TYCO SAFETY PRODUCTS
SENSORMATIC
EMC TEST REPORT

Model:
AMB9010
AMB9010-IPS

FCC ID: BVCAMB9010
IC: 3506A-AMB9010

Intentional Radiator

Standards Tested

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

Date:
August 23, 2011

EMC Engineer

6600 Congress Ave.
Boca Raton, FL. USA. 33487

Revision	Reason	Date
Rev 1	Initial	8/23/2011

1 Description and Characteristics of Equipment Under Test (EUT).

TYPE DESIGNATION
(See Note 1)
The type designation may be either a single alphanumeric code or an alphanumeric/code divided into two parts.

TYPE DESIGNATION AS A SINGLE ALPHANUMERIC CODE:

| A | M | B | 9 | 0 | 1 | 0 | | | | | | |

OR

TYPE DESIGNATION IN TWO PARTS:

1. EQUIPMENT SERIES No. (See Note 2)

| A | M | B | 9 | 0 | 1 | 0 | | | | | | | | | |

2. EQUIPMENT SPECIFIC No. (See Note 3)

- | I | P | S | | | | | | | | | | | | |

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 a specific equipment in the series or "family" of equipments. It is often referred to as the "identification number".

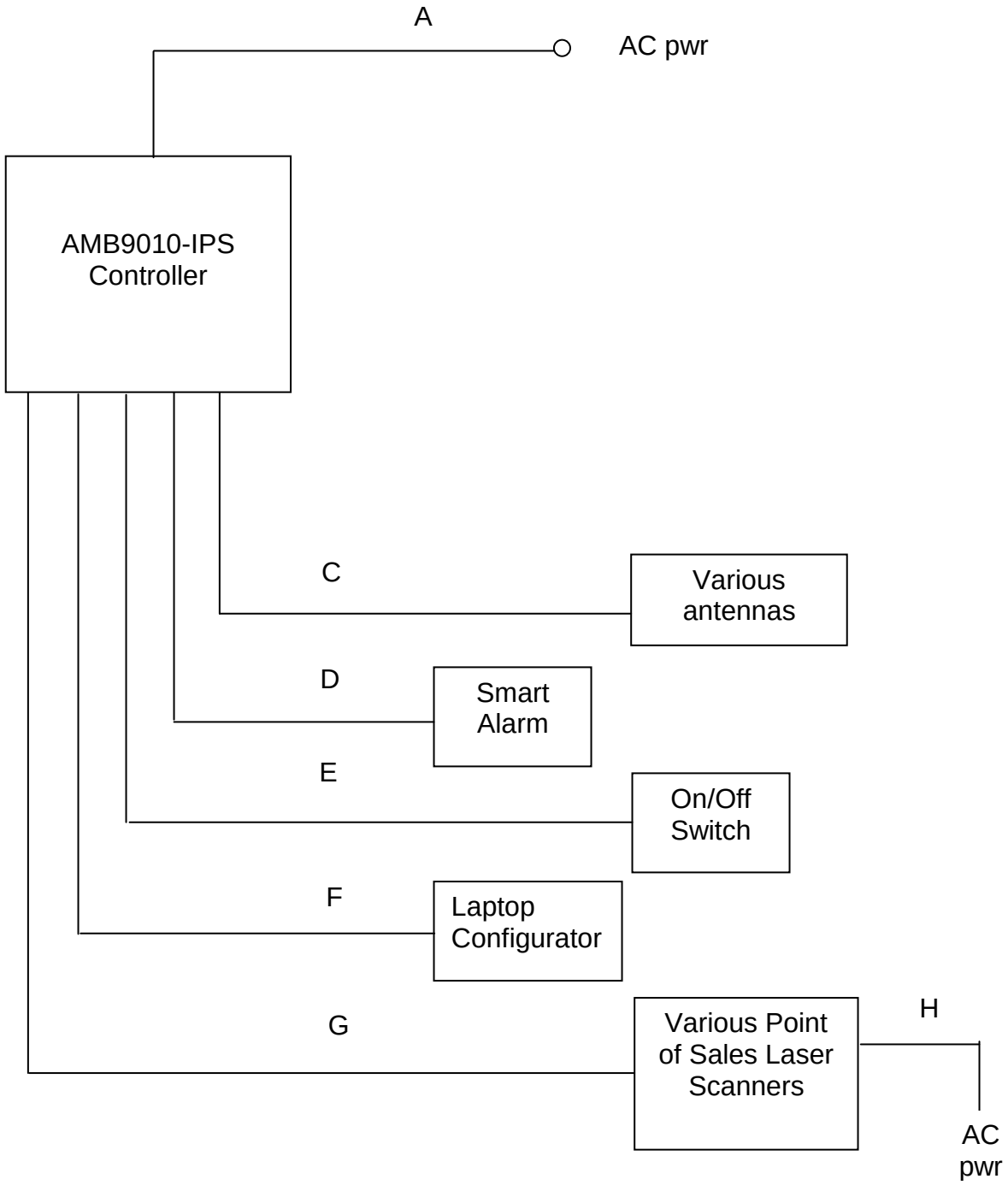
1.1 CONSTRUCTION OF EQUIPMENT	
[ ] Single unit (See Note 4)	
[X] Multiple units	
If multiple units describe each one clearly:	
Unit	Product Code
Controller/s	AMB9010 w Pwr Supply AMB9010-IPS
Antenna/s	AMB-5274 AMB-5182 AMB-5184 AMB-5185 AMB-5190 AMB-5780 AMB-5300 AMB-5010 AMB-5011 AMB-5012

Note 4:"UNIT" means a physically separate item of the equipment. The equipment under test may consist of two separate units. In this case additional sheets covering the transmitter and receiver characteristics for both units would be required, if unit 1 and unit 2 are covered by the same TYPE DESIGNATION.

This new model incorporates the power supply on a separate card within the covers of the previous unit, instead of the prior model with and external power supply. Minor change was made to the original printed circuit board to add the DC power connector, between internal power supply and motherboard. And the connector port panel was changed from a DC power cable connector for the external brick power supply to a common AC connector.

Tests were performed to verify that the new internal power supply performed according to the standard. The results are in this report which includes the previous test results of the unit with an external power supply.

1.1.1 Block Diagram of System to be Tested



1.2 LIST OF PORTS

Ident	Function	* Classify	** Max Cable Length	Test Length	Cable Type
A	AC Mains	ac power	> 1m but ≤ 3 m	1.83m; .3m	3 conductor unshielded
C	Ant Cable	signal/control	< 3 m	1.5m	3 conductor Shielded
D	RS 485	signal/control	< 3 m	2.1m	4 conductor unshielded
E	RS 485	signal/control	>3 m	2.1m	4 conductor unshielded
F	RS232	signal/control	>3 m	10m	4 conductor unshielded
G	RJ45	signal/control	>3 m	2.5m	8 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 EUT Characteristics

1.3.1 FREQUENCY CHARACTERISTICS

Method of frequency generation

[X] CRYSTAL
[X] SYNTHESIZER
[ ] OTHER:

FREQUENCY(S)

60 MHz
8 MHz
1.84 MHz
1.4 MHz
200 kHz
58 kHz

1.4 OTHER EQUIPMENT CHARACTERISTICS

INFORMATION TO DETERMINE PERFORMANCE ASSESSMENT
PRIMARY FUNCTIONS TO BE TESTED DURING AND AFTER EMC TESTS

The primary function to be tested is anti-theft label detection and deactivation.

ANCILLARY EQUIPMENT USED DURING TESTING

Hard tag
Lap Top
Remote Switch
Smart Alarm
POS Scanner

USER CONTROL FUNCTIONS:

None.

