TYCO / SENSORMATIC, LLC
EMC TEST REPORT

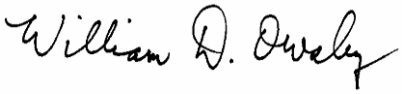
Model:
AMS-9060

FCC ID: BVCAMS90604
IC: 3506A-AMS90604

Intentional Radiator

FCC and IC
47 CFR, Part 15, Subpart B, and Subpart C
Industry Canada
ICES-003e, RSS GENi3, RSS-210i8

Date:
April 1, 2014



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Revision A	April 1, 2014	Initial

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1 SUMMARY OF RESULTS

1.1 47 CFR Part 15, Subpart B / Subpart C

Part	PARAMETER TO BE MEASURED	Applies	Comments
SubPart B, Unintentional Radiators (Class B)			
15.107	Conducted Disturbance (Conducted Emissions, 0.15-30 MHz)	X	Complies
15.109	Radiated Disturbance (Radiated Emissions, 30-x000 MHz)	X	Complies
SubPart C, Intentional Radiators (General Limit)			
15.207	Conducted Disturbance (Conducted Emissions, 0.15-30 MHz)	X	Complies
15.209	Radiated Disturbance (Radiated Emissions, 0.009 plus x MHz)	X	Complies

SUMMARY OF RESULTS

FCC 47 CFR Part 15.	Test Requirement	Test Limit	Comments
15.15 (b)	User Accessible Controls	Cannot change output power above limit.	The product contains no user accessible controls. Complies.
15.31 (e)	Vary Input AC Mains Power	Does not increase the output power above the limit.	Complies.
15.33	Frequency range of radiated measurements	General Limits of 15.209, 9 kHz to 2 GHz.	E-field and H-field measurements comply.
15.107	AC Conducted Emissions	Unintentional digital emissions subject to Class B limits of 15.107	Digital emissions determined by turning transmitter off. Complies.
15.109	Radiated Emissions	Unintentional digital emissions subject to Class B limits of 15.109	Digital emissions determined by turning transmitter off. Complies.
15.203	Antenna Connector	Permanently attached or unique coupling or professionally installed.	Professionally installed and setup. Complies.
15.204(b)(c)	System and Antennas	Marketed as a system with authorized antenna types	Transmitter capable of driving only loop antennas. Complies.
15.207 (a) (b)	AC Conducted Emissions	General Limits.	Conducted emissions on AC side of DC supply. Complies.
15.205 (a) (b) 15.209 (a) (c)	Radiated Emission	Comply with limits in 15.209 (a). No intentional emissions in the restricted bands of 15.205	The radiated emissions comply with the general emission limits.

1.2 IC RSS 210 (RSS GEN)

58 kHz

Clause	PARAMETER TO BE MEASURED	Applies	comment
4.6.1	Occupied Bandwidth 99% (-20 dBc)	X	7360 Hz
4.6.2	-6 dB Bandwidth	X	1175 Hz
4.6.3	-20 dB Bandwidth	X	2720 Hz

58 kHz plus 56 kHz

Clause	PARAMETER TO BE MEASURED	Applies	comment
4.6.1	Occupied Bandwidth 99% (-20 dBc)	X	16700 Hz
4.6.2	-6 dB Bandwidth	X	1160 Hz
4.6.3	-20 dB Bandwidth	X	3900 Hz

2 GENERAL

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 – 616407, and with Industry Canada, number – 3506A-1.

2.2 FCC Test Procedures

Both conducted and radiated emissions testing were performed according to the procedures in ANSI C63.4-2003, as required by 47 CFR Part 15 Subpart A Section 15.31(a)(3), 15.107, 15.109, 15.207, 15.209.

Accessory Equipment used during testing are all FCC DoC, Verified, or Certified products.
This includes ITE power supplies.

The digital portion of the EUT was evaluated according to the DoC procedures.

Radiated evaluations were performed in a pre-screen environment and the worst case was tested on the OATS.

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.

Per IC RSS-Gen,Ver. E, Section 4.8,
The following formula may be used to convert field strength (FS) in volts/metre to transmitter output power (TP) in watts:
TP = (FS x D) / (30 x G) 2
Where D is the distance in meters between the two antennas and G is the antenna numerical gain referenced to isotropic gain.
(Note: In an open-area test measurement, the effect due to the metal ground plane should be subtracted from the maximum field strength value in order to reference it to free space, before calculating TP.)

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 DESCRIPTION AND CHARACTERISTICS OF THE EUT

3.1 Construction Of Equipment Under Test (EUT)

[ ] Single unit

[X] Multiple units

Describe each unit clearly:
1 to 4 pedestals containing loop antennas.
Transmitters in chassis.
Interconnected with antenna and signal cables.

3.2 Overview

The model AMS-9060 is a controller capable of driving up to four tuned loop antennas in pedestals to generate a magnetic field to excite EAS tags, receive the tag signal and alarm when an acceptable tag signal is detected and verified. This controller functions by transmitting a 58 kHz (+/-200 Hz) ringing burst for 1.6 mS at a maximum rate of 90 Hz. Then at the end of the burst, detects the resonant ringing of any tags in the field. The 58 kHz nominal frequency shifts +/- 200 Hz in order to maximize coupling to the tags that have a manufacturing tolerance of that amount. There is also a 300 uS 56 kHz signal transmitted to provide a sync signal to other nearby systems to avoid transmissions in the receive time window. A single main PCB accommodates the Receiver, the Transmitter, and Power Supply.

3.3 A limited modular approval

The model AMS-9060, will be assembled at the factory under the control of the manufacturer. There is no mechanism for installing the module into any other end product outside of the manufacturers' control. Any future models will be fully tested to ensure continued compliance and are manufactured under the applicants' control.

FCC 15.212: (b) A limited modular approval may be granted for single or split modular transmitters that do not comply with all of the above requirements, e.g., shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation, if the manufacturer can demonstrate by alternative means in the application for equipment authorization that the modular transmitter meets all the applicable part 15 requirements under the operating conditions in which the transmitter will be used. Limited modular approval also may be granted in those instances where compliance with RF exposure rules is demonstrated only for particular product configurations. The applicant for certification must state how control of the end product into which the module will be installed will be maintained such that full compliance of the end product is always ensured.

3.4 Installation

This system is professionally installed.

3.4.1 Equipment Ratings

Power Supply
Primary input .....100-120Vac or 220-240Vac @ 50–60Hz
Primary power fuse.....3.15A, 250V, slo-blow
Current draw (120V) .....<2.5Arms
Current draw (240V) .....<1.25Arms
Input power (120V) .....<300W
Input power (240V) .....<150W

Transmitter
Operating frequency .....58 kHz (± 200 Hz) and 56 kHz.
Transmit burst duration.....1.6ms
Transmit current maximum.....20A peak
Burst Repetition Rate:
Based on 50Hz ac.....150 Hz
Based on 60Hz ac.....180 Hz

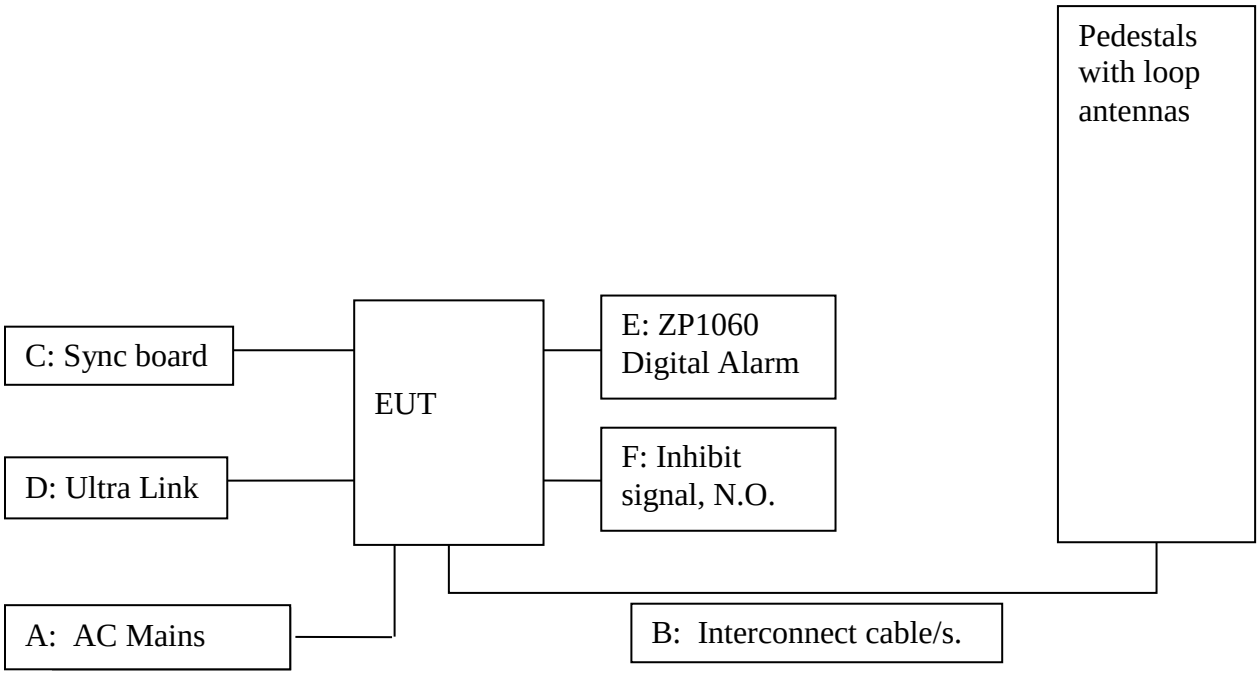
Receiver
Center frequency .....58 kHz

Ambient temperature .....0°C to 50°C, (32°F to 122°F)
Relative humidity .....0 to 90%, non-condensing

