

TYCO SAFETY PRODUCTS

SENSORMATIC

EMC

TEST REPORT

Model:
AMS-9050
FCC ID: BVCAMS9050
IC: 3506A-AMS9050
With option
AMC-7000 Metal Detector

Intentional Radiator
With
Unintentional Radiator

47 CFR, Part 15, Subpart B and Subpart C
Industry Canada
ICES-003
RSS-210

Date:
Feb. 4, 2009

Summary

47 CFR Part 15, Subpart B / Subpart C

Part	PARAMETER TO BE MEASURED	selected	Comments
15.107	Conducted Disturbance (Conducted Emissions)	X	complies
15.109	Radiated Disturbance (Radiated Emissions)	X	complies
15.207	Conducted Disturbance (Conducted Emissions)	X	complies
15.209	Radiated Disturbance (Radiated Emissions)	X	complies

Compliance with 15.203

The antenna is a professionally installed external antenna employing a terminal style connector; therefore the antenna is compliant with the requirements of this clause.

Compliance with 15.204

The only antenna type used with this transmitter is a loop. The loop with the highest gain (area x turns x current) has been used for testing and the transmit circuit adjusted for highest output.

TYCO SAFETY PRODUCTS 1

SENSORMATIC..... 1

EMC 1

TEST REPORT 1

1 DESCRIPTION AND CHARACTERISTICS OF THE EUT 4

 1.1 TYPE DESIGNATION 4

 1.2 CONSTRUCTION OF EQUIPMENT UNDER TEST (EUT) 5

 1.2.1 OVERVIEW 5

 1.2.2 INSTALLATION 5

 1.3 TEST SET-UP BLOCK DIAGRAM 6

 1.3.1 LIST OF PORTS 6

 1.3.2 CLOCK FREQUENCIES / CRYSTALS 6

 1.4 OTHER EQUIPMENT CHARACTERISTICS 7

 1.4.1 MARKETING AND INSTALLATION ENVIRONMENT 7

2 TESTS 8

 2.1 CONDUCTED EMISSIONS FCC Part 15 8

 2.2 RADIATED EMISSIONS FCC Part 15..... 10

 2.3 OCCUPIED BANDWIDTH 15

3 SECTION 4 EQUIPMENT LIST..... 16

1 DESCRIPTION AND CHARACTERISTICS OF THE EUT

1.1 TYPE DESIGNATION

(See Note 1)

The type designation may be either a single alphanumeric code or an alphanumeric/code divided into two parts.

EITHER TYPE DESIGNATION AS A SINGLE ALPHANUMERIC CODE:

A	M	S	-	9	0	5	0												
---	---	---	---	---	---	---	---	--	--	--	--	--	--	--	--	--	--	--	--

OR TYPE DESIGNATION IN TWO PARTS:

1. EQUIPMENT SERIES No. (See Note 2)

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

2. EQUIPMENT SPECIFIC No. (See Note 3)

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Note 1: This is the manufacturer’s numeric or alphanumeric code or name that is specific to a particular equipment. It may contain information in coded form on the characteristics of the equipment e.g. frequency, power. The manufacturer is free to choose the form of the type designation.

Note 2: This is the number, code or trade name used by the manufacturer to describe a series or “family” of equipment of substantially the same mechanical and electrical construction which will include a number of related equipments. This number is often referred to as the “model no.”

Note 3: This is the manufacturer’s identification number given to specific equipment in the series or “family” of equipments. It is often referred to as the “identification number”.

1.2 CONSTRUCTION OF EQUIPMENT UNDER TEST (EUT)

Single unit

Multiple units

If multiple units describe each one clearly

1.2.1 OVERVIEW

The AMS-9050 is a controller capable of driving a pair of antennas to generate a magnetic field to excite tags into resonance, receive the signal and alarm when an acceptable tag signal is detected and verified. This controller functions by transmitting a ringing pulse for 1.6 mS at a maximum rate of 90 Hz. Then at the end of the pulse detects the resonance ringing of any tags in the field. A single main PCB accommodates the Receiver, the Switching Amplifier Transmitter and the Power Supply.

The AMC-7000 samples the transmit waveform via a coupling transformer and analyses the transmit waveform from the AMS-9050 to the antennas using an algorithm to determine if there may be a metal object passing between the antenna pedestals.