STORED DATA:

none.

METHODS USED TO ACCESS NORMAL OPERATION:

Power up system with no tags in the field. When the "ready" LED is properly illuminated, place a hard tag on the transmitter/deactivator pad. With these conditions, The LAPTOP connected to the service port via RS232 cable connection provides visual data for both detection and deactivation.

OPERATION

As a standalone device, when an EAS tag is detected within the sense field of the antenna, the device emits a deactivating pulse. This turns off the tag from being detected.
If paired with a Point-of-sale Scanner, that has an EAS antenna mounted within it, then the Scanner actives the detector to check for a tag and if a tag is found then deactivates the tag.

2 Test Site Information

2.1 Test Site Registration

The Tyco Safety Products / Sensormatic Electronics, LLC OATS located at 6600 Congress Ave. Boca Raton, FL. 33487 is registered with the FCC, number – 889978 and 616407, and with Industry Canada, number – 3506A-1.

2.2 Test Procedures

Radiated and Conducted Emissions tests were performed using the procedures of ANSI C63.4 including methods for signal maximizations and EUT configuration.

2.3 Sample Calculation – Radiated & Conducted Emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where:
RAW = Measured level before correction (dBμV)
AMP = Amplifier Gain (dB)
CBL = Cable Loss (dB)
ACF = Antenna Correction Factor (dB/m)

dBμV/m = 20 * log * μV/m

Margin to Limit is calculated by subtracting corrected measurement from Limit.
Positive margin indicates compliance. Negative margin indicates non-compliance

To convert dBμV/m to dBμA/m,
Reduce reading in dBμV/m by 51.5 dB to convert to dBμA/m.

Effective Radiated Power is converted to Field Strength by the following:

The Friis transmission equation governs the interaction between two antennas in the far field:

$$P_r = \frac{P_t G_t G_r \lambda^2}{(4\pi r)^2}, \quad \textbf{(5)}$$

where P_r is the power measured at the receive antenna output port;
P_t is the power measured at the transmit antenna input port;
G_t is the gain of the transmit antenna;
G_r is the gain of the receive antenna;
l is the wavelength; and
r is the separation between the two antennas (the range length).

The electric field generated at a point in the far field as a function of the transmitted power is given by

$$E = \frac{\sqrt{30 P_t G_t(\theta,\phi)}}{r}, \quad \textbf{(12)}$$

where E is the electric field generated at the distance r from the transmit antenna,
P_t is the power measured at the transmit antenna input port,
G_t (q, f) is the angle-dependent gain of the transmit antenna, and
r is the distance from the transmit antenna to the test point (the range length)

Info: http://www.ce-mag.com/archive/02/Spring/fogelle2.html

Note: power levels into a dipole results in an E-field at a distance according to
power: (V^2) / R = P
power flux density: s = P / (4*pi*r^2), where pi = 3.14 and r = distance
field strength: e = sqrt (120 * pi * s) = sqrt(30 * P) / r
A half-wave dipole has a 1.64 gain in its equatorial plane, therefore:
e = sqrt(1.64*30*P) /r = 7*sqrt(p) / r
Field strength (e) e = (7.02*sqrt(ERP)) / d, ERP in Watts, d in meters.
Or Source Radiating (ERP) -> ERP = (e*d / 7.02)^2 in Watts, Volts/meter, meters

Conversion to dBuV from http://www.compeng.com.au/emc_conversion_tables_rf_calculator2.aspx

2.4 Uncertainty of Measurements

Combined Standard Uncertainty and Expanded Uncertainty using an expansion factor of 2. (estimated)		CISPR 16-4-2 Uncertainty Limits
Radiated Emissions = ± 1.56 dB	Expanded Uncertainty = 3.12 dB	5.2 dB
Conducted Emissions = ± 1.12 dB	Expanded Uncertainty = 2.24 dB	3.6 dB
Harmonic Current and Flicker = ± 2.6 %	Expanded Uncertainty = 5.12 %	
Radiated Immunity = ± 2.15 dB	Expanded Uncertainty = 4.3 dB	
ESD Immunity = 4.15 %	Expanded Uncertainty = 8.3 %	
EFT - Fast Transient Immunity = ± 2.82 %	Expanded Uncertainty = 5.64 %	
Conducted Immunity = ± 1.83 dB	Expanded Uncertainty = 2.24 dB	
Voltage Variation and Interruption = ± 1.7 %	Expanded Uncertainty = 3.4 %	
Surge Immunity = ± 3.1 %	Expanded Uncertainty = 6.2 %	

Uncertainty values were calculated based on methods in ETSI TR 100 028.

Per EN 300 330-1, Clause 9, the value of the measurement uncertainty for each measurement, shall be equal to or lower than the figures given below.

RF frequency ±1E10-7;
RF power, conducted ±1 dB;
RF power, radiated ±6 dB;
Temperature ±1°C;
Humidity ±5 %.

3 Applicable Tests

3.1 North American Tests

The complete list of measurements called for in 47 CFR Part 15 is given below.

	PARAMETER TO BE MEASURED	select
15.107(a)	Conducted Emission Limits, Digital Device, Class B	X
15.107(b)	Conducted Emission Limits, Digital Device, Class A	
15.109(a)	Radiated Emissions Limits, Digital Device, Class B	X
15.109(b)	Radiated Emissions Limits, Digital Device, Class A	
15.207	Conducted Emission Limits, Intentional Radiator	X
15.209	Radiated Emissions Limits, Intentional Radiators	X

Industry Canada accepts FCC test results with the addition of the bandwidth measurement. Therefore, only the following additional test is called for to comply with Canadian Regulations:

	PARAMETER TO BE MEASURED	select
section		
4.6.1	Occupied Bandwidth, 99%	X
4.6.2	6 dB Bandwidth	

3.1.1 CONDUCTED EMISSIONS

Port : AC Mains
Equipment operation : Transmitting, modulated; deactivating.

LIMIT for FCC Part 15.107, Class B and 15.207 General

Frequency range	Quasi-peak	Average
0,15 - 0,5 MHz	66 - 56 dBµV	56 - 46 dBµV
> 0,5 - 5 MHz	56 dBµV	46 dBµV
>5 - 30 MHz	60 dBµV	50 dBµV

Any Peak emission lower than the limits, need not be measured with that Detector to that limit.

