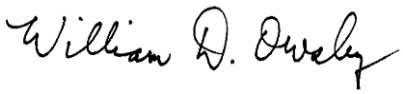
TYCO SAFETY PRODUCTS
SENSORMATIC ELECTRONICS, LLC.
EMC TEST REPORT

Model:
AMB-4300
Wireless Access Point

FCC ID: BVCAMB43
IC: 3506A-AMB43

Intentional Radiator
15.247 (DSSS 2400 – 2483.5 MHz)

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



EMC Engineer

6600 Congress Ave.
Boca Raton, FL. 33487
USA

Revision Level	Date	Reason
Rev. A	Nov. 22, 2013	Initial

1 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 that increase transmission power above permitted levels.
15.31 (e)	Vary Input AC Mains Power	Does not increase the output power above the limit.	Complies.
13.33 (a)	Frequency range of radiated measurements	General Limits of 15.209, 150 kHz to 24 GHz.	E-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 Requirements	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.	The antenna is permanently attached. Inverted F. Complies.
15.204(b)(c)	System and Antennas	Marketed as a system with authorized antenna types	Integral internal antenna. 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. Complies.
15.247 (a) (2)	Carrier Frequency Separation	DTS, 6 dB BW >500 kHz	Complies.
15.247 (b) (3)	Output Power	Maximum 1 W (30 dBm)	The EUT complies with the requirement. Max = 7 dBm. Complies.
15.247 (b) (4)	Maximum Antenna Gain	If gain of transmitting antenna is greater than 6 dBi, the output power shall be reduced by the amount exceeding 6 dBi.	Permanently attached integral antenna is less than 6 dBi. Complies.
15.247 (d)	100 kHz BW peak power	100 kHz BW outside band to 20 dB below 100 kHz in band for peak. 30 dB below for RMS.	Complies
15.247 (e)	DTS, the conducted power spectral density	Shall be < 8 dBm in any 3 kHz band	Complies
15.247 (i)	RF Exposure	Must ensure that RF MPE to the public falls within Commission Guidelines	Complies See RF Exposure Section.

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(a)	Conducted Emission Limits, Digital Device, CLASS B	X	Complies
15.107(b)	Conducted Emission Limits, Digital Device, CLASS A		
15.109(a)	Radiated Emissions Limits, Digital Device, CLASS B	X	Complies
15.109(b)	Radiated Emissions Limits, Digital Device, CLASS A		
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 to 10 GHz)	X	Complies

Compliance with 15.203:
This product is professionally installed and setup, therefore the device is compliant with the requirement of this clause.

Compliance with 15.204:
The antenna used with the transmitter is permanently mounted internal to the EUT.

1.2 IC RSS GEN

Clause	PARAMETER TO BE MEASURED	Applies	Comments
4.6.1	Occupied Bandwidth, 99%	X	
4.6.2	6 dB Bandwidth	X	

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 – 889978 and 616407, and with Industry Canada, number – 3506A-1.

2.2 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.

15.247 requirements were measured according to ANSI C63.10-2013 per FCC document 558074 D01 DTS Meas Guidance v03r01
Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

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

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

EUT was tested with modulation and without modulation in CW >98% duty cycle for worst case.

Radiated evaluations were performed in a pre-screen environment and the worst case was tested on the OATS.
Multiple orientations of radio were evaluated to determine worst case.

Maximum conducted transmit power was measured at a temporary RF connector on the transmitter in place of the antenna.

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:

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

where Pr is the power measured at the receive antenna output port;
Pt is the power measured at the transmit antenna input port;
Gt is the gain of the transmit antenna;
Gr 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

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

where E is the electric field generated at the distance r from the transmit antenna,
Pt is the power measured at the transmit antenna input port,
Gt (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 = PG / (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 = (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 302 208-1, Clause 7, the value of the measurement uncertainty for each measurement, shall be equal to or lower than the figures given below.

Parameter Uncertainty

RF frequency	+/-1 × 10-7
RF power, conducted	+/-0,75 dB
RF power, radiated, valid up to 12,75 GHz	+/-6 dB
Maximum frequency deviation for FM	+/-5 %
Two-signal measurements	+/-4 dB
Time	+/-5 %
Temperature	+/-1 K
Humidity	+/-5 %

3 DESCRIPTION AND CHARACTERISTICS OF THE EUT

3.1 Model / Type Designation

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

1. Equipment Series
AMB-4300

2. Equipment Specific
AMB-4310

3.1.1 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 anywhere; advertised and marketed to general public
And/or
[X] FCC 15, Sub-part C – Intentional Radiator

This system is professionally installed.

3.1.2 Overview

This report is part of the application for FCC Certification of a IEEE 802.15.4 transceiver operating in the 2400-2483.5 MHz. The transceiver module is mounted onto a digital board for communications and control and power.
The transceiver is for limited modular approval to be used in future products.

The EUT is a wireless access point that provides a synchronization signal to numerous handheld EAS deactivation units, and can determine the status of various deactivation units.