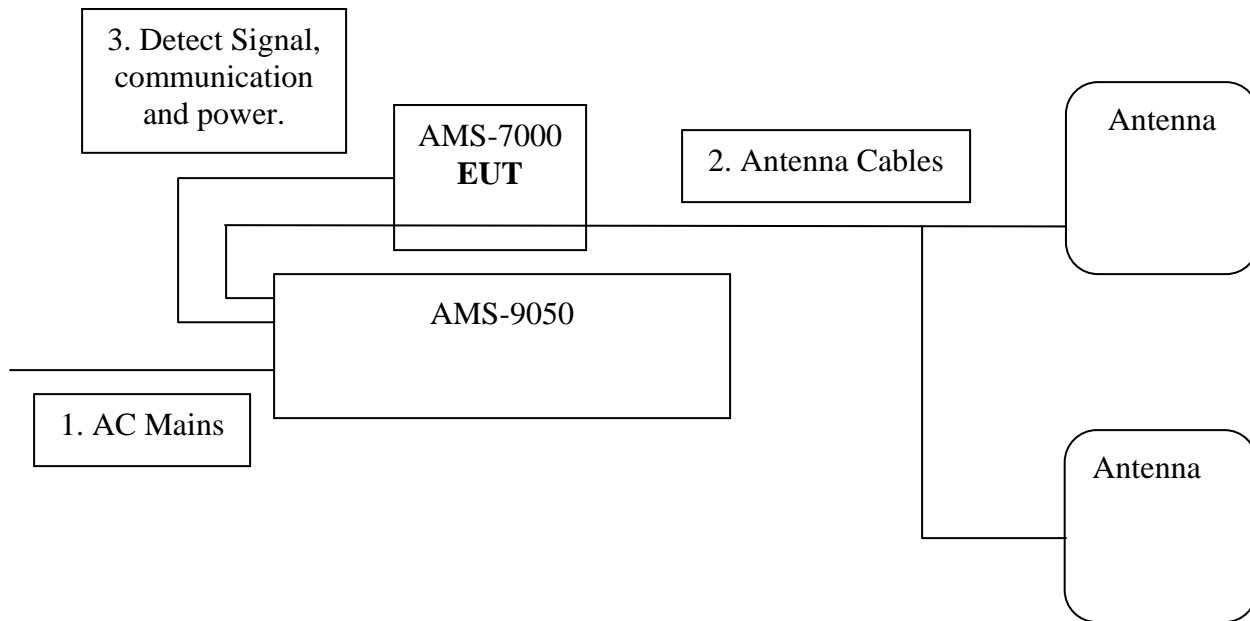
The transmit frequency range of the AMS-9050 is expanded by several kilohertz to provide a stable magnetic field during the metal detection mode and to avoid exciting the resonance of tags that would interfere with the metal detection algorithm. The tag detection mode continues to operate at frequencies that resonant with the tags.

1.2.2 INSTALLATION

This system is professionally installed.

The AMS-7000 is a box with a circuit card inside and is mounted on the chassis of the AMS-9050. The antenna cables are routed through the box for sampling and there is a signal output to indicate the presence of metal passing between the antennas.

1.3 TEST SET-UP BLOCK DIAGRAM



1.3.1 LIST OF PORTS

	Function	Classification	Max Cable Length	Test Length	Cable Type/Description
1	AC Mains	AC power	> 1 m but < 3 m	1.83m	3 conductor unshielded
2	Antenna cables	Antennas	> 3 m	12m	Shielded 2 Twisted Pair w/drn
3	Detect Signal, communications, and power	Signals + DC power	< 1 m	0.6m	6 conductor unshielded

* Classify ports as ac power, dc power, or signal/control.

** Classify maximum cable lengths as ≤ 1 m, > 1m but ≤ 3 m, or > 3m

1.3.2 CLOCK FREQUENCIES / CRYSTALS

- 58 kHz +/- 20%
- 500 kHz
- 16 MHz
- 20 MHz
- 100 MHz

1.4 OTHER EQUIPMENT CHARACTERISTICS

1.4.1 MARKETING AND INSTALLATION ENVIRONMENT

Either; (FCC 15: Sub-part B, Class A or B) – Unintentional Radiator

Emissions Class A is non-residential, not advertised or marketed to general public.

or

Emissions Class B is residential; advertised and marketed to general public

And/or

FCC 15, Sub-part C – Intentional Radiator

2 TESTS

2.1 CONDUCTED EMISSIONS

FCC Part 15

Clause 15.207

Port : AC mains of AMS-9050
 Limit : Class B – (15.107 is same as 15.207)
 Equipment operation : Metal Detecting
 Line Voltage and Freq : 120V / 60 Hz
 Temp : 22° C
 Humidity : 52.0% RH
 Date : 1/15/09

	Freq (MHz)	Peak (dBuV)	QP (dBuV)	Avg (dBuV)	Line	Comments
1	0.1964	53.1	51.5	50.2	L2	Complies
2	0.2925	46.3	41.8	34.9	L1	Complies
3	0.3916	50.5	47.2	37.2	L1	Complies
4	2.51	55.7	49.4	22.7	L2	Complies
5	3.29	59.8	53.4	40.5	L1	Complies
6	3.43	55.3	49.3	25.5	L1	Complies