3.4.2 Frequency Characteristics And Internal Clocks

58 kHz +/- 200 Hz
56 kHz
100 kHz
16 MHz
20 MHz
30 MHz
50 MHz
100 MHz

4 TEST SET-UP BLOCK DIAGRAM



List Of Ports

	Function	Classification	Max Cable Length	Test Length	Cable Type/Description
A	AC Mains	AC power	> 1 m but < 3 m	1.83m	3 conductor unshielded
B	Interconnect cables	Signal	>3m	10m	Shielded 2 Twisted Pairs w/drain
C	Multi-Unit sync	Signal	>3m	10m	5 conductor unshielded
D	Data RS485	Signal	>3m	10m	Unshielded Cat 5
E	Remote Alarm	Signal	>3m	10m	5 conductor unshielded
F	Inhibit sig	Signal	>3m	10m	5 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

5 FCC TESTS

5.1.1 Conducted Emissions, FCC Part 15, Clause 15.107 And 15.207

Limit : Class B, and general limits of 15.207
Equipment operation : Tag Detection with Ultra Exit antenna.
Line Voltage / Freq : 120V / 60 Hz
Temp : 25.2º C
Humidity : 50.8% RH
Date : 04-21-2014

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

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		Reading		Limit	
Freq (MHz)	Det	dBuV	Line	Class B	Margin
0.521	QP	48.97	L2	56	7.03
	Avg	28.28		46	17.72
0.578	QP	49.19	L2	56	6.81
	Avg	23.23		46	22.77
0.694	Qp	51.17	L2	56	4.83
	Avg	24.68		46	21.32
0.694	QP	48.93	L1	56	7.07
	Avg	20.95		46	25.05
3	QP	49.49	L1	56	6.51
	Avg	29.75		46	16.25
3.3	Qp	47.6	L2	56	8.4
	Avg	24.38		46	21.62

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

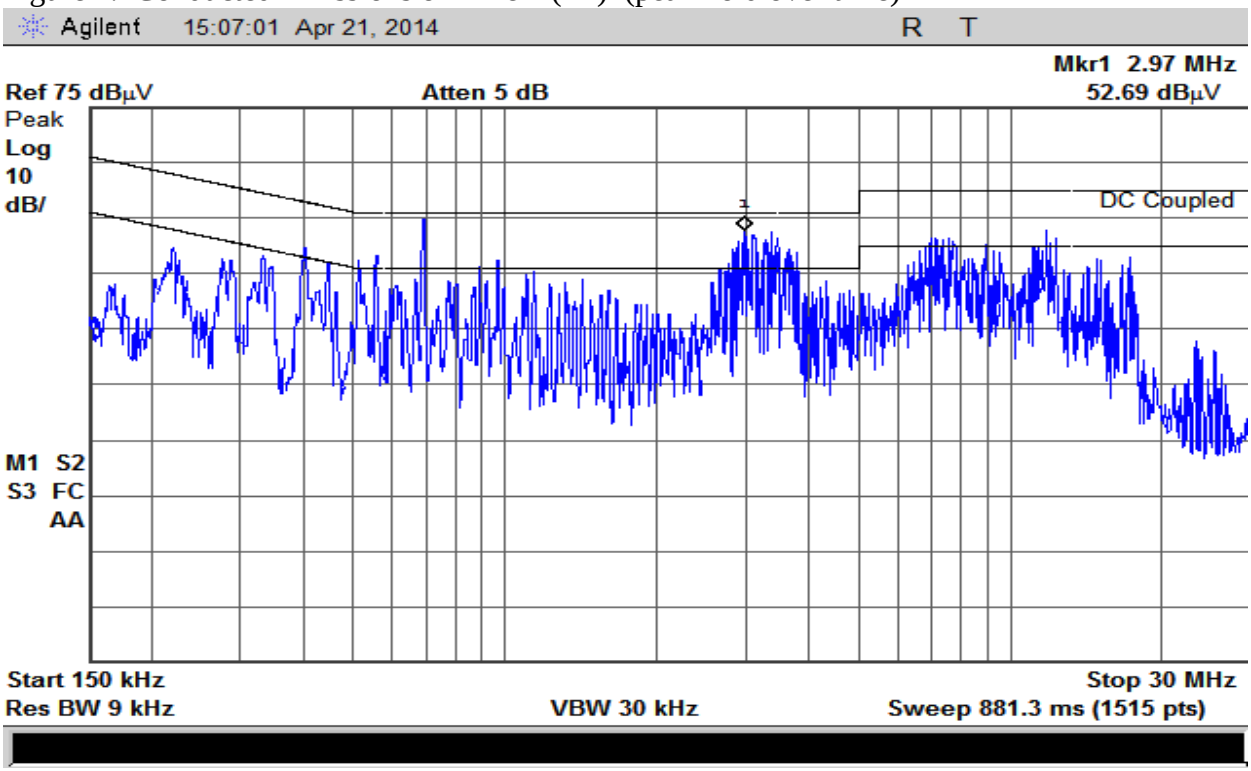
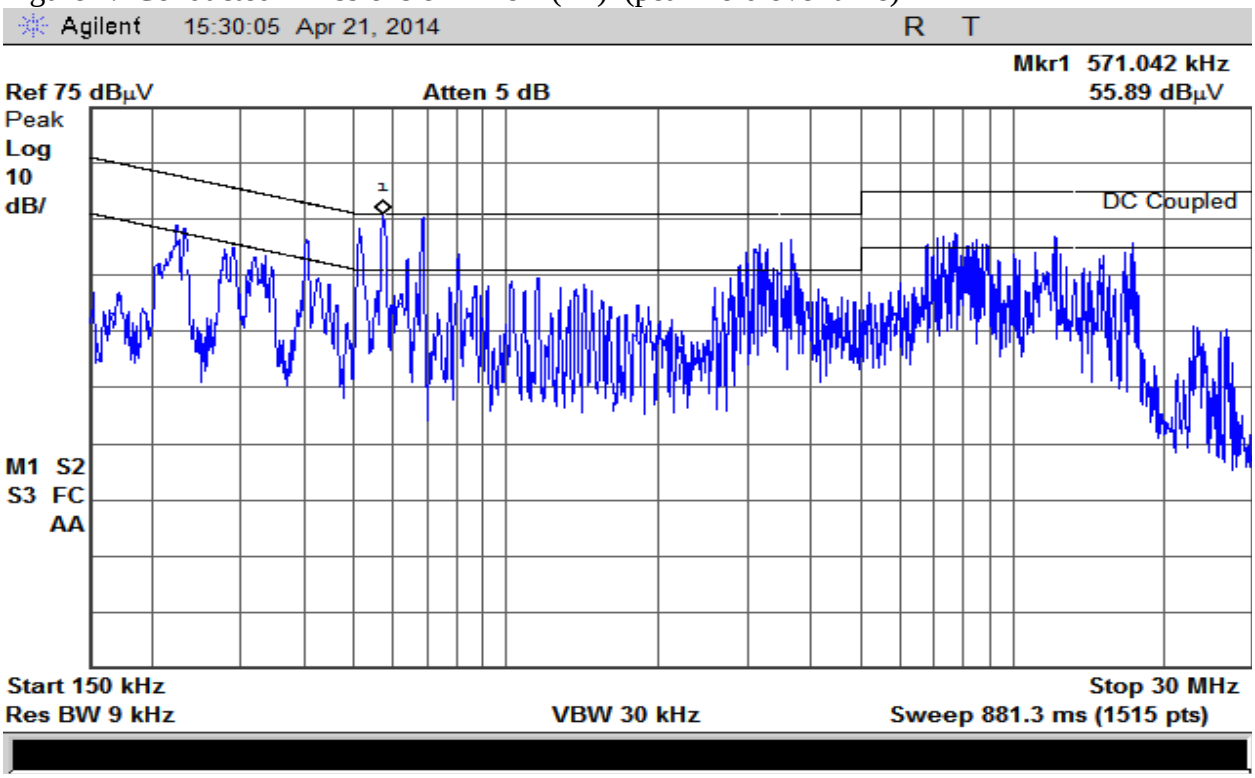