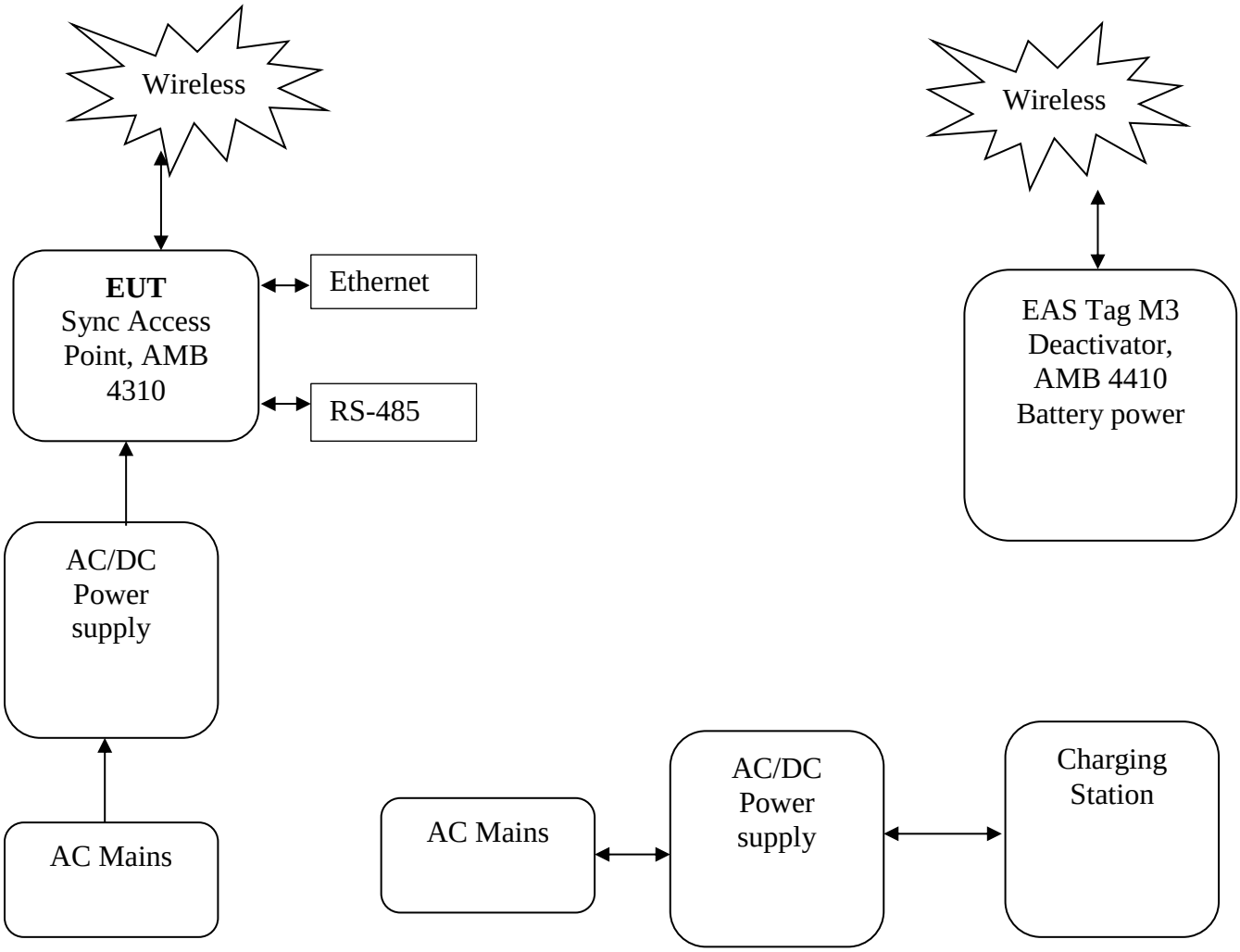
3.1.3 Environment

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

3.1.4 Frequency Characteristics and Internal Clocks

Transmitter: IEEE 802.15.4 transceiver (DSSS)
Operating frequency ..... 2400-2483.5 MHz

3.2 TEST SET-UP BLOCK DIAGRAM



3.2.1 List Of Ports

	Function	Classification	Max Cable Length	Test Length	Cable Type/Description
	AC Mains	AC power	> 1 m but < 3 m	1.8m	3 conductor unshielded
	DC power	DC power	> 1 m but < 3 m	1.8m	3 conductor unshielded
	Cat 5 Ethernet	Signal	100 m	10 m	4 pair unshielded
	Cat 5 RS-485	Signal	100 m	10 m	4 pair unshielded

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

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

3.2.2 Accessory Equipment Used During Testing

M3 handheld deactivation unit.
Ethernet switch
LDM

3.2.3 List of Power Supplies

5606-0079-01 Sensormatic power supply

3.2.4 Accessory Equipment Declaration of Conformity

All accessory equipment used during testing is commercially available off-the-shelf (COTS) FCC DoC or Verified devices.

4 FCC TESTS

4.1 AC Conducted Emissions, FCC Part 15, Clause 15.107 And 15.207

Limit : Class B limits of 15.107, and general limits of 15.207
Equipment operation : Sending sync signals
Line Voltage / Freq : 120V / 60 Hz
Temp : 22º C
Humidity : 52.0% RH
Date : 07/30/13
Equipment list asset numbers : 11, 37, 104.

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

Measurement Results

Freq (MHz)	Peak (dBuV)	QP (dBuV)	Avg (dBuV)	QP/Avg Limit	QP/Avg Margin	Line	Comments
24	49.65	na	35.98	60/50	na/14.02	L2	Complies