FCC Class B, 15.107 and 15.207 limits

Frequency range	Quasi-peak (dBuV)	Average (dBuV)
0,15 - 0,50	66 - 56	56 - 46
0,50 - 5	56	46
5 - 30	60	50

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED (for reference see test equipment listing)
 20, 21, 36, 37

Figure 1. Conducted Emissions on Line 1 (L1) (peak hold over time)

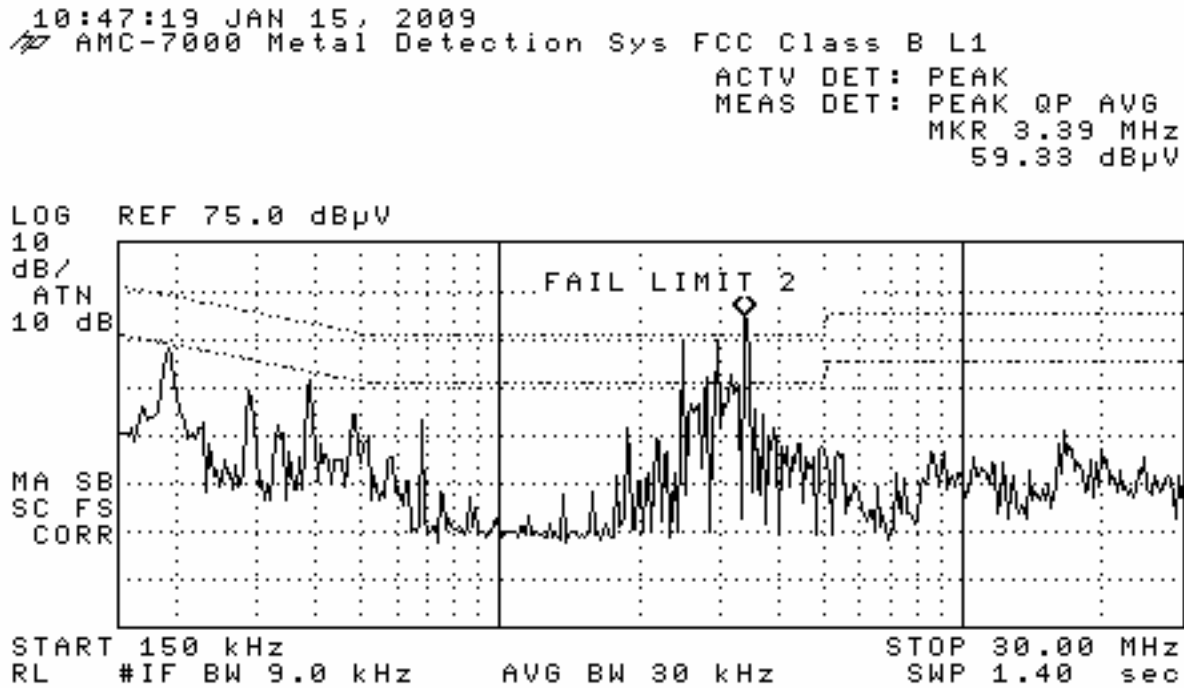
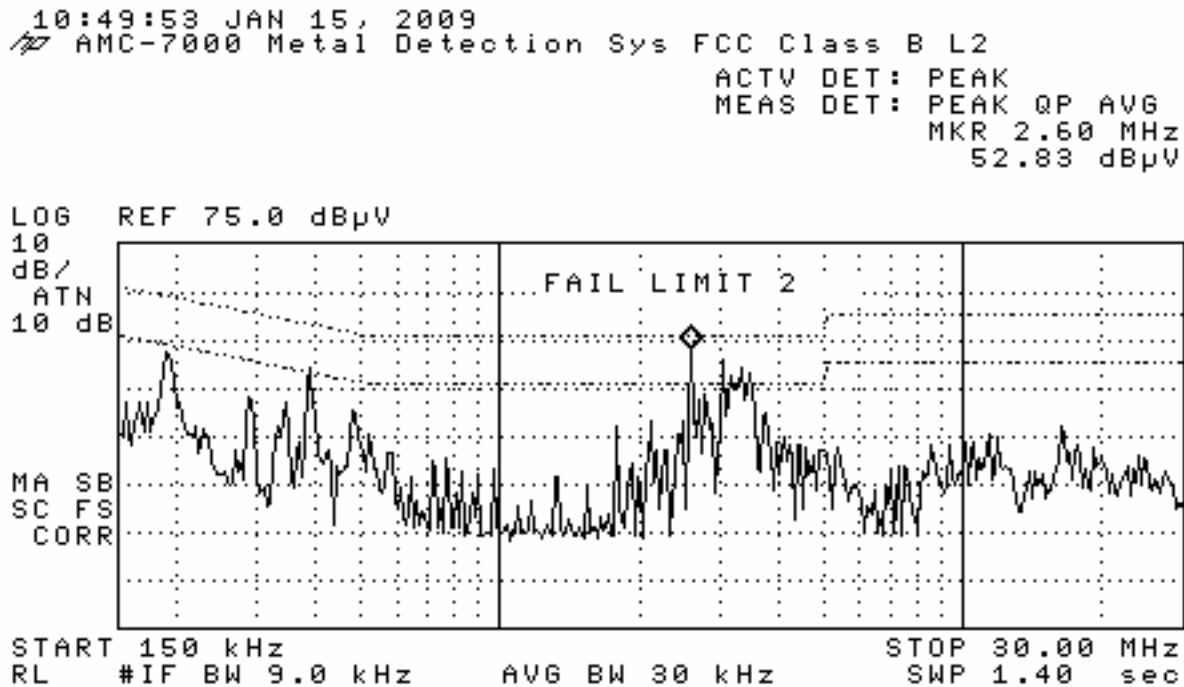