Figure 2. Conducted Emissions on Line 2 (L2) (peak hold over time)



5.1.2 Radiated Emissions, FCC Part 15, Clause 15.109 and 15.209 (above 30 MHz)

Limit : Class B
Equipment operation : Tag Detection with Ultra Exit Pedestals
Line Voltage / Freq : 120V / 60 Hz
Distance : 3 meters OATS
Temp : 36.8º C
Humidity : 42.9% RH
Date : 04-29-2014

LIMIT FCC Part 15, Subpart B.
Class B digital devices at 3 meters, Subpart B and General Limits, Subpart C

Frequency of emission (MHz)	Field strength (microvolts/meter)	Field strength (dBuV/m) at 3 meters
30–88	100	40
88–216	150	44
216–960	200	46
Above 960	500	54

Measurements:

Freq (MHz)	QP (dBuV)	Antenna	Polarization	ant fac	cable fac	Corrected	Class B	Margin
191	9.1	Bi-con #1	Vert	14.41	2.72	26.23	43.50	17.27
191	11.7	Bi-con #1	Horz	14.01	2.72	28.43	43.50	15.07
407	11.9	LP #1	Horz	15.97	4.67	32.54	46.00	13.46
419	9.3	LP #1	Horz	16.05	4.69	30.05	46.00	15.95
476	11.5	LP #1	Horz	17.22	5.44	34.17	46.00	11.83
477	13.4	LP #1	Vert	17.14	5.19	35.73	46.00	10.27

Note: Glitches between 30-40 MHz could not be measured with QP.

The following are pre-compliance chamber frequency scans.

Figure 1. Horizontal (peak hold over time)

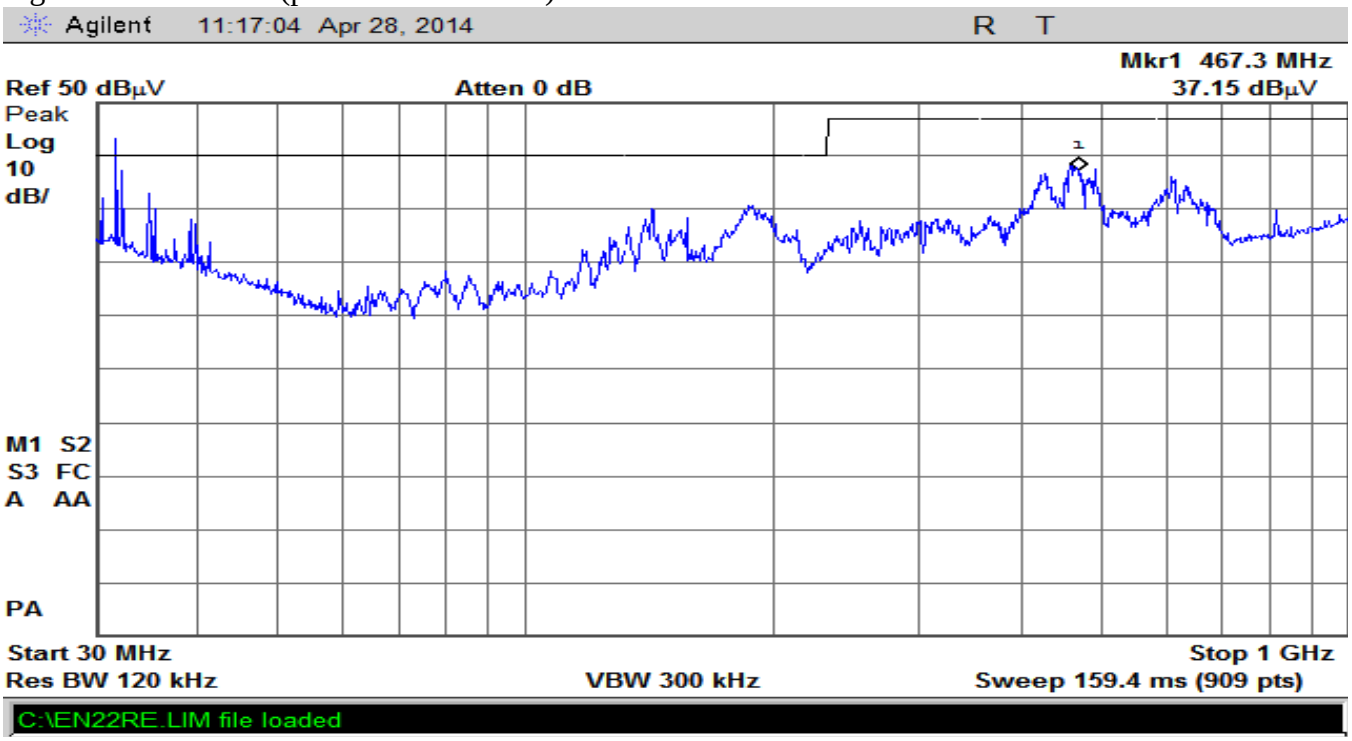
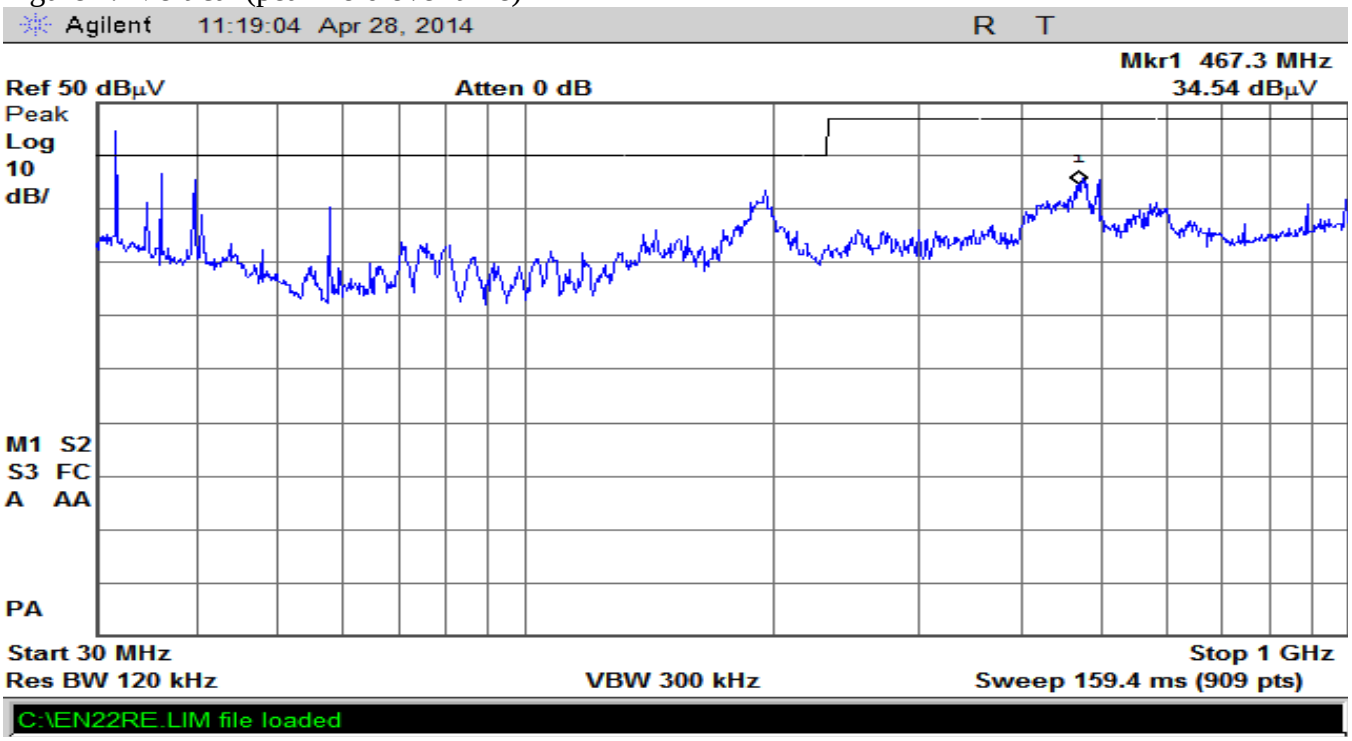


Figure 2. Vertical (peak hold over time)



5.1.3 Radiated Emissions, FCC Part 15, Clause 15.209 (below 30 MHz)

Limit : General Limits
Equipment operation : Tag Detection with Ultra Exit antenna.
Line Voltage / Freq : 120V / 60 Hz
Distance : 10 meters, H-field OATS
Temp : 33.2º C
Humidity : 52% RH
Date : 04/22/2014

All measurements made at appropriate RBW, 200 or 9000 Hz and with proper detector.
58 kHz transmit frequency. Average Det. up to 490 kHz and QP Det. above that.