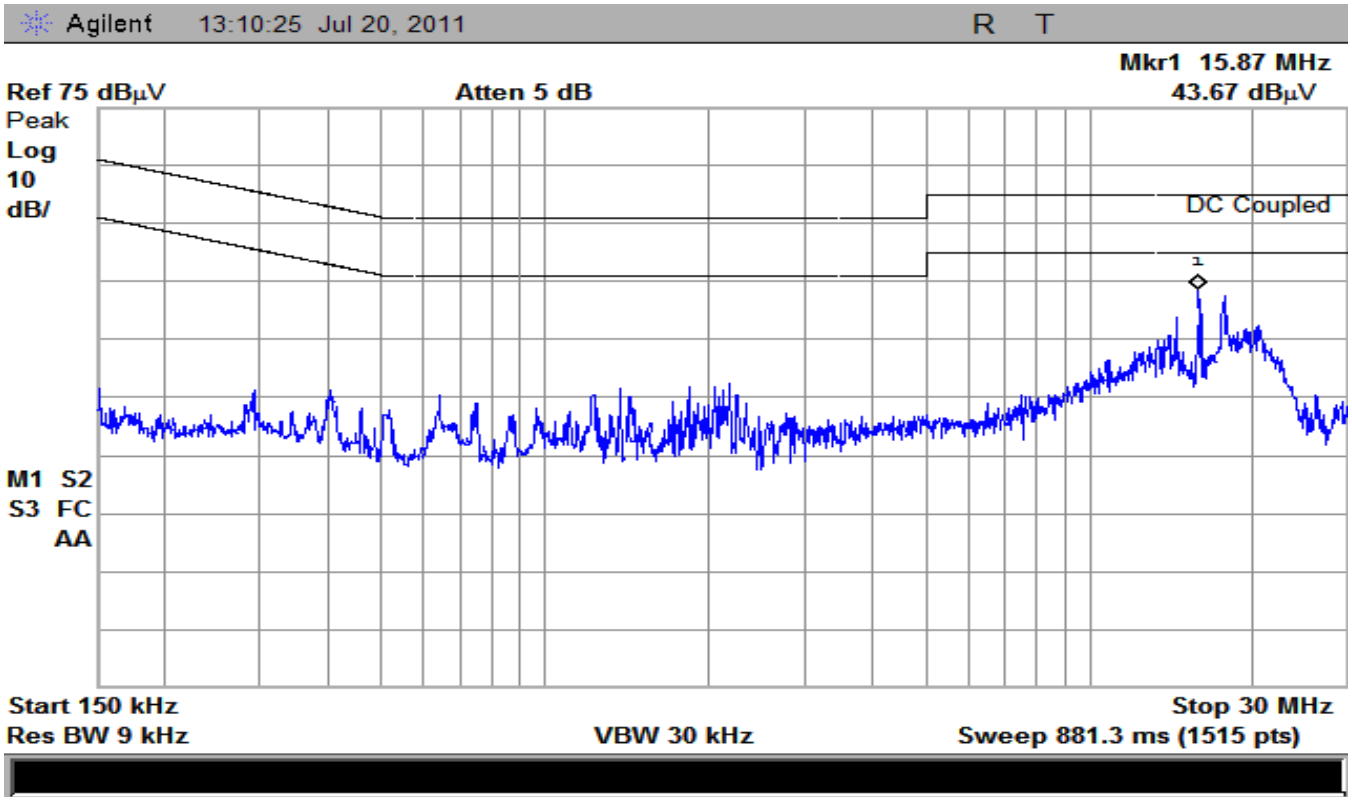
120 V / 60 Hz
(external power supply)

Freq. (MHz)	QP Level (dBµV)	Average Level (dBµV)
.150	50.5	27.1
.160	48.2	20.9
2.83	35.1	20.6
9.55	41.1	23.6
19.85	41.3	22.5
20.15	44.9	17.9

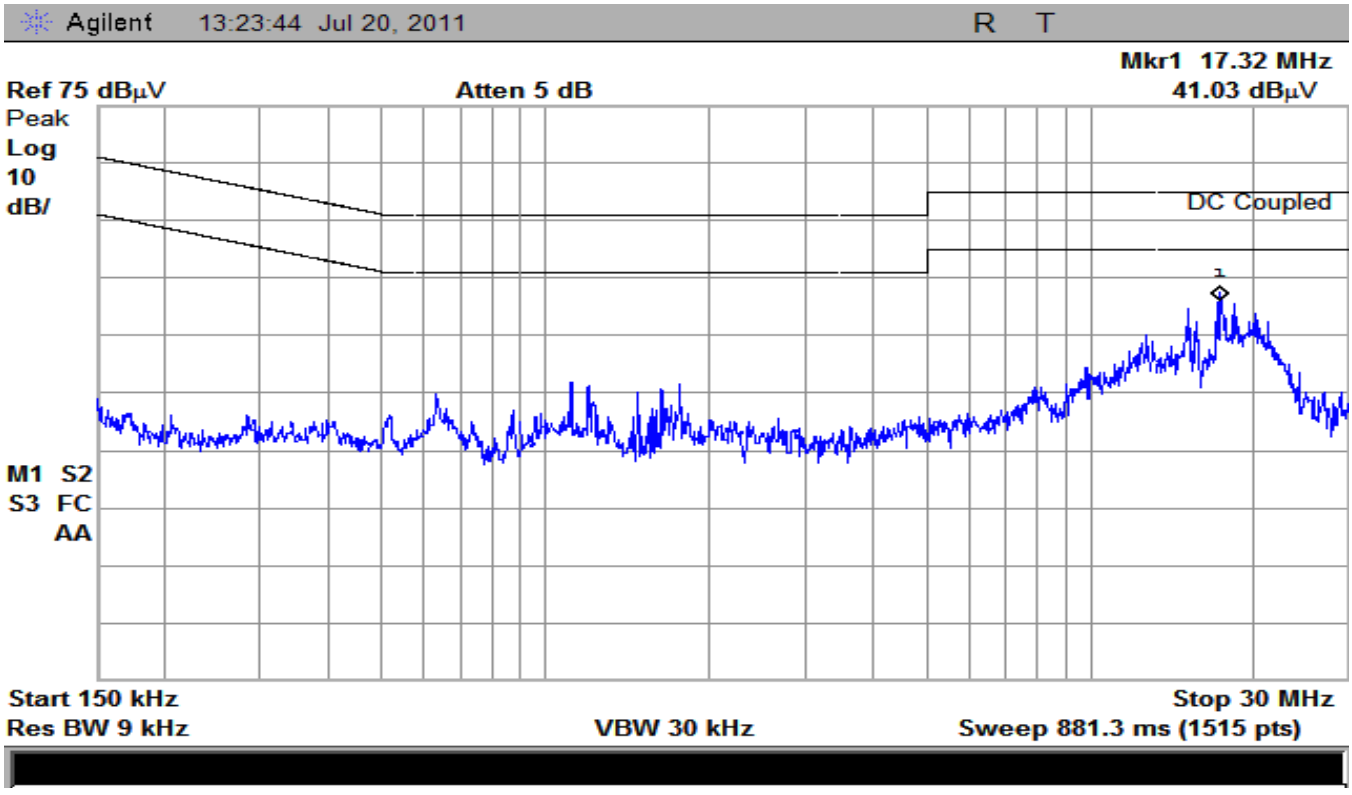
At 120 V / 60 Hz
(internal power supply) 7/20/2011 (note Peak emissions below limits)

Freq. (MHz)	Line	Peak Level (dBµV)	QP / Average Limit (dBµV)
0.715	L1	29	56 / 46
0.688	L2	27	56 / 46
10.98	L1	31	60 / 50
10.68	L2	28	60 / 50
17	L1	42	60 / 50
17	L2	44	60 / 50

Line 1


Agilent 13:10:25 Jul 20, 2011
R T
Mkr1 15.87 MHz
43.67 dBµV
Ref 75 dBµV
Atten 5 dB
Peak
Log
10
dB/
DC Coupled
M1 S2
S3 FC
AA
Start 150 kHz
Stop 30 MHz
Res BW 9 kHz
VBW 30 kHz
Sweep 881.3 ms (1515 pts)

Line 2


Agilent 13:23:44 Jul 20, 2011
R T
Mkr1 17.32 MHz
41.03 dBµV
Ref 75 dBµV
Atten 5 dB
Peak
Log
10
dB/
DC Coupled
M1 S2
S3 FC
AA
Start 150 kHz
Stop 30 MHz
Res BW 9 kHz
VBW 30 kHz
Sweep 881.3 ms (1515 pts)

3.1.2 RADIATED EMISSIONS, E-Field, FCC Part 15

Port : Enclosure
Equipment Operation : Transmitting, modulated, deactivating.
Power : 120V / 60 Hz
Temp. & Humd. : 39°C & 43%RH

FCC LIMITS for 15.109 and 15.209

LIMIT 15.109	Class B Quasi Peak Limit dBuV/m @3m	Class A Quasi Peak Limit dBuV/m @3m
30-88	40	50
88-216	43.5	54
216-960	46	57
>960	54	60