Figure 2. Conducted Emissions on Line 2 (L2) (peak hold over time)



2.2 RADIATED EMISSIONS**FCC Part 15**

Clause 15.109 (above 30 MHz)

Port : Enclosure
 Limit : Class A
 Equipment operation : Metal Detecting
 Line Voltage and Freq : 120V / 60 Hz
 Distance : 3 meters OATS
 Temp : 21° C
 Humidity : 51.5% RH
 Date : 1/15/09

Frequency (MHz)	BW (kHz)	Detector Pk/QP	Amplitude (dBuV)	FCC A @ 3m	Receiver Antenna	Comments
78.0	120	Pk / QP	34.7 / 25.0	49.5	BC, V, 1m	Complies
125.0	9 / 3	Pk / Pk	30.0 / 29.2	54	BC, H, 1m	Complies
200.0	120	Pk / QP	37.0 / 34.4	54	BC, V, 1m	Complies
200.0	120	Pk / QP	39.1 / 34.6	54	BC, H, 1m	Complies
300.0	120	Pk / QP	39.5 / 36.1	56.5	LP, V, 1m	Complies
400.0	120	Pk / QP	35.0 / 32.8	56.5	LP, H, 1m	Complies

Distance adjustment is found by $20 \cdot \log(10/3) = 10.5$ dB

LIMIT FCC Part 15, subpart B,

Class A digital devices at 10 meters and 3 meters, sub-part B

Frequency of emission (MHz)	Field strength (microvolts/meter)	Field strength (dBuV/m) at 10 meters	Field strength (dBuV/m) at 3 meters
30–88	90	39	49.5
88–216	150	43.5	54
216–960	210	46	56.5
Above 960	300	49.5	60

Class B digital devices at 3 meters, sub-part B

Frequency of emission (MHz)	Field strength (microvolts/meter)	Field strength (dBuV/m) at 3 meters
30–88	100	40
88–216	150	43.5
216–960	200	46
Above 960	500	54

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED (for reference see test equipment listing)
 11,16,17,33,34,36,37

Figure 1. (peak hold over time)