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

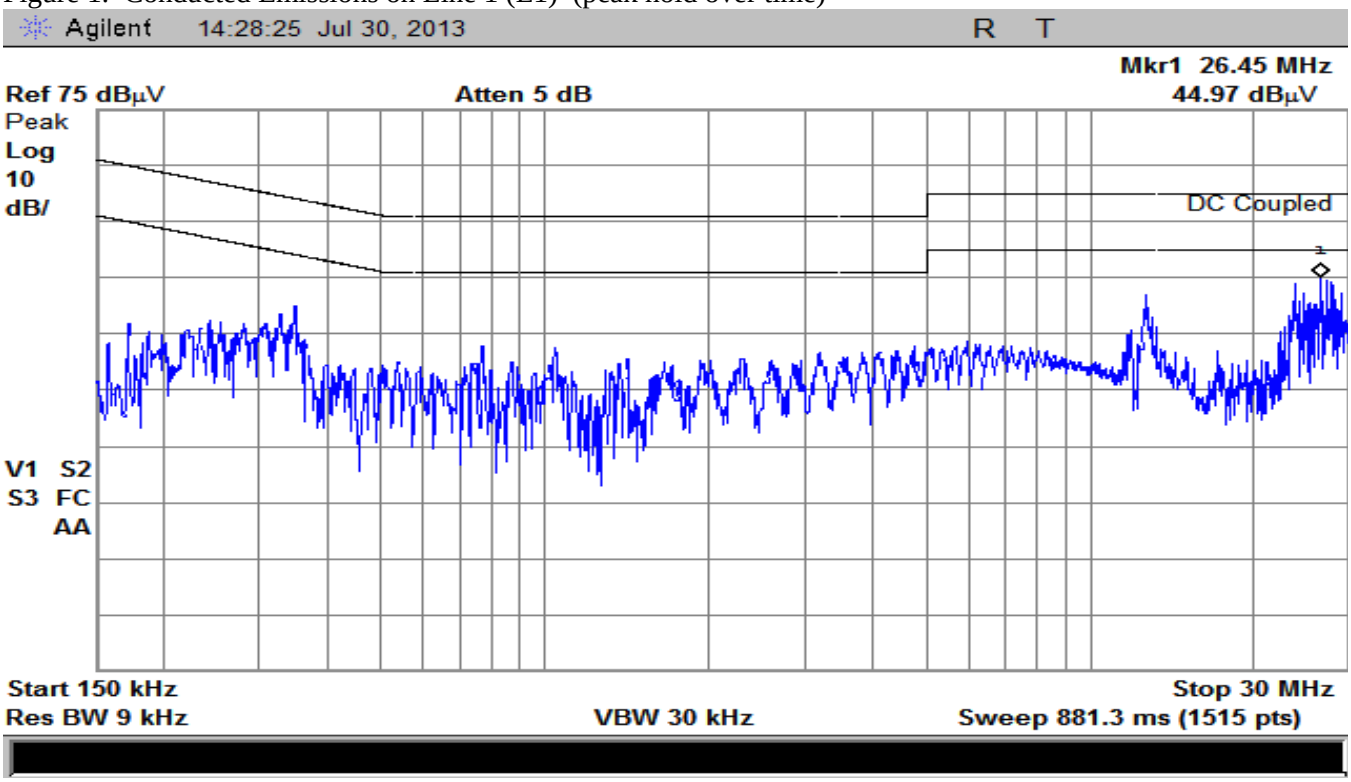
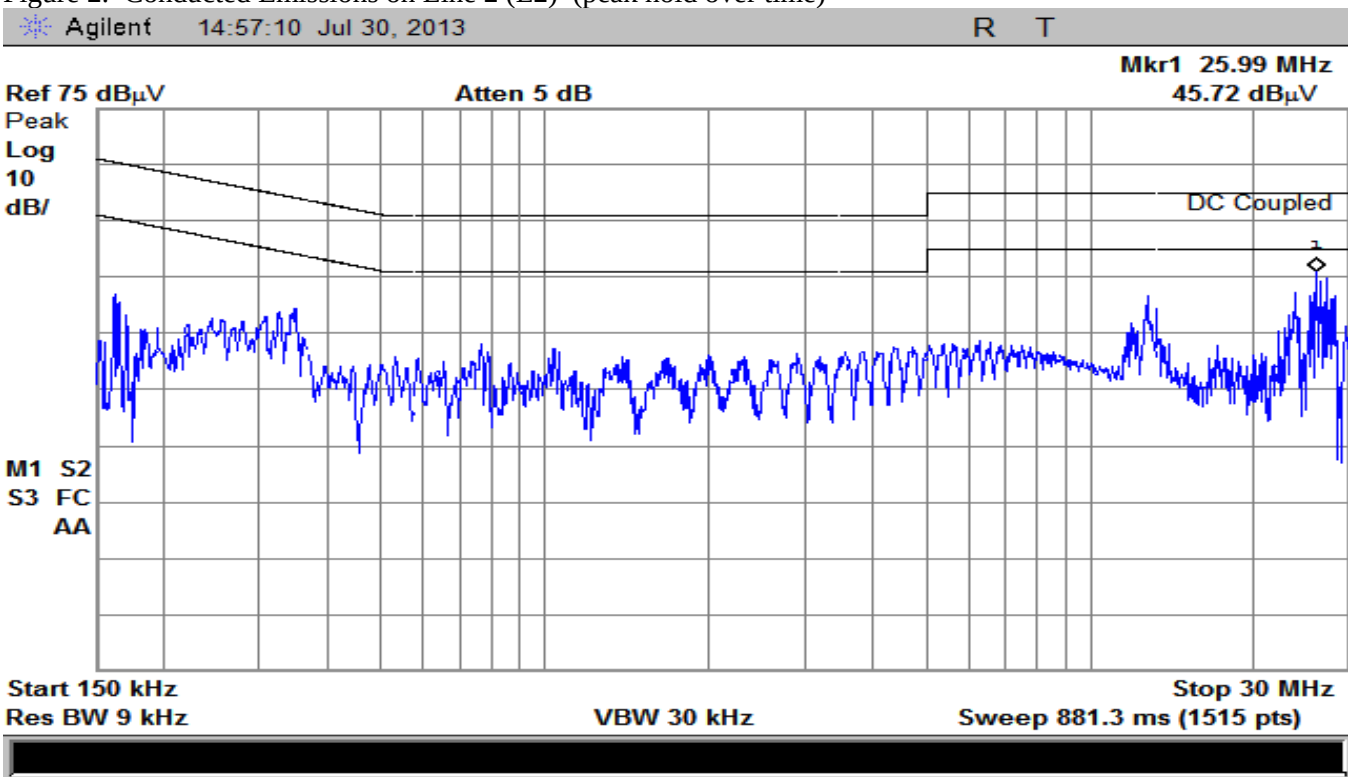
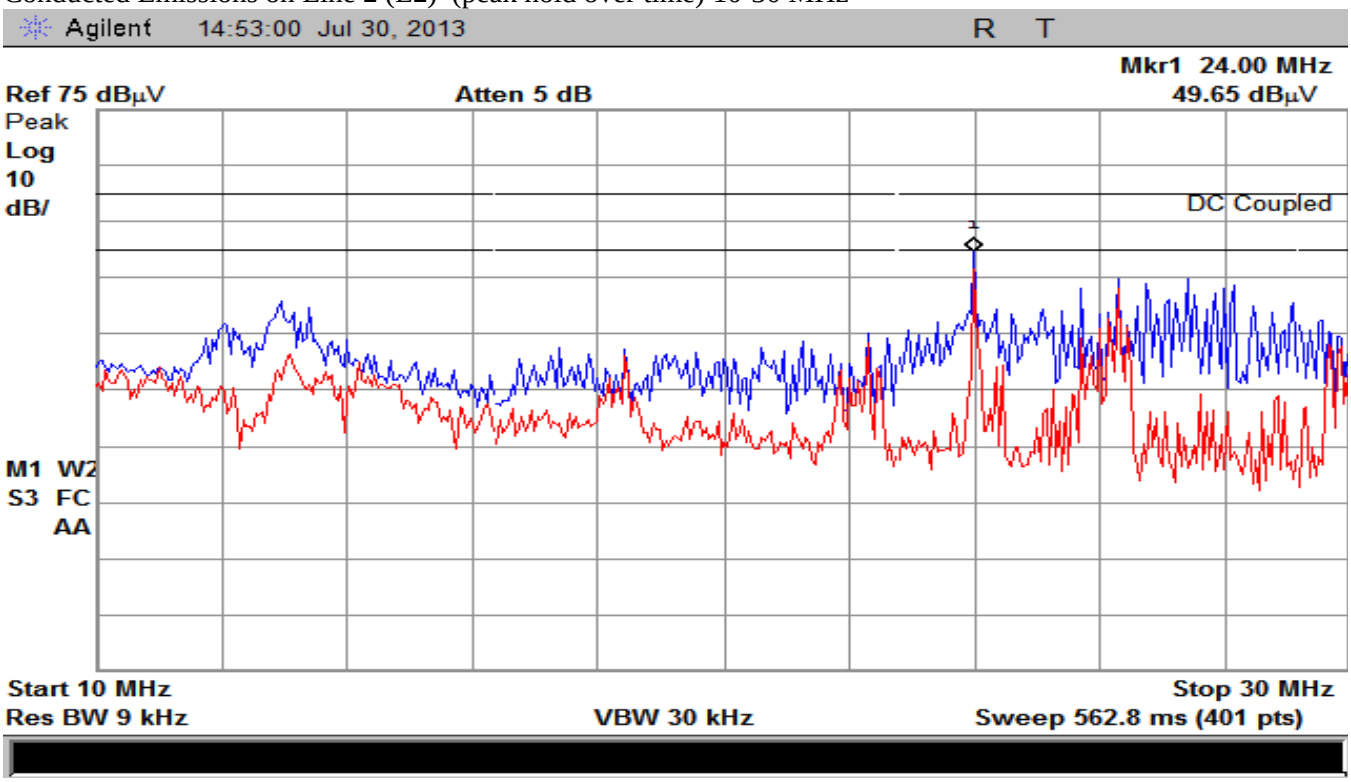