(external power supply)

Freq. (MHz)	Measured Level(dBuV)	Limit(dBuV)
33.1	38.1 #	40.0
120.1	37.8 #	43.5
240.1	43.1	46.0
360.1	35.8	46.0
480.3	34.5	46.0

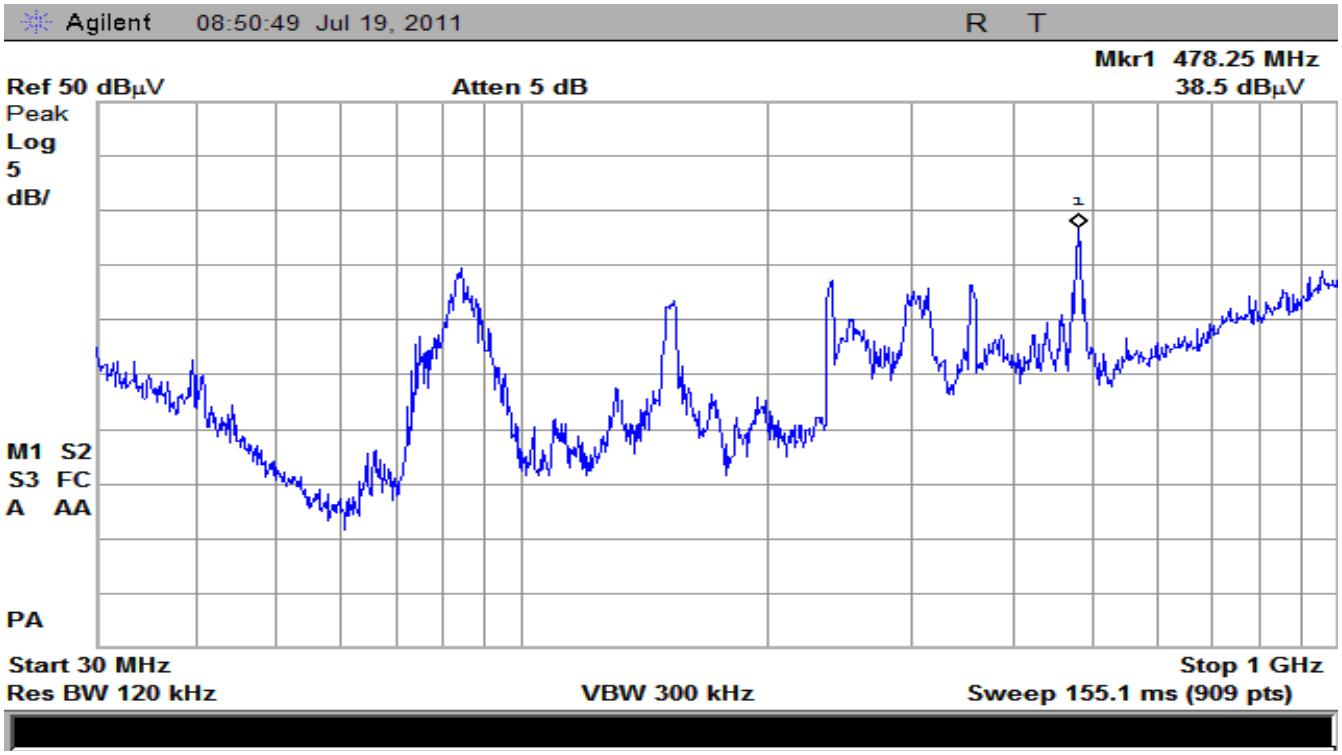
Quasi-Peak measurement is influenced by ambient. Ambient and intentional signals are below limit.

At 120 volts 60 Hz, OATS
(internal power supply) 7/19/2011

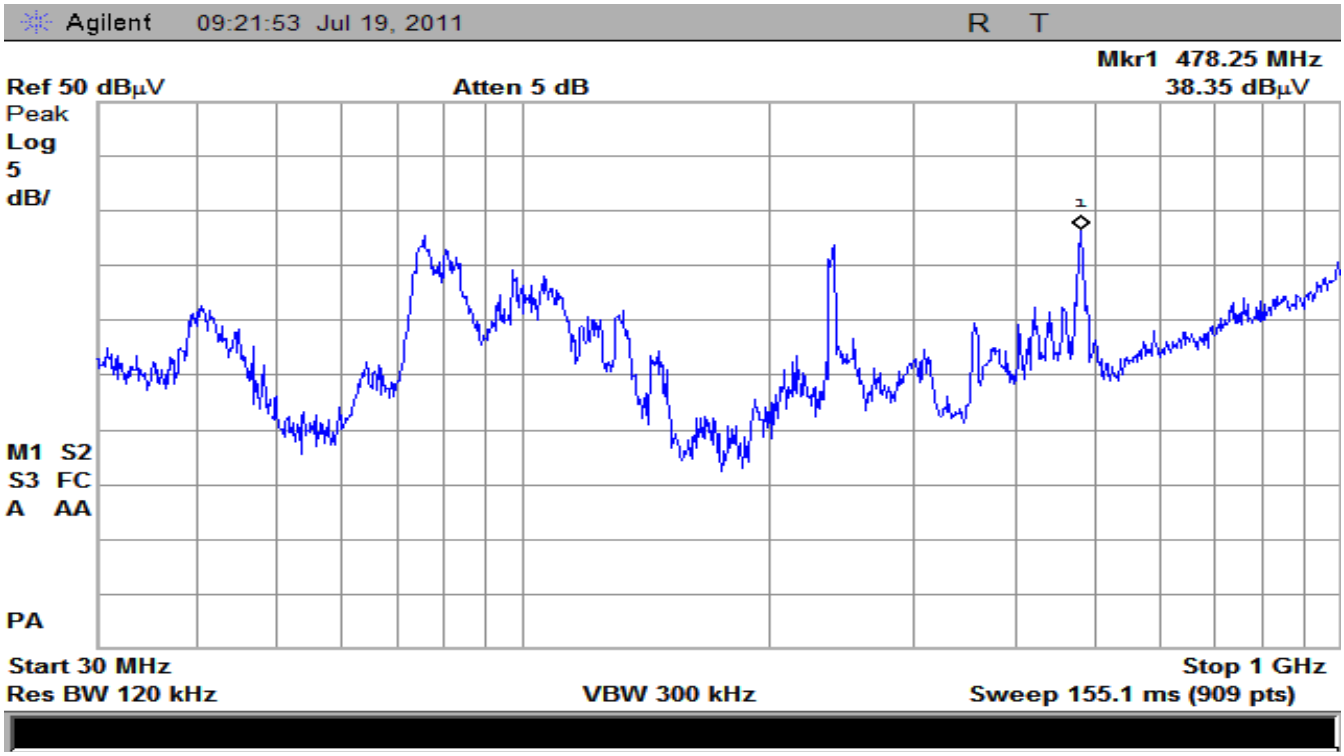
	Freq (MHz)	QP (dBuV)	Antenna	Polarity	ant fac	cable fac	Corrected	Limit Class B	Margin
Idle	87	13	Bicon #1	Horz	9.816	1.44	24.25	40.00	15.75
Act.	87	17.3	Bicon #1	Horz	9.816	1.44	28.55	40.00	11.45
	242	9.4	Bicon #1	Horz	18.224	3.05	30.67	46.00	15.33
	242	14.6	Bicon #1	Vert	19.452	3.05	37.10	46.00	8.90
Idle	75	23.5	Bicon #1	Vert	9.308	1.38	34.18	40.00	5.82
Act.	75	27.9	Bicon #1	Vert	9.308	1.38	38.58	40.00	1.42
	360	10.7	LP #1	Horz	15.207	4.11	30.02	46.00	15.98
	480	10.1	LP #1	Horz	17.319	5.26	32.68	46.00	13.32
	480	9.3	LP #1	Vert	17.274	5.26	31.83	46.00	14.17
	360	4.7	LP #1	Vert	14.802	4.11	23.61	46.00	22.39

Frequency Identification for OATS measurements.