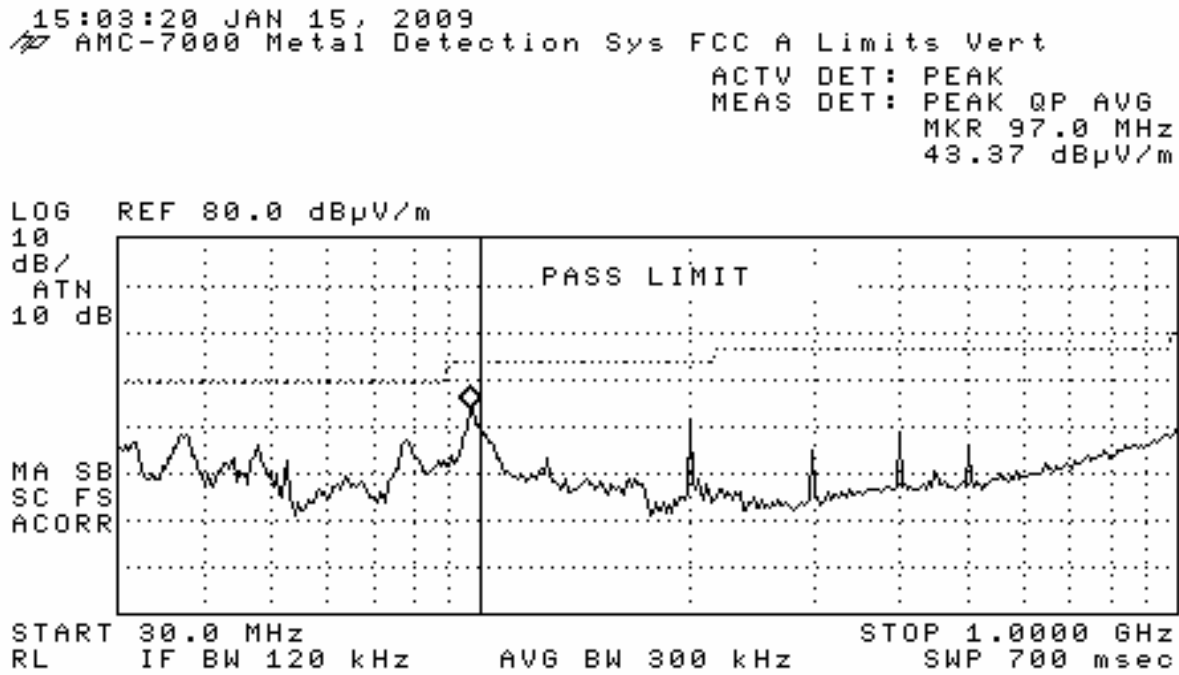
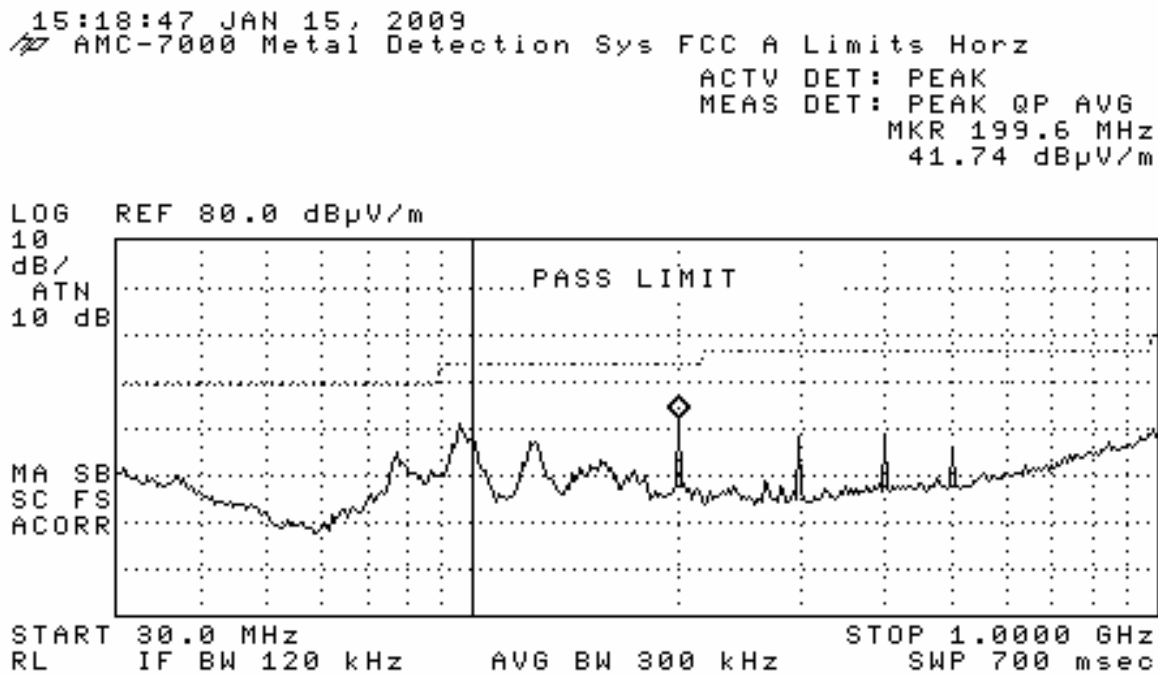


Figure 2. (peak hold over time)



Clause 15.209 (below 30 MHz)

Line Voltage and Freq : 120V / 60 Hz
 Distance : 10 meters, H-field test site south end of property.
 Temp : 20° C
 Humidity : 52% RH
 Date : 1/14/09