Freq	SpecAn Level			Ant Fact	F Fact	DCF	DCCF	QP Cor	Avg Cor	FCC Limit	Limit	Margin
kHz	pk	QP	av	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	Distance	dB
102vac	**49.3**	**42.6**	**34.4**	61.60	0	-104.1	-22.8	0.1	**-8.1**	**32.3**	av@300m	**40.4**
138vac	**52.2**	**45.3**	**37.3**	61.60	0	-104.1	-22.8	2.7	**-5.2**	**32.3**	av@300m	**37.6**
58	50.8	44.0	**35.7**	61.60	0	-104.1	-22.8	1.5	**-6.8**	**32.3**	av@300m	**39.1**
116	-0.8	-6.0	**-10.3**	55.75	1.3	-104.1	-22.8	-53.1	**-57.4**	**26.3**	av@300m	**83.7**
174	3.5	-1.5	**-11.3**	52.80	0.7	-104.1	-22.8	-52.1	**-61.9**	**22.8**	av@300m	**84.7**
232	0.5	-4.3	**-10.0**	50.60	0.4	-104.1	-22.8	-57.4	**-63.1**	**20.3**	av@300m	**83.4**
290	4.3	0.2	**0.3**	48.80	0.3	-104.1	-22.8	-54.9	**-54.7**	**18.4**	av@300m	**73.1**
348	0.2	-7.0	**-15.0**	47.35	0.3	-104.1	-22.8	-63.5	**-71.5**	**16.8**	av@300m	**88.3**
406	6.1	5.3	**-11.7**	46.15	0.2	-104.1	-22.8	-52.5	**-69.5**	**15.4**	av@300m	**84.9**
464	-1.4	-6.0	**-14.6**	45.05	0.2	-104.1	-22.8	-64.9	**-73.5**	**14.3**	av@300m	**87.8**
522	12.0	**6.4**	-10.5	44.25	0.2	-33.6	-22.8	**17.2**	0.3	**33.3**	QP@30m	**16.0**
580	12.0	**7.0**	1.9	43.70	0.2	-33.6	-22.8	**17.3**	12.2	**32.3**	QP@30m	**15.1**

Note: No higher frequency emissions were detected up to 30 MHz.

56 kHz transmit frequency.

Freq	SpecAn Level			Ant Fact	F Fact	DCF	DCCF	QP Cor	Avg Cor	FCC Limit	Limit	Margin
kHz	pk	QP	av	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	Distance	dB
102vac	**43.5**	**39.5**	**33.4**	61.60	0	-86.2	-22.8	14.9	**8.8**	**32.6**	av@300m	**23.9**
138vac	**46.3**	**42.3**	**36.1**	61.60	0	-86.2	-22.8	17.7	**11.4**	**32.6**	av@300m	**21.2**
56	44.9	40.9	**34.7**	61.60	0	-86.2	-22.8	16.3	**10.1**	**32.6**	av@300m	**22.6**
112	-7.3	-13.3	**-16.3**	55.75	1.3	-86.2	-22.8	-42.5	**-45.5**	**26.6**	av@300m	**72.1**
168	10.8	7.4	**-9.0**	52.80	0.7	-86.2	-22.8	-25.3	**-41.7**	**23.1**	av@300m	**64.8**
224	3.7	-3.8	**-10.0**	50.60	0.4	-86.2	-22.8	-39.0	**-45.2**	**20.6**	av@300m	**65.8**
280	9.6	6.6	**-10.0**	48.80	0.3	-86.2	-22.8	-30.5	**-47.1**	**18.7**	av@300m	**65.8**
336	-0.6	-7.7	**-14.0**	47.35	0.3	-86.2	-22.8	-46.3	**-52.6**	**17.1**	av@300m	**69.6**
392	10.5	7.7	**-9.7**	46.15	0.2	-86.2	-22.8	-32.2	**-49.6**	**15.7**	av@300m	**65.3**
448	-0.2	-6.0	**-15.0**	45.05	0.2	-86.2	-22.8	-47.0	**-56.0**	**14.6**	av@300m	**70.5**
504	8.7	**5.5**	-11.0	44.25	0.2	-27.8	-22.8	**22.1**	5.6	**33.6**	QP@30m	**11.5**
560	24.0	**23.0**	21.0	43.70	0.2	-27.8	-22.8	**39.1**	37.1	**32.6**	QP@30m	**-6.4**

Note: 560 kHz is a local AM radio station.

Legend for Radiated Emissions below 30 MHz Table.

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)
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 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)

56 kHz roll off factor

			pk	QP	av			
10.0	m		44.9	40.9	34.7			
15.0	m		34.5	30.6	24.9	10.4	10.3	9.8
20.0	m		27.2	23.0	17.7	17.7	18.0	17.0
						7.3	7.6	7.2
						2.95	**2.94**	**2.78**
		Avg.	2.92			**2.93**	**3.05**	**2.88**
						2.94	**2.98**	**2.82**