Chamber - Horizontal



Chamber – Vertical



3.1.3 RADIATED EMISSIONS, H-Field, FCC Part 15

Equipment Operation: Transmitting, normal modulation

Test conditions		Transmitter field strength @ Fundamental – 58kHz (dBµV/m)	
Sub clause 15.31		MEASURED corrected to 300 m	LIMIT@300m
Tnom 25ºC	Vnom 120 V	-22.5	32.3
	Vnom 138 V	-23.1	32.3
	Vnom 102 V	-22.0	32.3
Measured at 10 meters, corrected to Limit Distance.		NOTE: This is for the worst case antenna.	

Rx Loop Antenna STANDING up (Vertical to Ground)				Test Distance: 10m								
				Antenna	Filter							Margin
Freq	S.A.	Det	BW	Factor	Factor	DCCF	DCF	Pk Cor	Actual	Limit	FCC	Limit
kHz	dBuV			dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m		dB
58	22.9	pk	9kHz	62.3	0.0	-22.8	-84.9	0.3	-22.5	32.3	@300m	54.8
116	1.6	pk	9kHz	56.7	1.9	-22.8	-84.9	-24.7	-47.5	26.3	@300m	73.8
174	17.4	pk	9kHz	53.2	0.8	-22.8	-84.9	-13.5	-36.3	22.8	@300m	59.1
232	12.7	pk	9kHz	50.6	0.5	-22.8	-84.9	-21.1	-43.9	20.3	@300m	64.2
290	8.4	pk	9kHz	48.7	0.4	-22.8	-84.9	-27.4	-50.3	18.4	@300m	68.7
348, nf	0.0	pk	9kHz	47.3	0.4	-22.8	-84.9	-37.2	-60.0	16.8	@300m	76.8
406	3.1	pk	9kHz	46.1	0.4	-22.8	-84.9	-35.3	-58.1	15.4	@300m	73.5
464	-2.6	pk	9kHz	45.2	0.2	-22.8	-84.9	-42.1	-64.9	14.3	@300m	79.2
522, nf	-1.2	qp	9kHz	44.4	0.2	-22.8	-27.4	16.0	-6.9	33.3	@30m	40.2
580, nf	-5.5	qp	9kHz	43.6	0.2	-22.8	-27.4	10.9	-12.0	32.3	@30m	44.3
	meas dist	5.0	10.0									
58(pwr-15%)	102 vac	40.3	22.4									
58(pwr+15%)	138 vac	40.8	23.5									

Green hilite is for input fields.

Legend

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, Clause 4.
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)
F Fact: 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 per decade).

Otherwise determine actual rolloff factor by using the 2 or more point method using the factor P per formula below.
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)
Distance Correction Factor (DCF) = 20 log(Test Dist / 300)^P = 20 P log (Test Dist / 300) to adjust measurement to 300 m.
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, Clause 4.
Video bandwidth is set to at least 3 times wider than the IF bandwidth.
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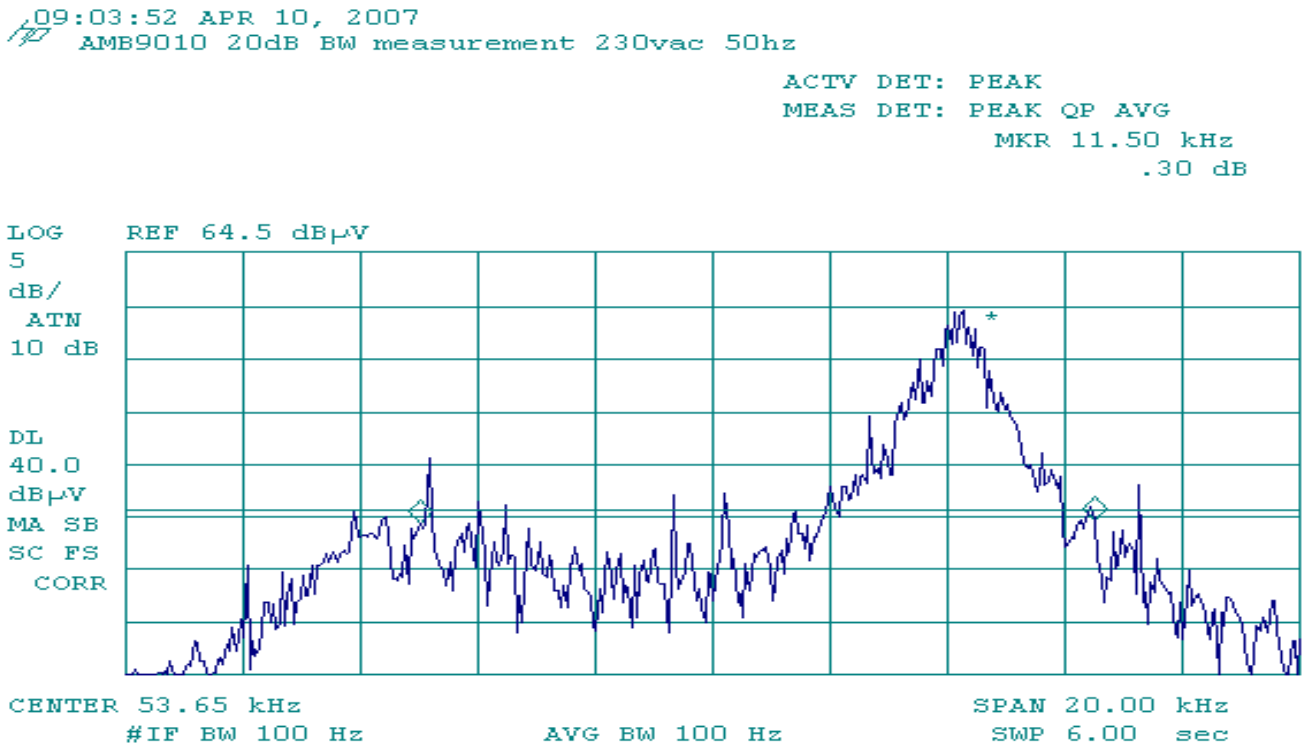
Use QP detector for other Freq bands below 1000 MHz per 15.209(d)
Average Detector measuring time is set to 100 mSec per 15.35(c)
QuasiPeak Detector measuring time is set to at least 1 second per CISPR 16
Peak Detector values may be used instead of QP if the value complies with the limit. 15.35(a)
Peak 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)
F Fact: 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 per decade).
Otherwise determine actual rolloff factor by using the 2 or more point method using the factor P per formula below.
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)
Distance Correction Factor (DCF) = 20 log(Test Dist / 300)^P = 20 P log (Test Dist / 300) to adjust measurement to 300 m.