56 kHz metal detect mode

Freq	SA			BW	AF	FF	Dist	DCF	DCCF	Pk Cor	QP Cor	AvgCor	Limit	Limit	Margin
kHz	pk	QP	av		dB	dB	m	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	Distance	dB
102vac	45.3	41.4	33.3	200Hz	61.60	0	10.0	-78.6	-16.8	28.3	24.4	16.3	32.6	av@300m	16.4
138vac	47.3	43.6	35.6	200Hz	61.60	0	10.0	-78.6	-16.8	30.3	26.6	18.6	32.6	av@300m	14.1
56	22.0	17.0	10.5	200Hz	61.60	0	30.0	-53.2	-16.8	30.4	25.4	18.9	32.6	av@300m	13.8
56	46.2	42.4	34.4	200Hz	61.60	0	10.0	-78.6	-16.8	29.2	25.4	17.4	32.6	av@300m	15.3
112	-2.5	-7.2	-9.4	200Hz	55.75	1.3	10.0	-78.6	-16.8	-24.1	-28.8	-31.0	26.6	av@300m	57.6
168	11.7	5.9	-8.6	9kHz	52.80	0.7	10.0	-78.6	-16.8	-13.4	-19.2	-33.7	23.1	av@300m	56.8
224	17.9	8.0	-10.2	9kHz	50.60	0.4	10.0	-78.6	-16.8	-9.7	-19.6	-37.8	20.6	av@300m	58.4
280	6.6	2.4	-12.5	9kHz	48.80	0.3	10.0	-78.6	-16.8	-22.9	-27.1	-42.0	18.7	av@300m	60.7
336	6.2	0.1	-12.0	9kHz	47.35	0.3	10.0	-78.6	-16.8	-24.8	-30.9	-43.0	17.1	av@300m	60.1
392	14.6	11.7	-8.6	9kHz	46.15	0.2	10.0	-78.6	-16.8	-17.7	-20.6	-40.9	15.7	av@300m	56.6
448	5.3	-6.8	-19.1	9kHz	45.05	0.2	10.0	-78.6	-16.8	-28.1	-40.2	-52.5	14.6	av@300m	67.1
504	11.4	6.9	-13.3	9kHz	44.25	0.2	10.0	-25.4	-16.8	30.5	26.0	5.8	33.6	QP@30m	7.6
560	12.9	7.8	7.3	9kHz	43.70	0.2	10.0	-25.4	-16.8	31.4	26.3	25.8	32.6	QP@30m	6.3

58 kHz tag detect mode

Freq	SA			BW	AF	FF	Dist	DCF	DCCF	Pk Cor	QP Cor	AvgCor	FCC Limit	Limit	Margin
kHz	pk	QP	av		dB	dB	m	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	Distance	dB
102vac	49.0	40.5	32.1	200Hz	61.60	0	10.0	-86.7	-16.8	23.9	15.4	7.0	32.3	av@300m	25.3
138vac	50.7	43.3	33.9	200Hz	61.60	0	10.0	-86.7	-16.8	25.6	18.2	8.8	32.3	av@300m	23.5
58	20.6	14.5	7.1	200Hz	61.60	0	30.0	-58.7	-16.8	23.5	17.4	10.0	32.3	av@300m	22.3
58	49.8	42.5	33.3	200Hz	61.60	0	10.0	-86.7	-16.8	24.7	17.4	8.2	32.3	av@300m	24.1
116	-15.5	-24.4	-28.6	200Hz	55.75	1.3	10.0	-86.7	-16.8	-45.1	-54.0	-58.2	26.3	av@300m	84.6
174	11.0	6.2	-8.8	9kHz	52.80	0.7	10.0	-86.7	-16.8	-22.2	-27.0	-42.0	22.8	av@300m	64.8
232	14.1	6.1	-14.3	9kHz	50.60	0.4	10.0	-86.7	-16.8	-21.6	-29.6	-50.0	20.3	av@300m	70.3
290	10.0	3.8	-	9kHz	48.80	0.	10.0	-	-16.8	-27.6	-33.8	-49.1	18.4	av@300	67.4

			11.5		0	3	0	86.7						m	
348	3.8	-6.8	-17.9	9kHz	47.35	0.3	10.0	-86.7	-16.8	-35.2	-45.8	-56.9	16.8	av@300m	73.7
406	12.6	6.7	-14.4	9kHz	46.15	0.2	10.0	-86.7	-16.8	-27.7	-33.6	-54.7	15.4	av@300m	70.2
464	6.6	-5.5	-21.3	9kHz	45.05	0.2	10.0	-86.7	-16.8	-34.8	-46.9	-62.7	14.3	av@300m	77.0
522	10.4	-1.7	-10.1	9kHz	44.25	0.2	10.0	-28.0	-16.8	26.9	14.8	6.4	33.3	QP@30m	18.5
580	17.5	11.4	4.9	9kHz	43.70	0.2	10.0	-28.0	-16.8	33.4	27.3	20.8	32.3	QP@30m	5.0

Table Legend follows;