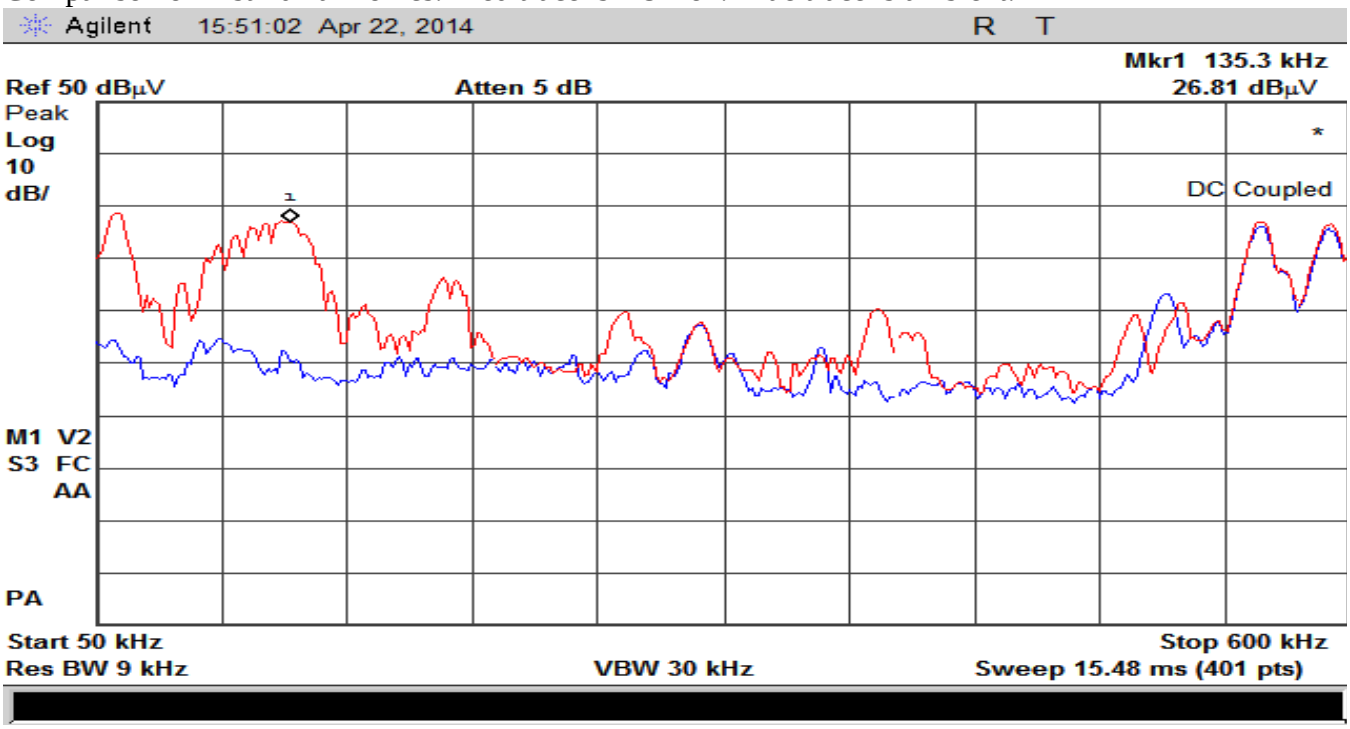
58 kHz roll off factor

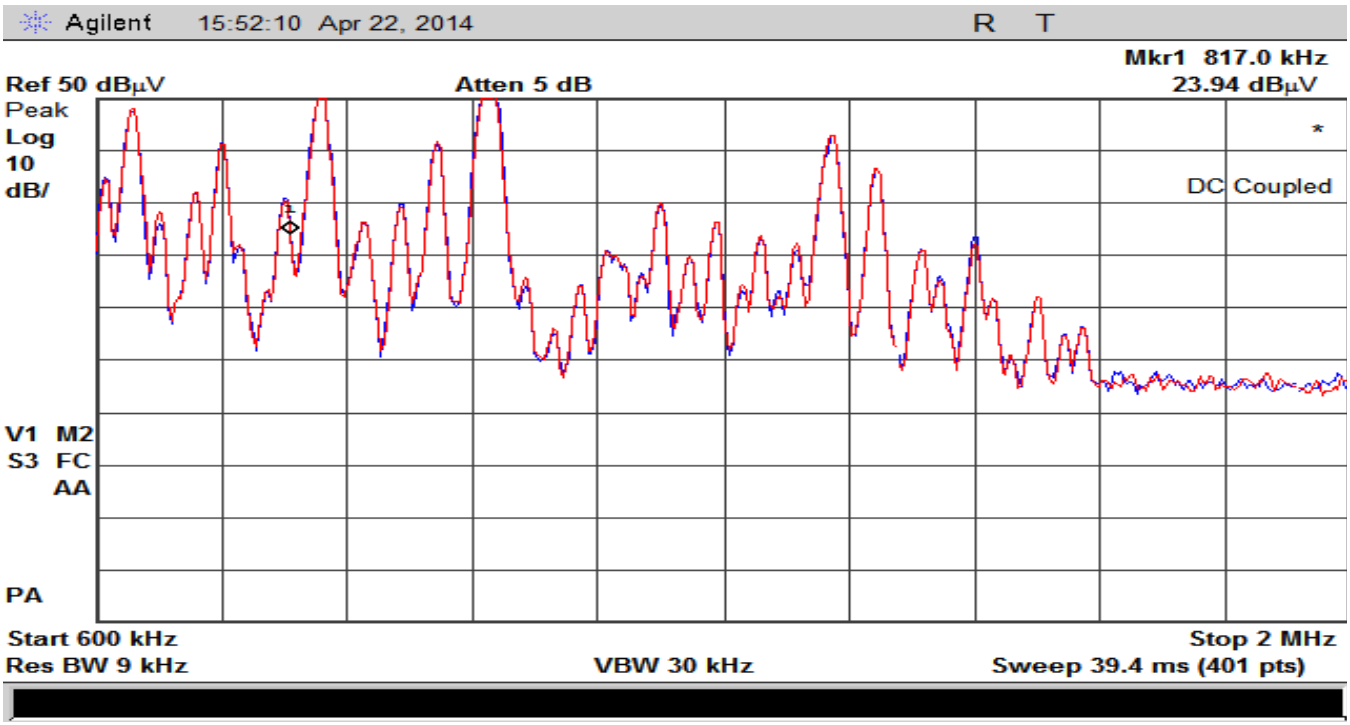
			pk	QP	av			
10.0	m		50.8	44.0	35.7			
15.0	m		38.1	31.3	24.7	12.7	12.7	11.1
20.0	m		28.9	21.6	16.6	21.9	22.5	19.2
						9.2	9.7	8.1
						3.59	**3.61**	**3.14**
		Avg.	3.52			**3.69**	**3.90**	**3.24**
						3.63	**3.73**	**3.18**

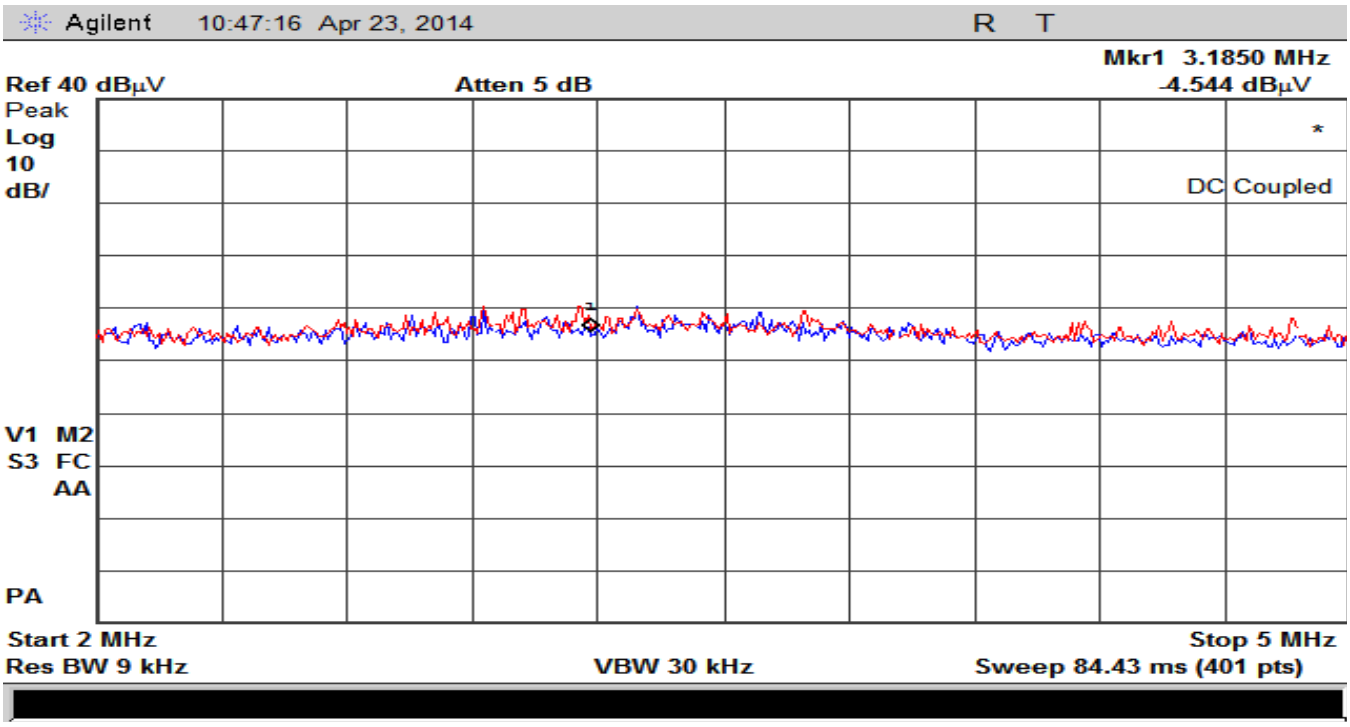
In each pedestal there are two antenna loops. For the 58 kHz signal, one loop flips polarity in order the change the shape of the magnetic field to better couple with the EAS tags in different orientations.
The 56 kHz signal is not used to couple to tags so the field does not need to change shape.
So the roll off factor calculates to different values.