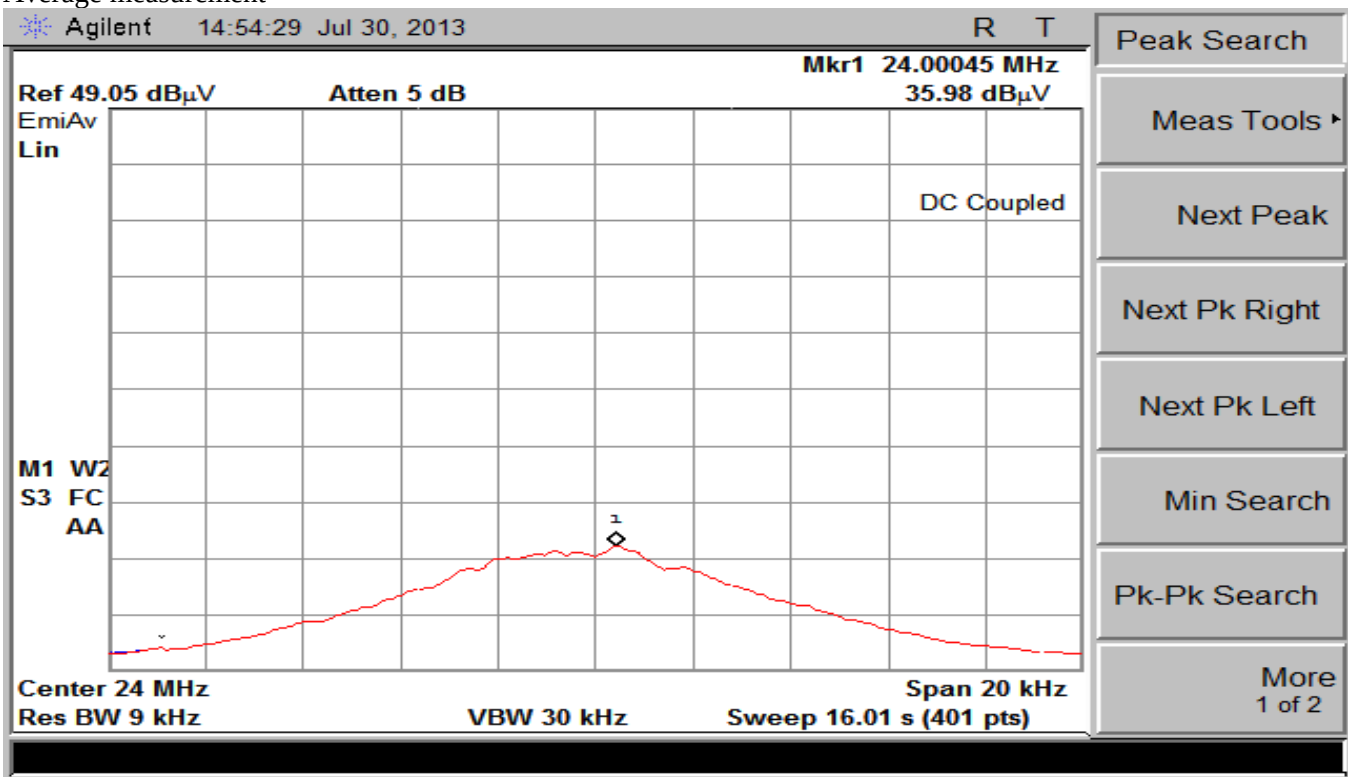
Figure 2. Conducted Emissions on Line 2 (L2) (peak hold over time)



Conducted Emissions on Line 2 (L2) (peak hold over time) 10-30 MHz



Average measurement



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

Limit : Class B
Equipment operation : Sending sync signals
Line Voltage / Freq : 120V / 60 Hz
Distance : 3 meters OATS
Temp : 21º C
Humidity : 51.5% RH
Date : 09/10/13
Equipment list asset numbers : 5, 6, 8, 104.

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**

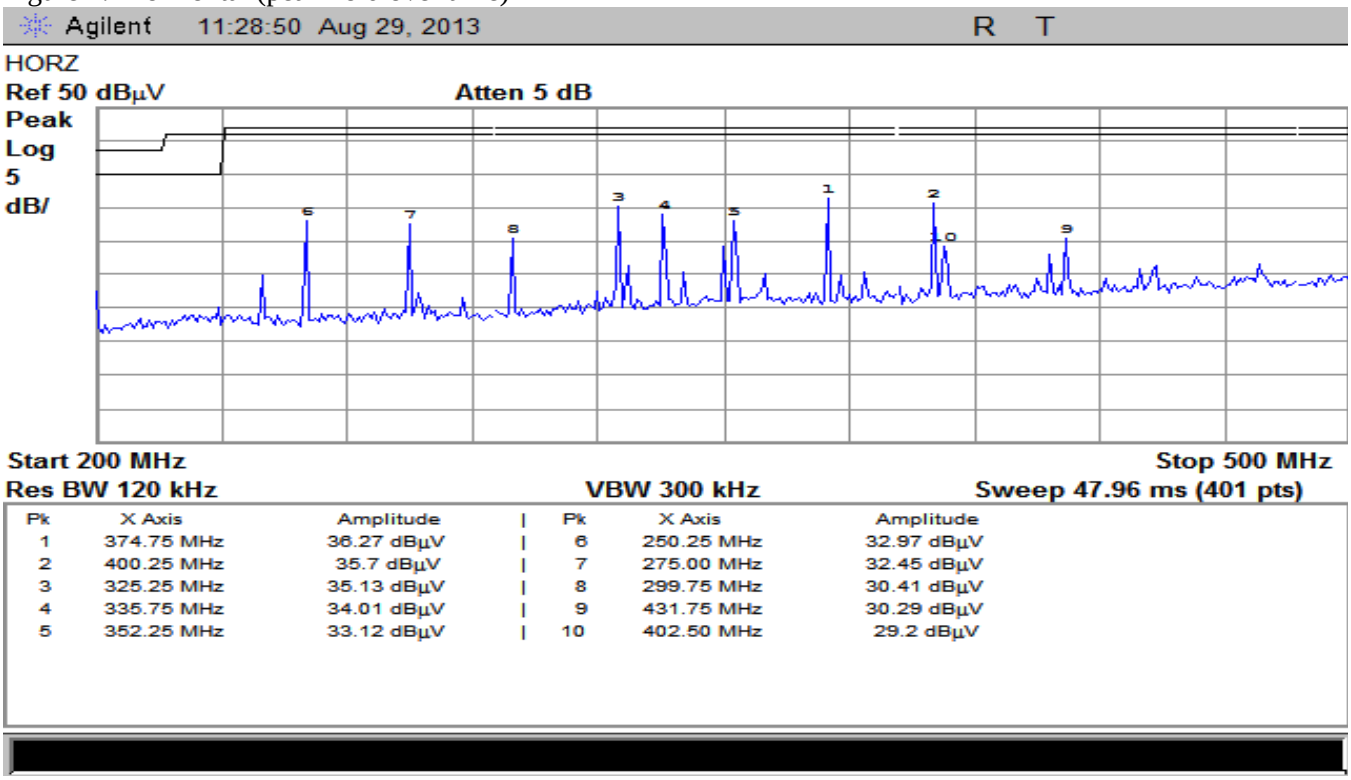
OATS Measurements:

		FCC 120 volts 60 Hz					Limit	
Freq (MHz)	QP (dBuV)	Antenna	Polarization	ant fac	cable fac	Corrected	Class B	Margin
325	15.56	LP #1	Horz	14.404	3.83	33.79	46.00	12.21
375	12.44	LP #1	Horz	15.382	4.28	32.10	46.00	13.90
275	14.24	LP #1	Horz	13.285	3.38	30.91	46.00	15.09
400	15.43	LP #1	Horz	15.904	4.54	35.88	46.00	10.12
336	14.66	LP #1	Horz	14.396	4.01	33.07	46.00	12.93
250	17.6	LP #1	Horz	12.29	3.23	33.12	46.00	12.88
4810	86.23 pk	Horn	Horz	28.57	6.055	51.72	54	2.28
7216	79.56	Horn	Horz	29.96	14.18	51.78	54	2.22

GHz correction of harmonic emissions is time averaged. Using 25% as duty factor, correction= 20log(.25) = -12 dB