Note: Limits and details change at 490 kHz, per 15.209(a)
Detector bandwidths are specified in ANSI C63.4-2003, sec 4.2 which references ANSI C63.2-1996 and CISPR 16-1-1:2003-11
Video bandwidth is set to at least 3 times wider than the IF bandwidth.
Use Average detector for Freq bands 9-90 kHz and 110-490 kHz and above 1000 MHz per 15.209(d)
Use QP detector for other Freq bands below 1000 MHz per 15.209(d)
Average Detector measuring time is set to 100 mSec per 15.35(c)
QuasiPeak Detector measuring time is set to at least 1 second per CISPR 16
Peak Detector values may be used instead of QP if the value complies with the limit. 15.35(a)
Peak Limit is 20 dB higher than QuasiPeak or Average Limit in Table of 15.209 per 15.35(b)
Measure Variation of Fundamental Emission due to power supply variation +/-15% per 15.31(e)
AF = Antenna Factor
FF = Filter Factor: Insertion loss of High Pass Filter, excluding fundamental.
DCCF (duty cycle correction factor) = 20 log (duty cycle) = 20 log (pulse duration/pulse repetition period) = 20 log (on time / repeat time)
Math Average of DCCF can be used instead of using Average Detector
DCF: Use square law (40 dB). If "Actual" is non-compliant, determine actual correction factor per formula below.
Distance Correction Factor (DCF) = 20 log(Test Dist / 300)^P = 20 P log (Test Dist / 300) to adjust measurement to 300 meters.
Where P is the roll-off exponent . P is found as follows:
Roll off Factor P = (Level(@ Distance 1) - Level(@ Distance 2)) / 20 log (Distance 2 / Distance 1)

2.3 OCCUPIED BANDWIDTH

The peak on the left is during the metal detect mode.
 The wider peak on the right is during the tag detect mode.

Figure 1.
 20 dB Bandwidth from highest level – tag detect mode.

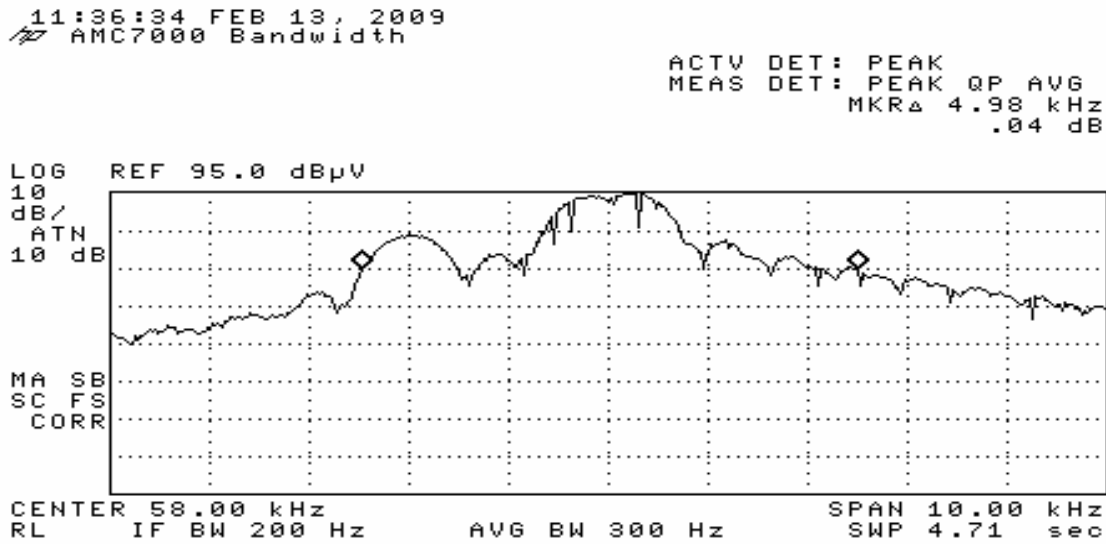
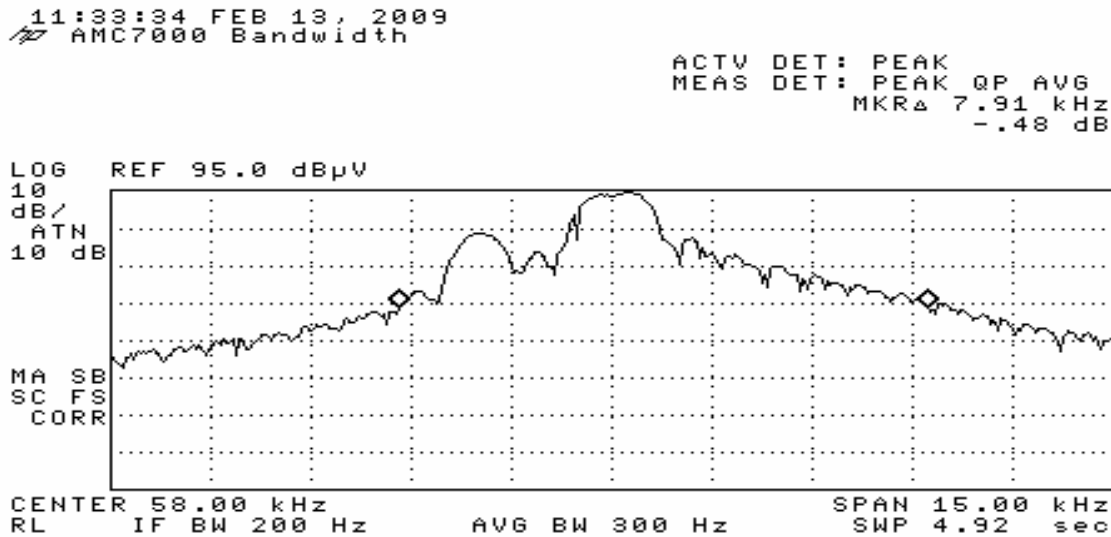