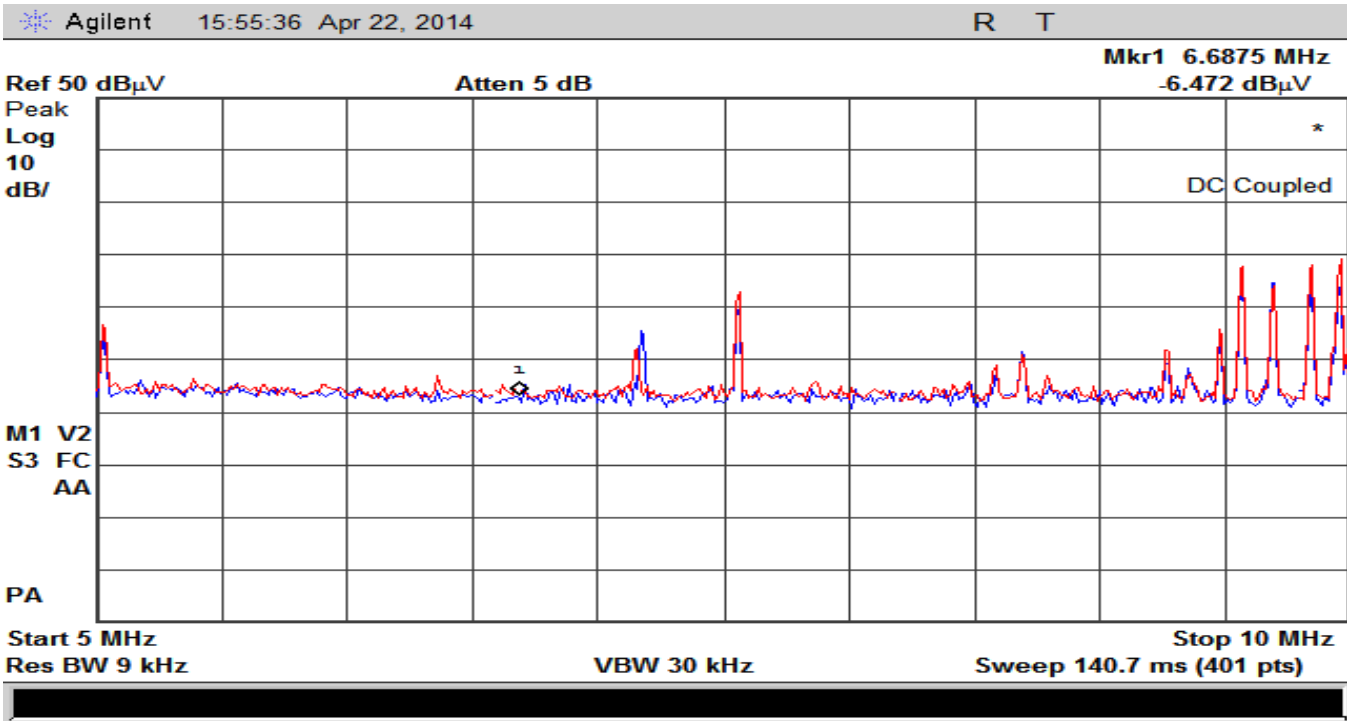
Detector readings of transmitter frequencies were entered into the above spread sheet for H-field calculations.
The below spectrum scans are to identify frequencies for further investigation and measurements.
The scans are not used certification, but only identify frequencies of interest.

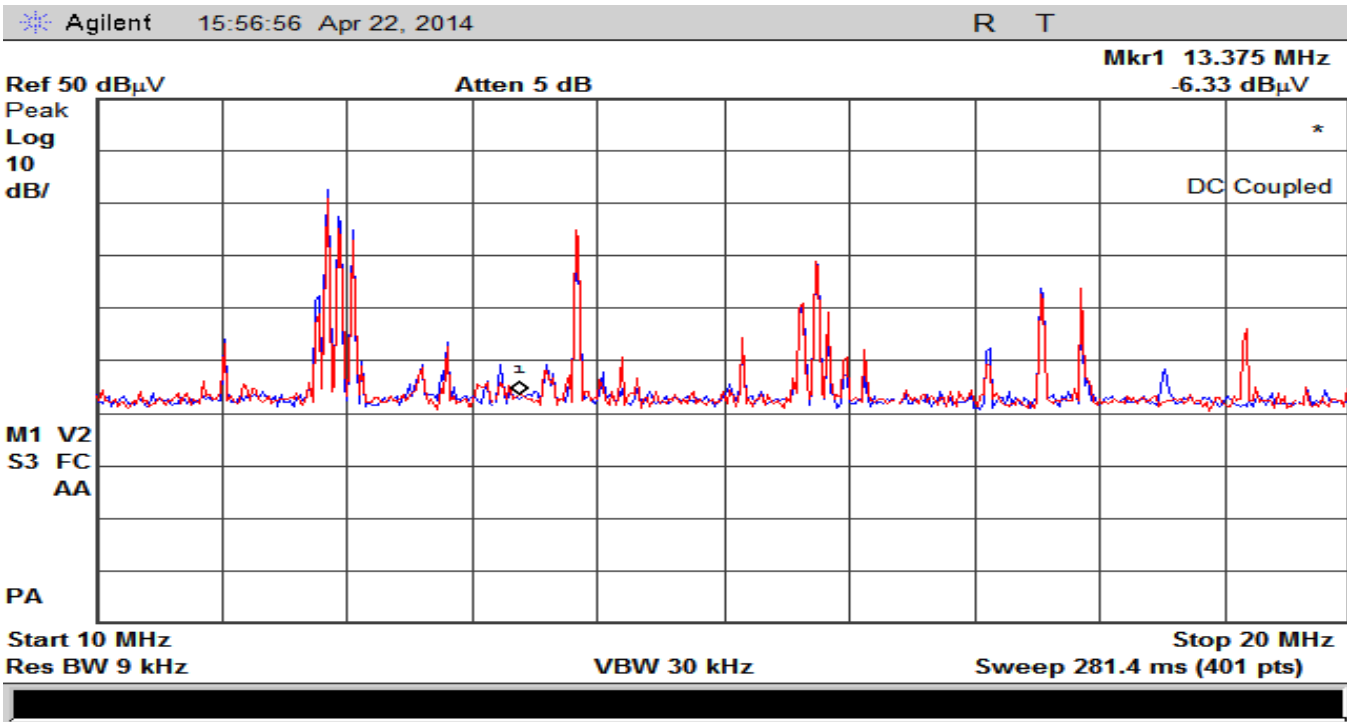
Comparison of first 10 harmonics. Red trace is EUT on. Blue trace is ambient.

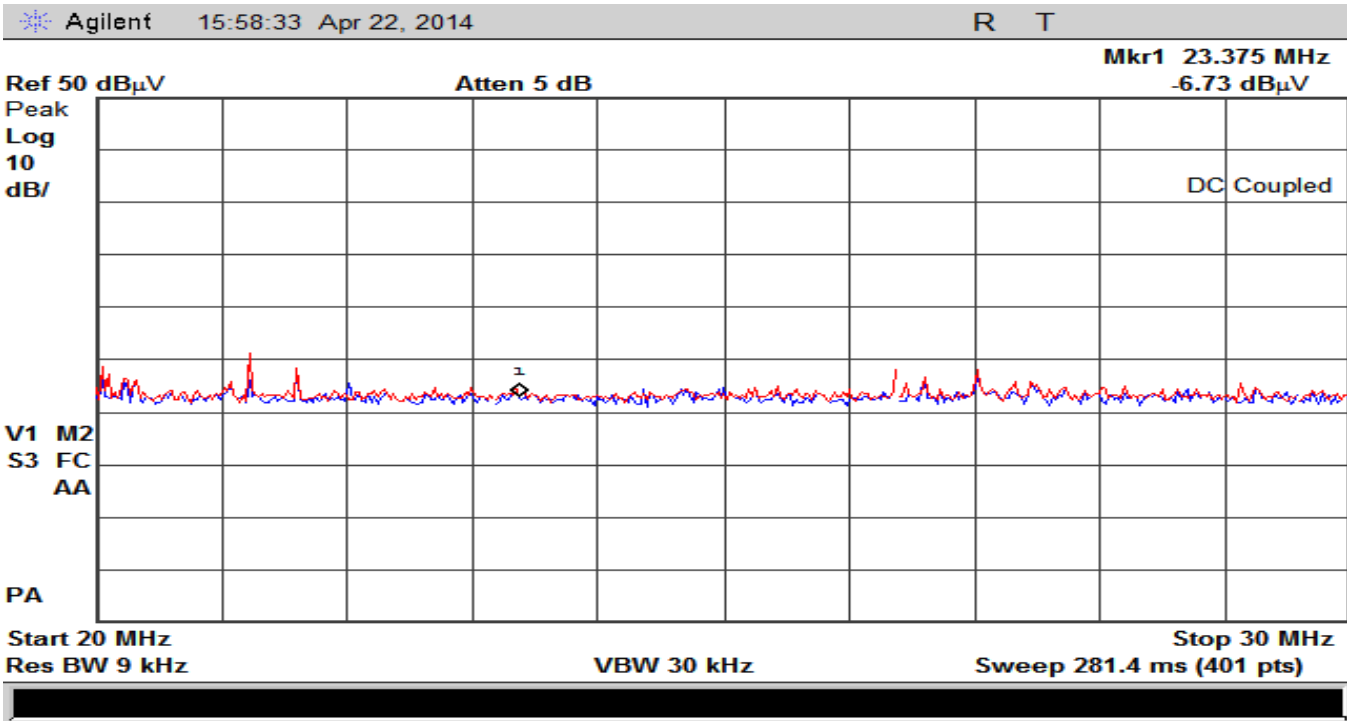





Agilent 10:47:16 Apr 23, 2014
R T
Mkr1 3.1850 MHz
-4.544 dBµV
Ref 40 dBµV
Atten 5 dB
Peak
Log
10
dB/
DC Coupled
V1 M2
S3 FC
AA
PA
Start 2 MHz
Res BW 9 kHz
VBW 30 kHz
Stop 5 MHz
Sweep 84.43 ms (401 pts)