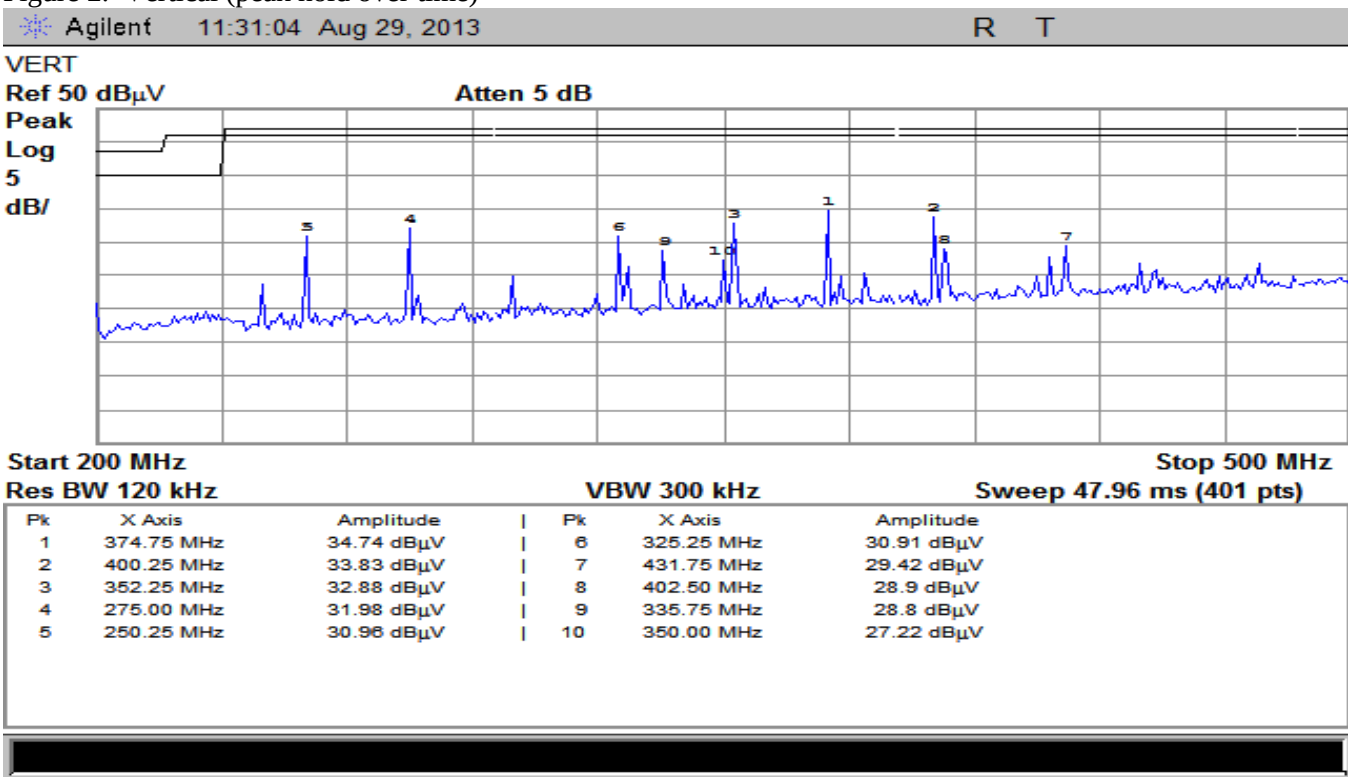
Frequency scans below.

Figure 1. Horizontal (peak hold over time)

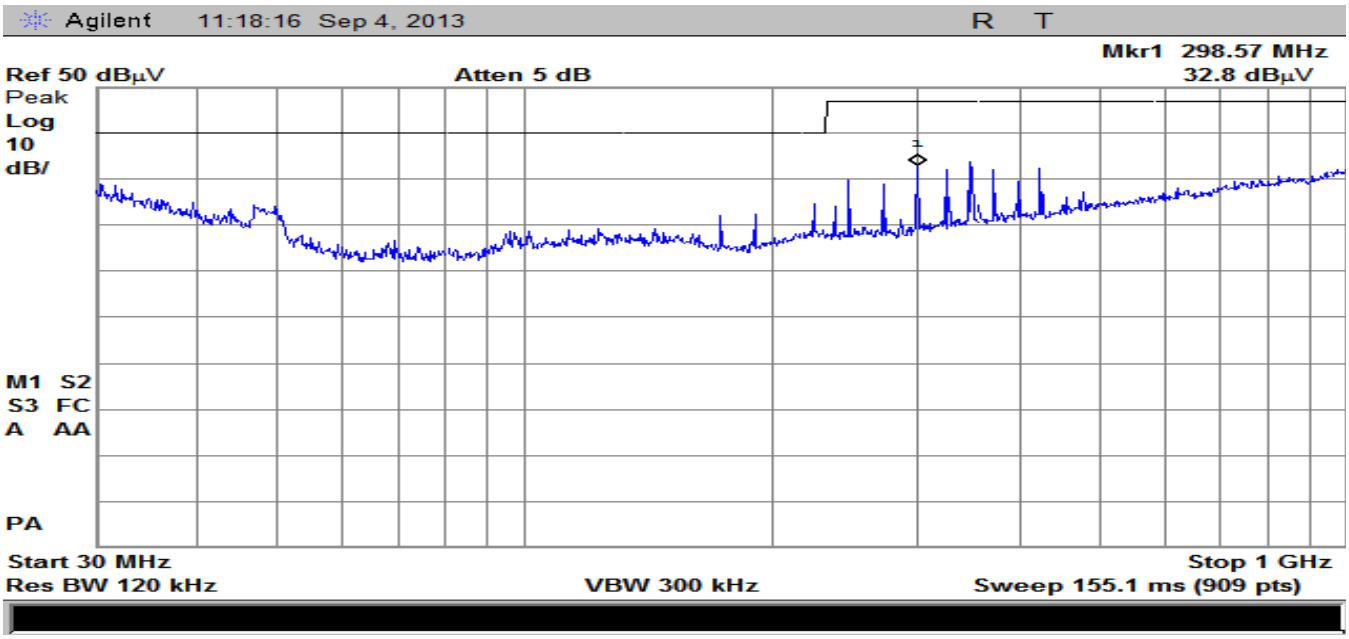


Pk	X Axis	Amplitude	Pk	X Axis	Amplitude
1	374.75 MHz	36.27 dBµV	6	250.25 MHz	32.97 dBµV
2	400.25 MHz	35.7 dBµV	7	275.00 MHz	32.45 dBµV
3	325.25 MHz	35.13 dBµV	8	299.75 MHz	30.41 dBµV
4	335.75 MHz	34.01 dBµV	9	431.75 MHz	30.29 dBµV
5	352.25 MHz	33.12 dBµV	10	402.50 MHz	29.2 dBµV