Figure 2.
 20 dB Bandwidth from next highest level – metal detect mode.



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED (for reference see test equipment listing)
 8, 36, 37

3 SECTION 4 EQUIPMENT LIST

	Model	Description	Serial #	Vendor
1	FM2000	Isotropic Field Monitor	15171	AR
2	FP2000	Isotropic Field Probe	15214	AR
3	888	Leveler	14998	AR
4	75A220	Low Band Amplifier	15208	AR
5	10W1000A	High Band Amplifier	15138	AR
6	1501L-1P	Power Source	4263	California Inst.
7	1201WP	Power Surce	4286	California Inst.
8	ALP -70	Loop Antenna	163	Electro Metrics
9	ALR-30M	Adj Loop Ant .010 - 30MHz	801	Electro Metrics
10	EM 7600	Transient Limiter	187	Electro Metrics
11	3110B	Biconical Antenna	1017	Electro Metrics
12	3104	Biconical Antenna	3195	EMCO
13	3104C	Biconical Antenna	9009-4334	EMCO
14	3121C	Adjustable Dipole Antenna	1262	EMCO
15	3121C	Adjustable Dipole Antenna	1263	EMCO
16	3146	Log Periodic Antenna	3909	EMCO
17	3146	Log Periodic Antenna	3576	EMCO
18	3146	Log Periodic Antenna	4731	EMCO
19	* 3825/2	Line Imp Stable Network w/NEMA	1562	EMCO
20	3816/2NM	Line Imp Stable Network	1018	EMCO
21	3816/2NM	Line Imp Stable Network	1064	EMCO
22	F-203I	EM Injection Clamp	30	FCC
23	F-201	RF Absorbing Clamp	174	FCC
24	FCC-801-M3-16	Coupling Decoupling Netwk	58	FCC
25	FCC-801-M3-16	Coupling Decoupling Netwk	59	FCC
26	F-33-1	RF Current Probe	304	FCC
27	150/50	Adapter Kit	110/111	FCC
28	87IV	DMM	174	Fluke
29	6060B	Frequency Generator	5850202	Giga-tronics
30	PEFT Junior	ETF Generator	083 180-16	Haefely Trench
31	PEFT Junior	Capacitive Cable Clamp	083-078-31	Haefely Trench
32	34401A	Multimeter	US36078401	HP
33	8447F	High Band Amp .009-1300MHz	2805A03473	HP
34	8447F	High Band Amp .009-1300MHz	3113A06072	HP
35	8447A	High Band Amp.1-400MHz	1145A01085	HP
36	8591EM	Spectrum Analyzer w/Track Gen	3520A00190	HP
37	8591EM	Spectrum Analyzer	3649A01066	HP

	Model	Description	Serial #	Vendor
38	8562A	Spectrum Analyzer	2712A00534	HP
39	11940A	Close Field Probe30MHz-1GHz	2650A06961	HP
40	11941A	Close Field Probe 9kHz-30MHz	2807A05261	HP
41	6843A	Harmonic Flicker Test System	3531A-00116	HP
42	CE50	Surge Coupler/Decoupler	9507535	Key Tek
43	CM-I/OCD	Signal LineSurge CDN unbalanced	9904213	Key Tek
44	CM-TELCD	Signal LineSurge CDN balanced	9904206	Key Tek
45	112AMX-UMC31	Power Source	190	Pacific Inst.
46	NSG435	ESD Simulator	1197	Shaffner
47	NSG431	ESD Simulator	1267	Shaffner
48	CBL6141	BiLog Antenna	4112	SchaffnerChase
49	C3910	Directional Coupler	6706	SchaffnerChase
50	CPM9830	RF Pulse Modulator	1019	SchaffnerChase
51	CBA9413A	Amplifier	9902	SchaffnerChase
52	CDN M3	Coupler/Decoupler	M3-007	CE Test
53	CDN M3	Coupler/Decoupler	M3-008	CE Test
54	CDN M3	Coupler/Decoupler	M3-00	CE Test