3.1.4 OCCUPIED BANDWIDTH, IC, RSS-Gen

Ambient temperature : 24.6°C
Relative humidity : 51.4% RH
Date : 4/10/07
Line Input : 230VAC 50Hz

Modulation Bandwidth (kHz)			
Low Cut-Off Freq	Tx lo	Tx hi	High Cut-Off Freq
-20 dB			-20 dB
47.8kHz	34.5dBuv	36.5dBuv	59.5kHz

Bandwidth set to 100 Hz
Transmitter set to power level reported on previous page.
Cut-Off = Carrier - 20 dB



4 EQUIPMENT LIST

5kv VA AC Power Source	California Inst.	5001ix	54328	10-Dec-10	10-Dec-11
Power Analyzer & Cond System	California Inst.	PACS-1	72376	10-Dec-10	10-Dec-11
58 kHz Filter	In House	unique	N/A	30-Aug-11	30-Aug-12
Double-Ridge Waveguide Horn	EMCO	3115	3006	31-Mar-11	30-Mar-13
Biconical Antenna	Electro Metrics	3110B	1017	18-May-11	18-May-12
Biconical Antenna	ETS	3110B	3380	18-May-11	18-May-12
Log Periodic Antenna	EMCO	3146	3909	18-May-11	18-May-12
Log Periodic Antenna	EMCO	3146	4731	18-May-11	18-May-12
Transient Limiter	Electro Metrics	EM 7600	187	08-Nov-10	08-Nov-11
Line Imp Stable Network	EMCO	3816/2NM	1018	11-Jan-11	11-Jan-12
Loop Antenna	Electro Metrics	ALP -70	163	27-May-11	27-May-12
Directional Coupler	Werlatone	C3910	6706	09-Nov-10	09-Nov-11
RF Power Meter	Boonton	4231-30	53701	23-Dec-10	23-Dec-11
Power Sensor	Boonton	51011-EMC	31932	23-Dec-10	23-Dec-11
Directional Coupler	Werlatone	C5673	11481	09-Nov-10	09-Nov-11
Radiation Meter	Narda	EMR-200	AN-0055	21-Jan-11	21-Jan-12
EFT Generator	Haefely Trench	PEFT Junior	083 180-16	22-Mar-11	21-Mar-14
RF Absorbing Clamp	FCC	F-201	174	09-Jun-09	08-Jun-12
Coupling Decoupling Netwk	FCC	FCC-801-M3-16	58	02-Feb-11	02-Feb-12
Coupling Decoupling Netwk	FCC	FCC-801-M3-16	59	02-Feb-11	02-Feb-12
RF Current Probe	FCC	F-33-1	304	24-Nov-10	24-Nov-11
ESD Simulator with 2 Tips	Shaffner	NSG435	1197	05-Nov-10	05-Nov-11
Surge Coupler/Decoupler	Key Tek	CE50	9507535	16-Nov-10	16-Nov-11
Humidity & Temperature Meter	Davis Inst	4465CF	10304858	13-Aug-11	13-Aug-12
Log Periodic Antenna	EMCO	3146	3576	29-Apr-11	28-Apr-12
Spectrum Analyzer	HP	8562A	2712A00534	29-Jul-11	28-Jul-12
Spectrum Analyzer	HP	8591EM	3649A01066	26-Jul-11	25-Jul-12
Active Monopole	EMCO	3301B	4287	10-Jun-11	10-Jun-13
Signal Generator	Marconi	2024	783031	16-Mar-11	15-Mar-12
Coupling Decoupling Netwk	FCC	FCC-801-M3-16A	2036	02-Feb-11	02-Feb-12
Line Imp Stable Network	EMCO	3816/2NM	1064	11-Jan-11	11-Jan-12
Coupling Decoupling Netwk	FCC	FCC-801-M3-16A	2037	02-Feb-11	02-Feb-12
Biconical Antenna	EMCO	3104C	4334	03-Apr-10	02-Apr-12
Spectrum Analyzer	HP	E7401A	US39110103	28-Jul-11	27-Jul-12

Pre-Amp .009-1300MHz	HP	8447F	2805A03473	29-Jul-11	28-Jul-12
Pre-Amp .009-1300MHz	HP	8447F	3113A06072	29-Jul-11	28-Jul-12
Spectrum Analyzer	Agilent	E7405A	MYY49510099	28-Jul-11	27-Jul-12
Spectrum Analyzer	Agilent	E7405A	MYY49510320	08-Jun-11	07-Jun-12
AC Power Source	Pacific	120ASX	1513_05894	26-May-10	25-May-12
Dipole Antenna	EMCO	3121C	9701-1262	28-Dec-11	28-Dec-12
Signal Generator	Agilent	N5183A	MY50140589	03-Mar-11	02-Mar-12
Horn Antenna	ETS Lindgren	3115	00135941	11-Apr-11	10-Apr-12
Horn Antenna	ETS Lindgren	3116B	00122502	03-Feb-11	03-Feb-12
Loop Antenna	ETS Lindgren	6512	00123860	22-Nov-10	22-Nov-11
Antenna	Teseq	T800	28620	10-Jun-11	09-Jun-12

5 ANTENNA FACTORS.

Customer Name: Tyco Safety Products - Sensormatic
Antenna Manufacturer: Electro-Metrics
Antenna Model: ALP-70 Loop
Antenna Serial No.: 163
Temperature (Deg C): 21.0
Humidity (%): 50.0
Measurement Distance in Meters = 1.0
NOTES: ACF valid to 10 meters per NIST methods.

Freq (MHz)	E-field ACF (dB)	H-field ACF (dB)
0.01	75.6	24.1
0.02	71.6	20.2
0.03	68.3	16.9
0.04	65.5	14.0
0.05	63.6	12.2
0.06	61.1	9.7
0.07	59.6	8.2
0.08	58.5	7.0
0.09	57.8	6.4
0.10	56.8	5.4
0.20	51.8	0.4
0.30	48.5	-3.0
0.40	46.3	-5.1
0.50	45.0	-6.5
0.60	43.6	-7.8
0.70	42.8	-8.6
0.80	41.6	-9.8
0.90	41.1	-10.3
1.00	40.5	-11.0
2.00	38.2	-13.3
3.00	37.2	-14.3
4.00	37.0	-14.4
5.00	36.7	-14.8
6.00	37.6	-13.8
7.00	37.7	-13.8
8.00	37.7	-13.7
9.00	37.6	-13.9
10.00	37.6	-13.8
15.00	37.4	-14.0
20.00	37.2	-14.2
25.00	36.2	-15.2
30.00	37.4	-14.1

Customer Name: Tyco Safety Products - Sensormatic
Antenna Manufacturer: EMCO
Antenna Model: 3104C Biconical
Antenna Serial No.: 9009-4334
Temperature (Deg C). 3
Humidity (%). 65
Measurement Distance in Meters = 3
Antenna Polarization = VERT / HORZ