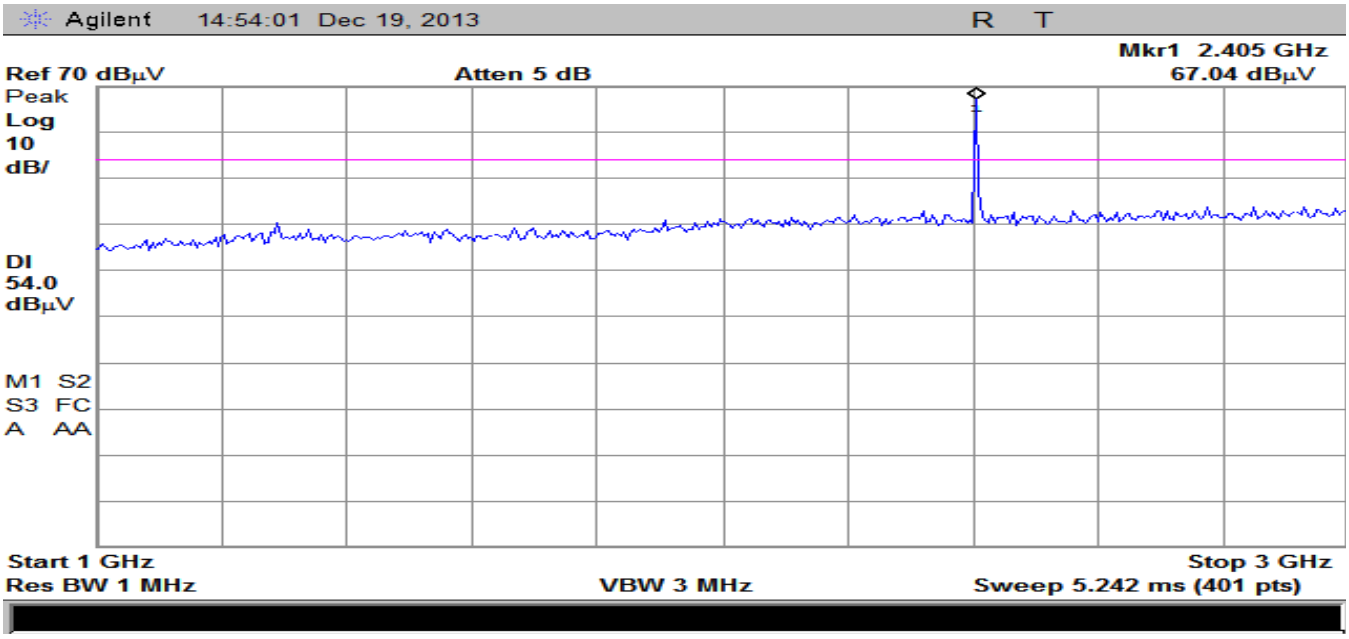
Figure 2. Vertical (peak hold over time)

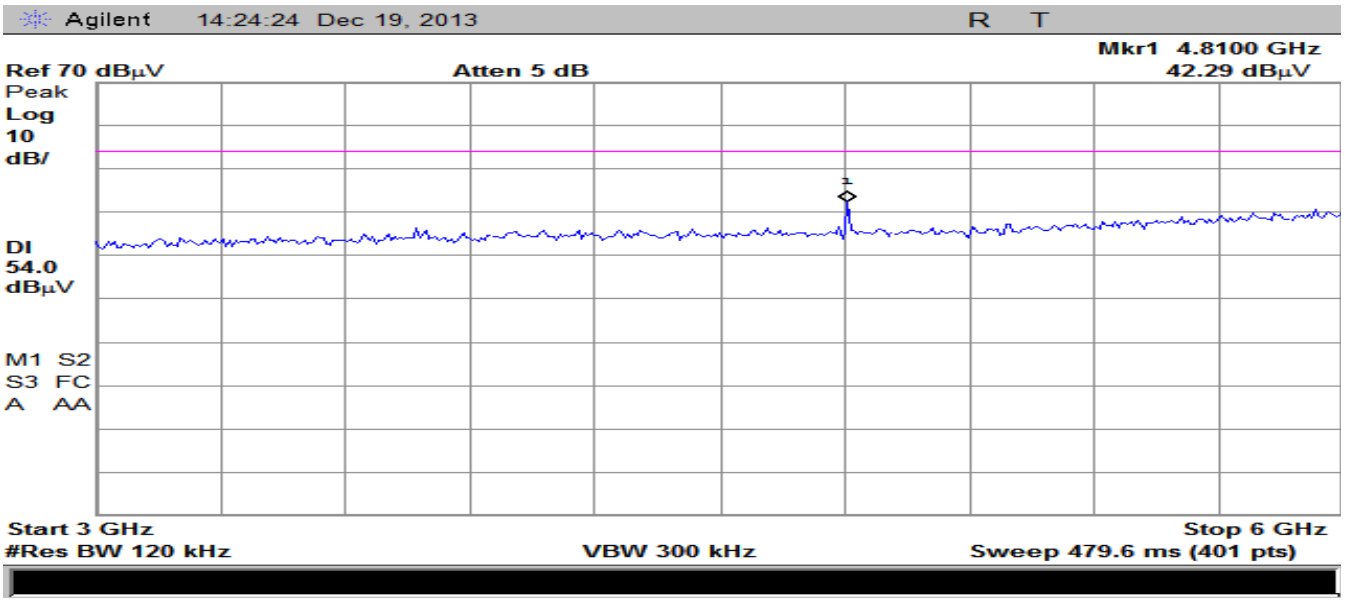


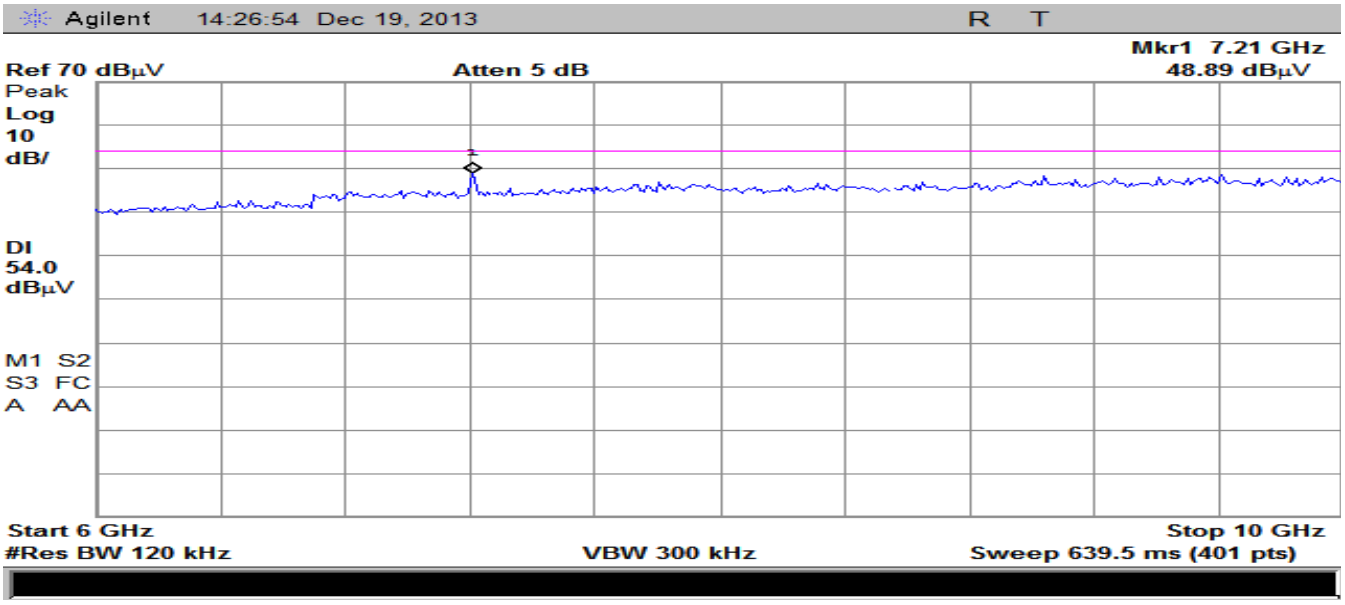
Pk	X Axis	Amplitude	Pk	X Axis	Amplitude
1	374.75 MHz	34.74 dBµV	6	325.25 MHz	30.91 dBµV
2	400.25 MHz	33.83 dBµV	7	431.75 MHz	29.42 dBµV
3	352.25 MHz	32.88 dBµV	8	402.50 MHz	28.9 dBµV
4	275.00 MHz	31.98 dBµV	9	335.75 MHz	28.8 dBµV
5	250.25 MHz	30.96 dBµV	10	350.00 MHz	27.22 dBµV



