.07	30.76	17.81	79.00	66.00	-48.24	-48.19
0.456775	30.62	28.61	16.30	79.00	66.00	-50.39	-49.70
0.493839	29.33	26.38	14.85	79.00	66.00	-52.62	-51.15
0.533689	27.23	24.10	14.19	73.00	60.00	-48.90	-45.81
0.569935	26.70	23.28	15.28	73.00	60.00	-49.72	-44.72
0.608223	24.90	23.03	15.34	73.00	60.00	-49.97	-44.66
0.645386	24.78	22.62	14.54	73.00	60.00	-50.38	-45.46
0.683805	24.15	21.53	12.96	73.00	60.00	-51.47	-47.04
0.722465	21.56	18.72	10.34	73.00	60.00	-54.28	-49.66
0.759995	19.24	15.99	8.47	73.00	60.00	-57.01	-51.53
0.797650	19.23	15.41	7.94	73.00	60.00	-57.59	-52.06
0.835908	19.50	16.71	11.55	73.00	60.00	-56.29	-48.45
0.873605	21.36	18.56	14.82	73.00	60.00	-54.44	-45.18
0.911350	20.52	18.69	15.30	73.00	60.00	-54.31	-44.70
0.949425	21.31	18.39	14.66	73.00	60.00	-54.61	-45.34
6.042475	31.30	27.64	16.48	73.00	60.00	-45.36	-43.52
6.535154	29.50	26.39	16.78	73.00	60.00	-46.61	-43.22
6.572398	30.84	27.27	17.14	73.00	60.00	-45.73	-42.86
6.800533	29.49	28.10	16.31	73.00	60.00	-44.90	-43.69
7.105260	27.28	24.74	14.78	73.00	60.00	-48.26	-45.22
11.586448	28.74	26.07	20.81	73.00	60.00	-46.93	-39.19
12.747361	29.18	28.30	25.63	73.00	60.00	-44.70	-34.37
13.357991	32.77	31.81	29.59	73.00	60.00	-41.19	-30.41
13.420604	33.19	32.06	29.77	73.00	60.00	-40.94	-30.23
14.151464	34.71	33.23	30.80	73.00	60.00	-39.77	-29.20
14.213620	34.92	33.82	31.25	73.00	60.00	-39.18	-28.75
14.335605	33.53	32.45	29.83	73.00	60.00	-40.55	-30.17
15.252233	33.01	31.77	28.42	73.00	60.00	-41.23	-31.58
16.167680	34.86	33.37	29.57	73.00	60.00	-39.63	-30.43
17.696241	38.25	35.38	31.74	73.00	60.00	-37.62	-28.26
19.709180	39.70	38.25	34.95	73.00	60.00	-34.75	-25.05
20.258499	39.17	38.22	35.67	73.00	60.00	-34.78	-24.33
21.663270	41.98	40.75	37.50	73.00	60.00	-32.25	-22.50

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Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
23.129623	44.78	43.66	39.85	73.00	60.00	-29.34	-20.15
24.045935	37.18	35.84	32.26	73.00	60.00	-37.16	-27.74
24.350575	38.38	37.09	33.48	73.00	60.00	-35.91	-26.52
24.534223	37.68	36.05	32.03	73.00	60.00	-36.95	-27.97
25.694404	36.30	34.97	31.38	73.00	60.00	-38.03	-28.62
26.488284	38.95	37.08	34.36	73.00	60.00	-35.92	-25.64
26.610350	39.36	37.68	34.90	73.00	60.00	-35.32	-25.10
27.342013	40.51	38.26	34.12	73.00	60.00	-34.74	-25.88
28.686666	40.78	39.21	36.79	73.00	60.00	-33.79	-23.21
29.235943	42.23	40.54	37.22	73.00	60.00	-32.46	-22.78

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NOTES AND COMMENTS

(Special conditions unique to this test)

The associated time clock/access control system was the focus of a separate evaluation and report.

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