Freq	Ver ACF	Hor ACF
(MHz)	(dB)	(dB)
20.0000	17.7	20.6
21.0000	17.4	20.0
22.0000	16.4	18.6
23.0000	16.1	18.1
24.0000	15.3	16.9
25.0000	14.9	16.4
26.0000	14.2	15.5
27.0000	13.6	15.0
28.0000	13.0	14.3
29.0000	12.3	13.7
30.0000	11.9	13.3
31.0000	11.3	12.7
32.0000	11.0	12.4
33.0000	10.5	11.9
34.0000	10.3	11.7
35.0000	9.9	11.3
36.0000	9.8	11.3
37.0000	9.6	11.0
38.0000	9.6	11.0
39.0000	9.5	10.8
40.0000	9.5	10.7
40.0000	9.5	10.7
41.0000	9.6	10.7
42.0000	9.7	10.7
43.0000	9.9	10.6
44.0000	10.0	10.6
45.0000	10.2	10.7
46.0000	10.4	10.7
47.0000	10.5	10.7
48.0000	10.7	10.7
49.0000	11.0	10.8
50.0000	11.2	10.8
51.0000	11.4	10.8
52.0000	11.6	10.8
53.0000	11.9	10.9
54.0000	12.0	10.9
55.0000	12.1	11.0
56.0000	11.9	10.9
57.0000	11.9	11.0
58.0000	11.4	10.9
59.0000	11.2	10.9
60.0000	10.8	10.8
61.0000	10.5	10.8
62.0000	10.0	10.5
63.0000	9.7	10.4
64.0000	9.2	10.1
65.0000	8.9	9.9
66.0000	8.5	9.5
67.0000	8.2	9.3
68.0000	7.8	8.9
69.0000	7.6	8.6
70.0000	7.3	8.2
71.0000	7.2	7.9
72.0000	7.0	7.5
73.0000	7.0	7.3
74.0000	6.8	7.0
75.0000	6.8	6.8
75.0000	6.8	6.8
76.0000	6.7	6.5
77.0000	6.7	6.4
78.0000	6.6	6.3
79.0000	6.7	6.3
80.0000	6.7	6.3
81.0000	6.9	6.3
82.0000	7.2	6.4
83.0000	7.4	6.5
84.0000	7.6	6.7
85.0000	7.9	6.8
86.0000	8.2	7.1
87.0000	8.3	7.2
88.0000	8.7	7.6
89.0000	8.8	7.7
90.0000	9.1	8.0
91.0000	9.2	8.1
92.0000	9.5	8.5
93.0000	9.5	8.6
94.0000	9.8	8.9
95.0000	9.9	9.0
96.0000	10.2	9.4
97.0000	10.6	9.9
98.0000	11.4	11.2
99.0000	11.7	12.0
100.0000	11.7	11.7
101.0000	11.4	11.3
102.0000	11.6	11.4
103.0000	11.5	11.2
104.0000	11.8	11.5
105.0000	11.9	11.5
106.0000	12.1	11.8
107.0000	12.2	11.8
108.0000	12.5	12.1
109.0000	12.6	12.2
110.0000	12.9	12.6
111.0000	13.1	12.7
112.0000	13.5	13.2
113.0000	13.8	13.5
114.0000	14.3	14.2
115.0000	14.8	14.9
116.0000	15.6	15.7
117.0000	16.3	15.8
118.0000	16.3	15.3
119.0000	15.6	14.5
120.0000	15.0	14.1
121.0000	14.3	13.6
122.0000	14.1	13.5
123.0000	13.8	13.3
124.0000	13.6	13.3
125.0000	13.4	13.2
126.0000	13.4	13.3
127.0000	13.2	13.1
128.0000	13.1	13.2
129.0000	12.9	13.0
130.0000	13.0	13.2
131.0000	12.8	13.0
132.0000	12.8	13.2
133.0000	12.7	13.0
134.0000	12.8	13.1
135.0000	12.7	13.0
136.0000	12.8	13.0
137.0000	12.8	13.0
138.0000	12.8	13.1
139.0000	12.8	13.0
140.0000	12.8	13.0

141.0000	12.8	13.0
142.0000	12.9	13.1
143.0000	13.0	13.1
144.0000	13.0	13.2
145.0000	13.2	13.3
146.0000	13.3	13.4
147.0000	13.5	13.6
148.0000	13.7	13.8
149.0000	14.0	14.1
150.0000	14.2	14.2
151.0000	14.4	14.3
152.0000	14.3	14.2
153.0000	14.5	14.1
154.0000	14.5	13.9
155.0000	14.6	13.9
156.0000	14.7	13.8
157.0000	14.8	13.8
158.0000	14.7	13.7
159.0000	14.8	13.8
160.0000	14.8	13.8
161.0000	15.0	14.0
162.0000	15.1	14.0
163.0000	15.3	14.2
164.0000	15.4	14.2
165.0000	15.7	14.4
166.0000	15.7	14.4
167.0000	16.0	14.7
168.0000	15.9	14.7
169.0000	16.1	14.9
170.0000	16.1	15.0
171.0000	16.1	15.2
172.0000	16.1	15.2
173.0000	16.2	15.4
174.0000	16.3	15.5
175.0000	16.4	15.7
176.0000	16.5	15.8
177.0000	16.7	16.0
178.0000	16.8	16.1
179.0000	16.9	16.3
180.0000	17.0	16.4
181.0000	17.1	16.6
182.0000	17.1	16.7
183.0000	17.2	16.9
184.0000	17.2	17.0
185.0000	17.3	17.1
186.0000	17.3	17.2
187.0000	17.5	17.3
188.0000	17.6	17.5
189.0000	17.8	17.6
190.0000	17.8	17.7
191.0000	17.9	17.7
192.0000	17.8	17.5
193.0000	17.8	17.5
194.0000	17.7	17.3
195.0000	17.8	17.4
196.0000	17.7	17.4
197.0000	17.9	17.5
198.0000	17.8	17.4
199.0000	17.7	17.5
200.0000	17.6	17.3
201.0000	17.7	17.4
202.0000	17.6	17.3
203.0000	17.5	17.3
204.0000	17.4	17.3
205.0000	17.4	17.3
206.0000	17.2	17.2
207.0000	17.2	17.2
208.0000	17.2	17.2
209.0000	17.2	17.2
210.0000	17.1	17.1
211.0000	17.0	17.2
212.0000	16.9	17.0
213.0000	16.9	17.0
214.0000	16.8	16.9
215.0000	16.7	16.9
216.0000	16.6	16.8
217.0000	16.5	16.7
218.0000	16.5	16.7
219.0000	16.4	16.5
220.0000	16.5	16.4
221.0000	16.5	16.3
222.0000	16.4	16.2
223.0000	16.4	16.1
224.0000	16.2	16.1
225.0000	16.2	15.9
226.0000	16.0	16.0
227.0000	16.1	16.0
228.0000	16.1	15.9
229.0000	16.0	15.8
230.0000	16.1	15.7
231.0000	16.1	15.7
232.0000	16.2	15.7
233.0000	16.2	15.6
234.0000	16.3	15.7
235.0000	16.3	15.6
236.0000	16.5	15.7
237.0000	16.6	15.7
238.0000	16.6	15.7
239.0000	16.6	15.7
240.0000	16.7	15.7
241.0000	16.7	15.8
242.0000	16.8	15.9
243.0000	16.8	15.9
244.0000	16.9	16.0
245.0000	17.0	16.0
246.0000	17.0	16.1
247.0000	17.2	16.2
248.0000	17.2	16.3
249.0000	17.4	16.4
250.0000	17.4	16.5
251.0000	17.5	16.6
252.0000	17.5	16.7
253.0000	17.5	16.8
254.0000	17.5	17.0
255.0000	17.5	17.1
256.0000	17.6	17.3
257.0000	17.7	17.4
258.0000	17.9	17.5
259.0000	18.1	17.6
260.0000	18.2	17.7
261.0000	18.4	17.9
262.0000	18.5	18.0
263.0000	18.5	18.1
264.0000	18.6	18.3
265.0000	18.6	18.4
266.0000	18.6	18.6
267.0000	18.7	18.7
268.0000	18.7	18.8
269.0000	18.7	19.0
270.0000	18.8	19.1
271.0000	18.9	19.2
272.0000	18.9	19.3
273.0000	19.1	19.4
274.0000	19.2	19.5
275.0000	19.3	19.5
276.0000	19.4	19.6
277.0000	19.5	19.7
278.0000	19.6	19.7
279.0000	19.8	19.8
280.0000	19.9	19.9
281.0000	20.1	20.0
282.0000	20.1	20.1
283.0000	20.1	20.2
284.0000	20.1	20.3
285.0000	20.1	20.4
286.0000	20.2	20.6
287.0000	20.2	20.7
288.0000	20.3	21.0
289.0000	20.3	21.2
290.0000	20.5	21.3