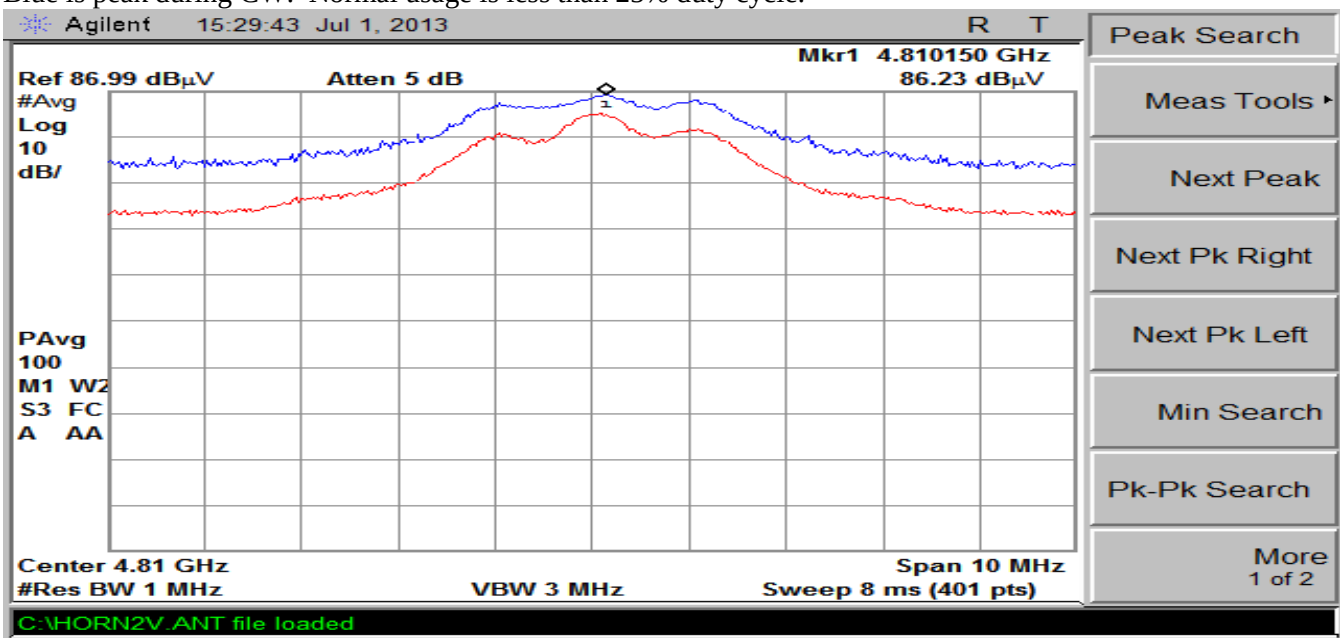
Fundamental emission of Radio

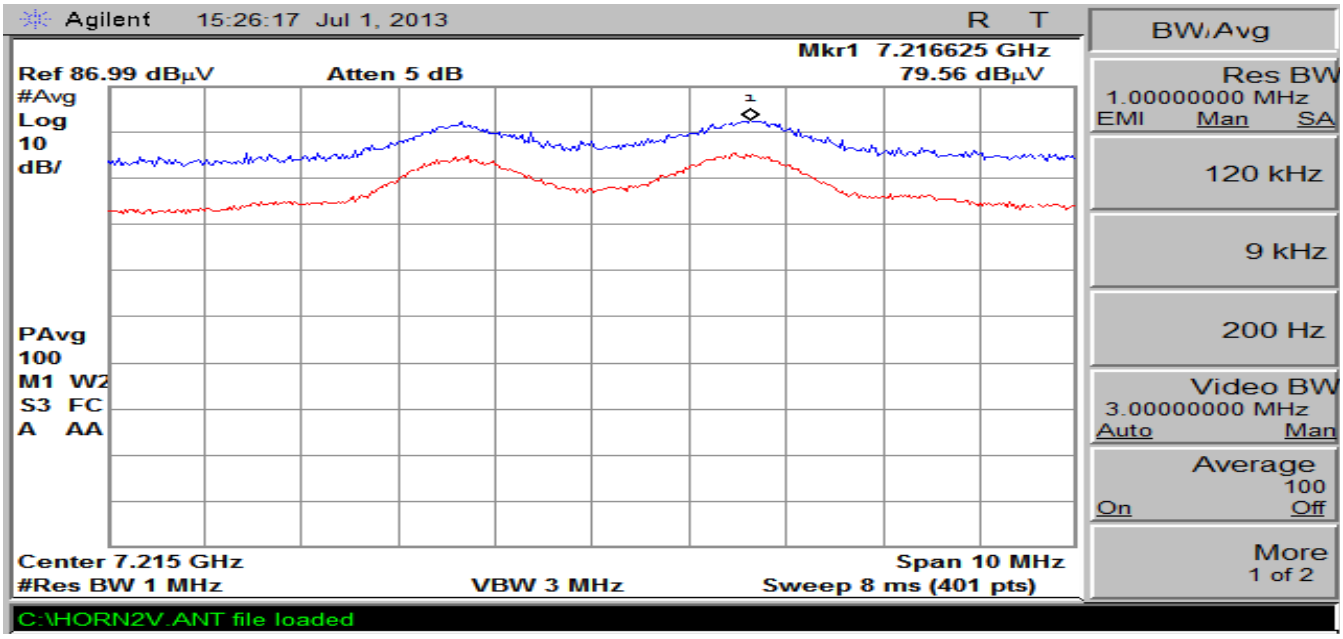


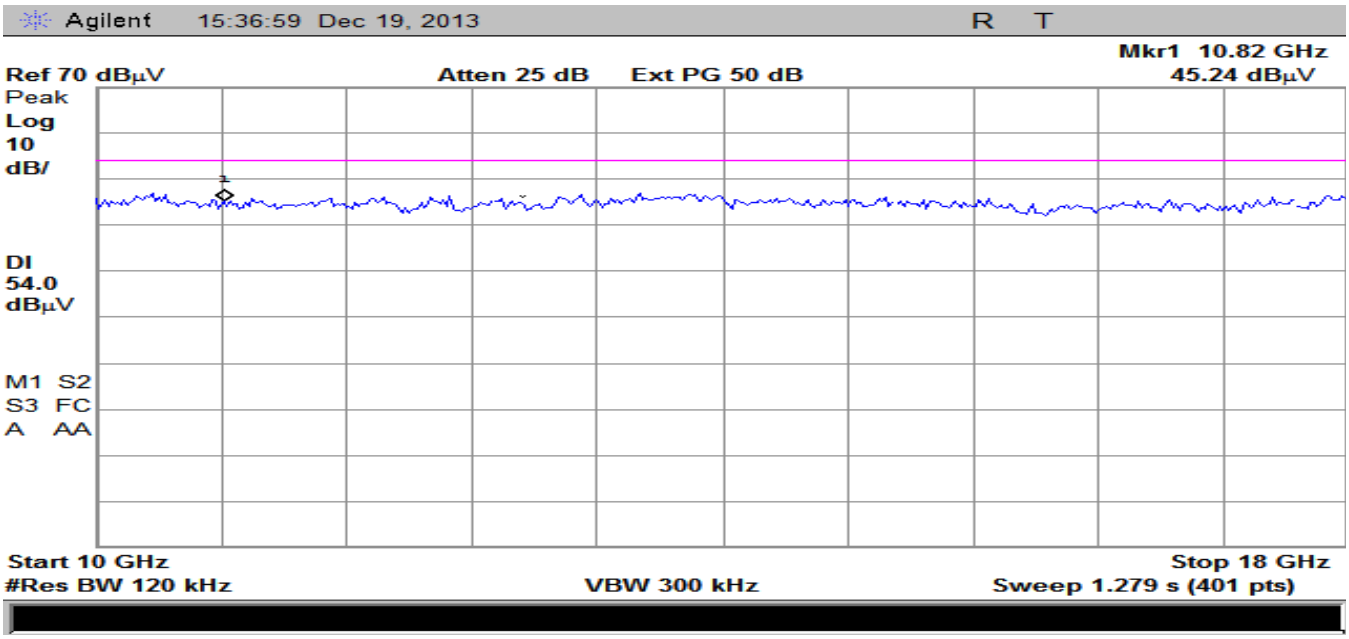

Agilent 14:24:24 Dec 19, 2013
R T
Mkr1 4.8100 GHz
42.29 dBµV
Ref 70 dBµV
Atten 5 dB
Peak
Log
10
dB/
DI
54.0
dBµV
M1 S2
S3 FC
A AA
Start 3 GHz
#Res BW 120 kHz
VBW 300 kHz
Stop 6 GHz
Sweep 479.6 ms (401 pts)

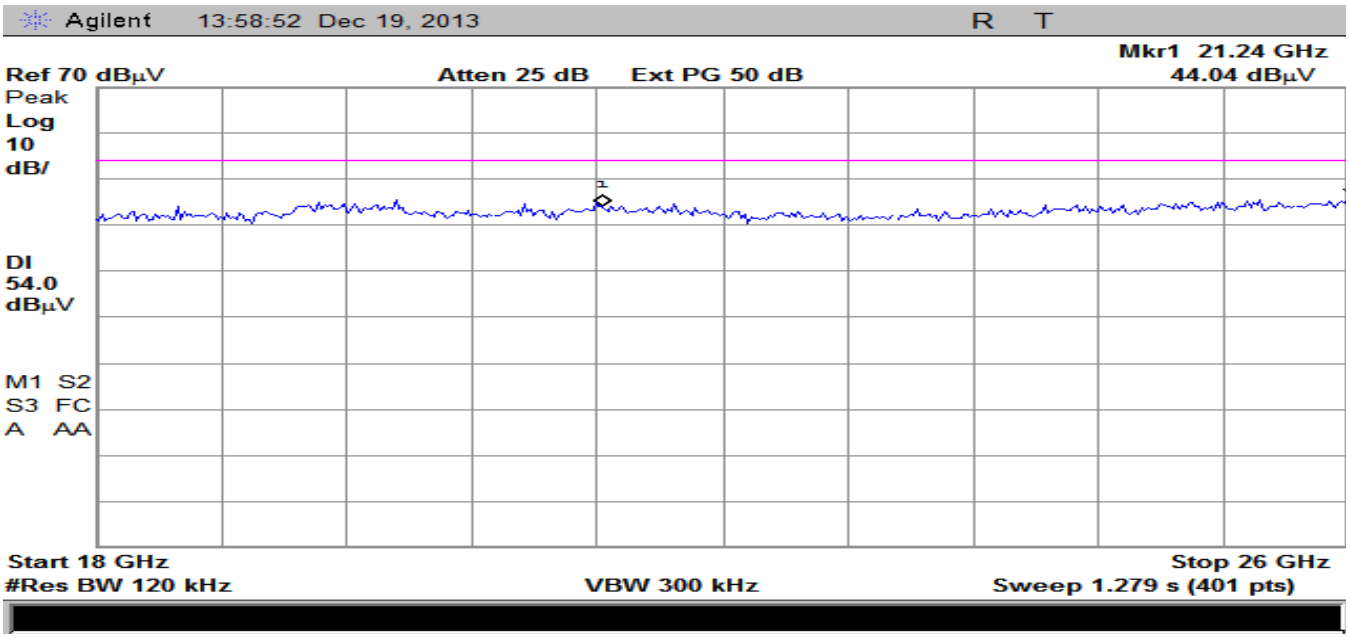

Agilent 14:26:54 Dec 19, 2013
R T
Mkr1 7.21 GHz
48.89 dBµV
Ref 70 dBµV