Agilent 15:55:36 Apr 22, 2014
R T
Mkr1 6.6875 MHz
-6.472 dBµV
Ref 50 dBµV
Atten 5 dB
Peak
Log
10
dB/
DC Coupled
M1 V2
S3 FC
AA
PA
Start 5 MHz
Res BW 9 kHz
VBW 30 kHz
Stop 10 MHz
Sweep 140.7 ms (401 pts)

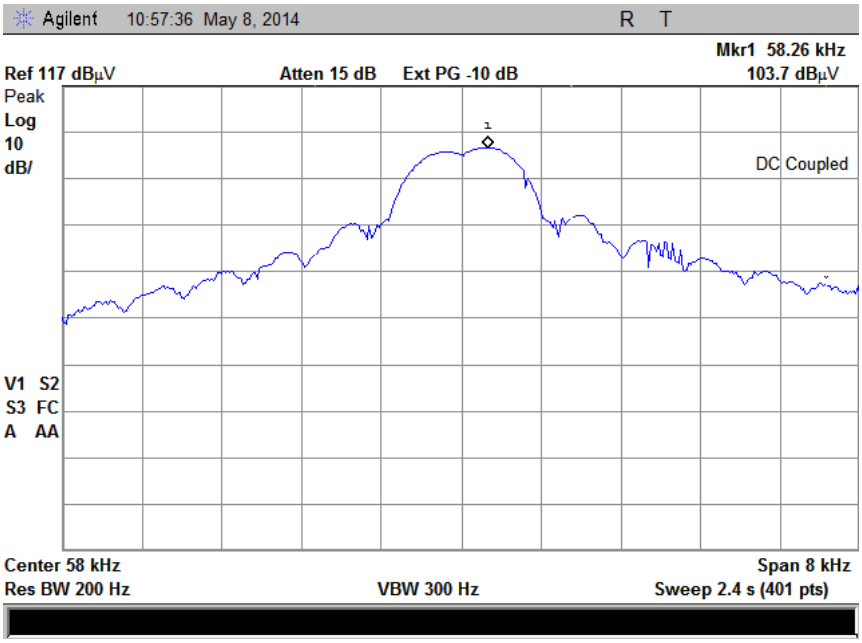

Agilent 15:56:56 Apr 22, 2014
R T
Mkr1 13.375 MHz
-6.33 dBµV
Ref 50 dBµV
Atten 5 dB
Peak
Log
10
dB/
DC Coupled
M1 V2
S3 FC
AA
PA
Start 10 MHz
Res BW 9 kHz
VBW 30 kHz
Stop 20 MHz
Sweep 281.4 ms (401 pts)


Agilent 15:58:33 Apr 22, 2014
R T
Mkr1 23.375 MHz
-6.73 dBµV
Ref 50 dBµV
Atten 5 dB
Peak
Log
10
dB/
DC Coupled
V1 M2
S3 FC
AA
PA
Start 20 MHz
Res BW 9 kHz
VBW 30 kHz
Stop 30 MHz
Sweep 281.4 ms (401 pts)

5.1.4 Occupied Bandwidth For Industry Canada – IC.

Port	: Antenna
Line Input Voltage and Freq	: 120V / 60 Hz
Ambient temperature	: 22.6^{0}C
Relative humidity	: 51.2%
Date	: 04/08/2014

99% bandwidth

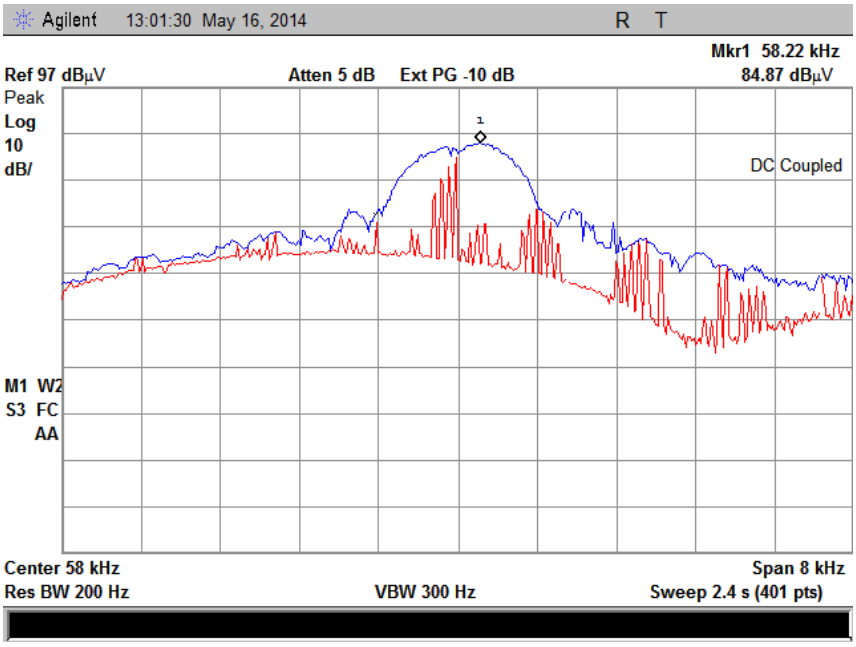


Step 1: Capture data from trace
Step 2: Convert amplitude data to linear
Step 3: Sum all amplitude data points : 11.4866
Step 4: caculate 0.5 % of data points: 0.0574
Step 5: Beginning at lower edge get running sum until .5% is reached, this is lower point of Occ BW: 54400 Hz
Step 6: Repeat starting at upper edge: 61760 Hz