291.0000	20.6	21.5
292.0000	20.6	21.7
293.0000	20.6	21.8
294.0000	20.7	21.8

295.0000	20.6	21.9
296.0000	20.6	22.0
297.0000	20.7	22.1
298.0000	20.7	22.2

299.0000	20.8	22.3
300.0000	20.8	22.4

Customer Name: Tyco Safety Products - Sensormatic
Antenna Manufacturer: EMCO
Antenna Model: 3146 – Log periodic
Antenna Serial No.: 9303-3576
Temperature (Deg C). 3
Humidity (%). 65
Measurement Distance in Meters = 3
Antenna Polarization = VERT / HORZ

Freq (MHz)	Ver ACF (dB)	Hor ACF (dB)
200.0000	11.7	12.1
205.0000	11.6	12.1
210.0000	11.7	11.9
215.0000	11.6	11.7
220.0000	11.5	11.5
225.0000	11.2	11.4
230.0000	11.1	11.4
235.0000	11.5	11.6
240.0000	11.8	11.9
245.0000	12.2	12.1
250.0000	12.6	12.4
255.0000	12.6	12.6
260.0000	12.8	13.0
265.0000	12.9	13.2
270.0000	13.0	13.5
275.0000	13.3	13.6
280.0000	13.6	13.7
285.0000	13.9	13.8
290.0000	14.1	14.0
295.0000	14.1	14.1
300.0000	14.2	14.3
305.0000	14.5	14.8
310.0000	14.8	15.2
315.0000	14.8	15.1
320.0000	14.7	14.8
325.0000	14.7	14.6
330.0000	14.6	14.6
335.0000	14.3	14.7
340.0000	14.1	14.9
345.0000	14.2	14.9
350.0000	14.5	14.9
355.0000	14.8	14.8
360.0000	15.0	14.9
365.0000	15.3	15.0
370.0000	15.2	15.1
375.0000	15.1	15.2
380.0000	15.0	15.3
385.0000	15.4	15.5
390.0000	15.7	15.8
395.0000	15.5	15.9
400.0000	15.4	16.1
405.0000	15.5	16.0
410.0000	15.7	15.9
415.0000	16.0	16.1
420.0000	16.0	16.2
425.0000	15.9	16.4
430.0000	15.8	16.5
435.0000	15.9	16.5
440.0000	16.1	16.4
445.0000	16.4	16.5
450.0000	16.7	16.7
455.0000	16.9	16.9
460.0000	16.9	17.2
465.0000	16.9	17.3
470.0000	16.9	17.3
475.0000	17.1	17.4
480.0000	17.2	17.4
485.0000	17.5	17.5
490.0000	17.7	17.6
495.0000	17.9	17.9
500.0000	17.9	17.9
505.0000	18.0	18.2
510.0000	18.3	18.6
515.0000	18.5	19.0
520.0000	18.3	18.8
525.0000	18.0	18.6
530.0000	17.7	18.5
535.0000	17.6	18.6
540.0000	17.6	18.4
545.0000	17.9	18.3
550.0000	18.2	18.3
555.0000	18.3	18.6
560.0000	18.2	18.7
565.0000	18.1	18.8
570.0000	18.0	18.9
575.0000	18.2	18.7
580.0000	18.4	18.6
585.0000	18.7	18.8
590.0000	18.8	19.1
595.0000	18.7	19.2
600.0000	18.7	19.2
605.0000	18.7	19.1

610.0000	18.8	19.3
615.0000	19.0	19.5
620.0000	19.2	19.4
625.0000	19.4	19.4
630.0000	19.2	19.4
635.0000	19.2	19.4
640.0000	19.5	19.7
645.0000	19.7	19.9
650.0000	19.9	20.0
655.0000	20.1	20.1
660.0000	20.3	20.3
665.0000	20.4	20.4
670.0000	20.5	20.6
675.0000	20.5	20.7
680.0000	20.5	20.9
685.0000	20.4	20.9
690.0000	20.4	21.1
695.0000	20.4	21.0
700.0000	20.5	21.0
705.0000	20.6	21.0
710.0000	20.5	21.0
715.0000	20.5	21.0
720.0000	20.5	21.2
725.0000	20.7	21.3
730.0000	20.7	21.2
735.0000	20.7	21.2
740.0000	20.6	21.1
745.0000	20.6	21.2
750.0000	20.6	21.4
755.0000	20.6	21.4
760.0000	20.7	21.3
765.0000	20.7	21.4
770.0000	20.7	21.4
775.0000	20.7	21.4
780.0000	20.7	21.4
785.0000	20.7	21.4
790.0000	20.8	21.5
795.0000	20.9	21.6
800.0000	21.1	21.6
805.0000	21.0	21.7

810.0000	21.1	21.7
815.0000	21.1	21.8
820.0000	21.3	22.0
825.0000	21.4	22.1
830.0000	21.5	22.1
835.0000	21.6	22.2
840.0000	21.7	22.3
845.0000	21.7	22.4
850.0000	21.8	22.4
855.0000	21.9	22.5
860.0000	22.2	22.7
865.0000	22.4	22.9
870.0000	22.5	23.0
875.0000	22.6	23.1
880.0000	22.6	23.1
885.0000	22.5	23.2
890.0000	22.6	23.1
895.0000	22.6	23.1
900.0000	22.7	23.3
905.0000	22.7	23.3
910.0000	22.8	23.3
915.0000	22.8	23.2
920.0000	22.6	23.3
925.0000	22.6	23.4
930.0000	22.6	23.4
935.0000	22.7	23.4
940.0000	22.7	23.5
945.0000	22.7	23.6
950.0000	22.6	23.5
955.0000	22.7	23.6
960.0000	22.9	23.7
965.0000	22.9	23.9
970.0000	23.1	23.8
975.0000	23.1	23.8
980.0000	23.1	23.9
985.0000	23.2	23.9
990.0000	23.3	24.1
995.0000	23.5	24.4
1000.0000	23.6	24.4

Customer Name: Tyco Safety Products - Sensormatic
Antenna Manufacturer: EMCO
Antenna Model: 3115 Horn
Antenna Serial No.: 3006
Temperature (Deg C): 20.0
Humidity (%): 37.0
Measurement Distance in Meters = 3.0
Antenna Polarization = VERT / HORZ
NOTES: Observed Pin Depth: -0.0003" from typical.

Freq (MHz)	Ver ACF (dB)	Hor ACF (dB)
1000.0000	23.377	23.524
1500.0000	25.067	25.087
2000.0000	27.357	27.365
2500.0000	29.000	29.024
3000.0000	30.277	30.385
3500.0000	31.557	31.512
4000.0000	32.827	32.580
4500.0000	32.593	32.499
5000.0000	33.481	33.288
5500.0000	34.467	34.421
6000.0000	34.894	34.639
6500.0000	34.730	34.612
7000.0000	35.473	35.489
7500.0000	36.832	36.780
8000.0000	37.271	37.207
8500.0000	37.649	37.600
9000.0000	37.956	37.940
9500.0000	37.858	37.743
10000.0000	38.517	38.433
10500.0000	38.992	39.004
11000.0000	40.566	40.541
11500.0000	39.704	39.684
12000.0000	39.424	39.396
12500.0000	38.797	38.822
13000.0000	39.622	39.615
13500.0000	40.408	40.394
14000.0000	41.209	41.203
14500.0000	41.665	41.584
15000.0000	40.325	40.233
15500.0000	38.024	38.049
16000.0000	37.320	37.358
16500.0000	38.400	38.340
17000.0000	41.136	40.903
17500.0000	42.866	42.522
18000.0000	44.717	44.269