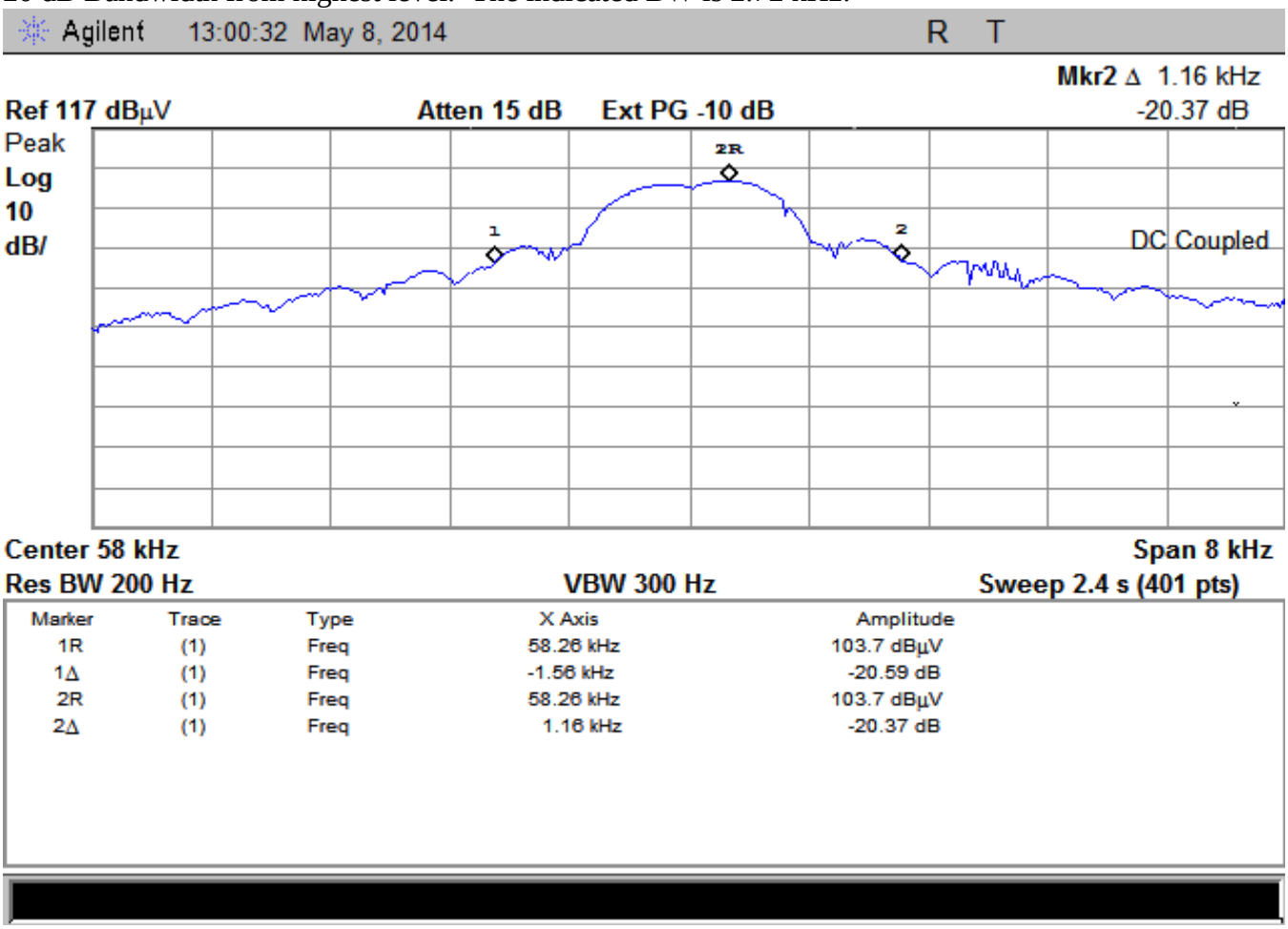
99% OBW for 58 kHz = 7360 Hz

With 56 kHz sync pulse active plus 58 kHz.
The Sync pulse occupied band is the curve in wide on the red trace.

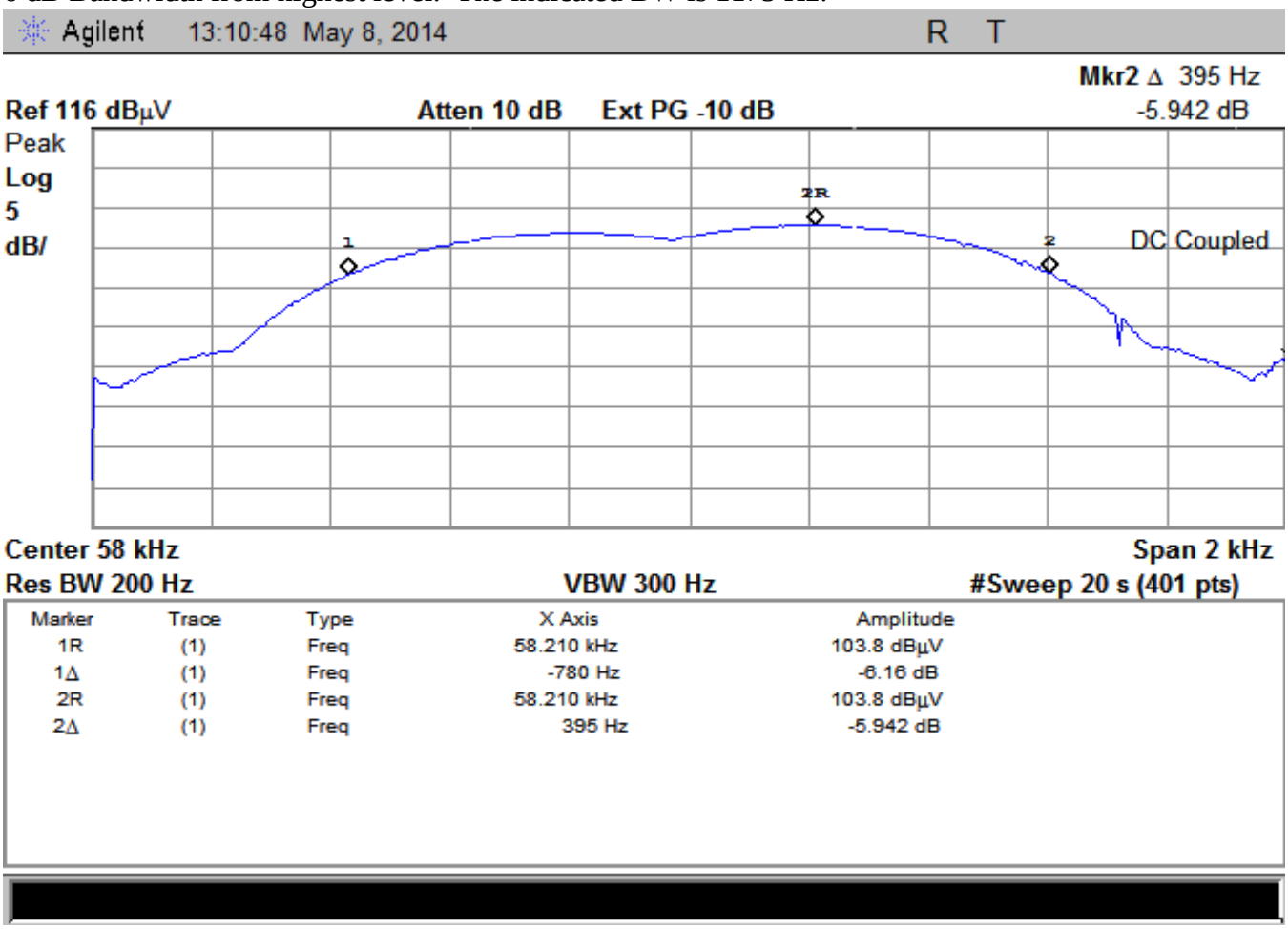
99% OBW with the 56 kHz = 16,700 kHz



20 dB Bandwidth from highest level. The indicated BW is 2.72 kHz.



6 dB Bandwidth from highest level. The indicated BW is 1175 Hz.



6 EQUIPMENT LIST

ID	Description	Manufacturer	Model	Serial #	Last Ca	DueDate
4	58 kHz Filter	In House	unique	N/A	30-Aug-13	30-Aug-14
5	Double-Ridge Waveguide Horn	EMCO	3115	3006	31-Mar-13	30-Mar-15
6	Biconical Antenna	Electro Metrics	3110B	1017	18-May-12	18-May-14
7	Biconical Antenna	ETS	3110B	3380	31-Aug-13	30-Aug-15
8	Log Periodic Antenna	EMCO	3146	3909	31-Aug-13	30-Aug-15
9	Log Periodic Antenna	EMCO	3146	4731	18-May-12	18-May-14
10	Transient Limiter	Electro Metrics	EM 7600	187	13-Jan-13	12-Jan-15
11	Line Imp Stable Network	EMCO	3816/2NM	1018	04-Mar-14	04-Mar-15
12	Loop Antenna	Electro Metrics	ALP -70	163	30-Aug-13	29-Aug-15
13	Directional Coupler	Werlatone	C3910	6706	06-Mar-14	06-Mar-15
14	RF Power Meter	Boonton	4231-30	53701	06-Mar-14	06-Mar-15
16	Directional Coupler	Werlatone	C5673	11481	06-Mar-14	06-Mar-15
29	Log Periodic Antenna	EMCO	3146	3576	07-Aug-12	07-Aug-14
36	Coupling Decoupling Netwk	FCC	FCC-801-M3-16A	2036	04-Mar-14	04-Mar-15
37	Line Imp Stable Network	EMCO	3816/2NM	1064	04-Mar-14	04-Mar-15
39	Biconical Antenna	EMCO	3104C	4334	09-Aug-12	09-Aug-14
104	Spectrum Analyzer	Agilent	E7405A	MYY49510099	25-Jul-13	25-Jul-15
105	Spectrum Analyzer	Agilent	E7405A	MYY49510320	19-Jul-13	19-Jul-15
152	Dipole Antenna	EMCO	3121C	9701-1262	28-Dec-12	27-Dec-14
153	Signal Generator	Agilent	N5183A	MY50140589	06-Mar-14	06-Mar-15
154	Horn Antenna	ETS Lindgren	3115	00135941	07-Aug-12	07-Aug-14
155	Horn Antenna	ETS Lindgren	3116B	00122502	03-Feb-13	02-Feb-15
156	Loop Antenna	ETS Lindgren	6512	00123860	06-Aug-12	06-Aug-14
175	EMI Power Sensor	Boonton Electronics	51011-EMC	35804	06-Mar-14	06-Mar-15
176	Electrostatic Discharge Simulator	Kikusui Electronics	KES4021A	SE002201	08-May-14	08-May-15
177	Power Sensor	Boonton	51100-9E	35669	06-Mar-14	06-Mar-15
178	Signal Generator	Agilent	N5183A	MY50141499	06-Mar-14	06-Mar-15
187	Dual Directional Coupler	Werlatone	C6148-10	95097	06-Mar-14	06-Mar-15

7 End of test report.