Atten 5 dB
Peak
Log
10
dB/
DI
54.0
dBµV
M1 S2
S3 FC
A AA
Start 6 GHz
#Res BW 120 kHz
VBW 300 kHz
Stop 10 GHz
Sweep 639.5 ms (401 pts)

Blue is peak during CW. Normal usage is less than 25% duty cycle.



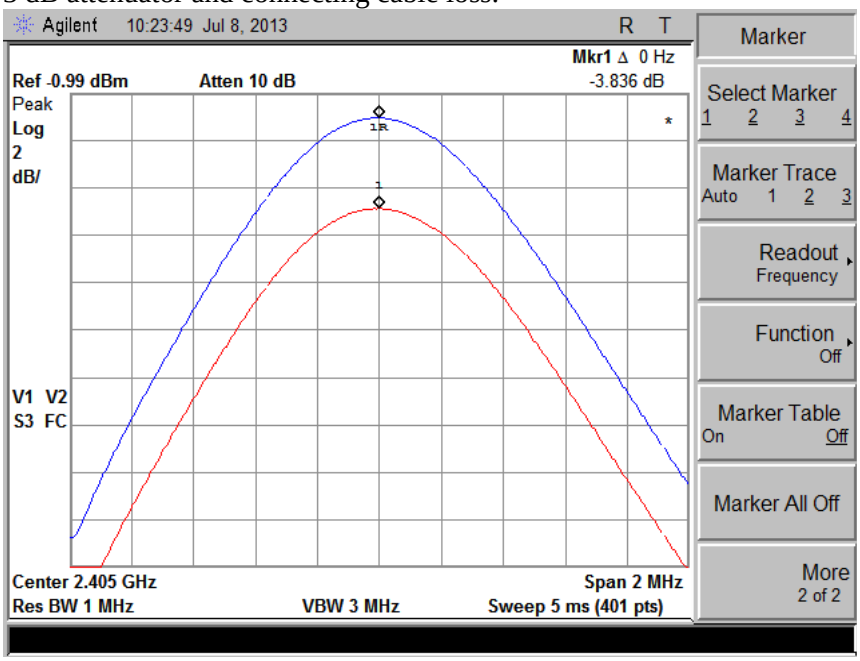



Agilent 15:36:59 Dec 19, 2013
R T
Mkr1 10.82 GHz
45.24 dBµV
Ref 70 dBµV
Atten 25 dB
Ext PG 50 dB
Peak
Log
10
dB/
Dl
54.0
dBµV
M1 S2
S3 FC
A AA
Start 10 GHz
#Res BW 120 kHz
VBW 300 kHz
Stop 18 GHz
Sweep 1.279 s (401 pts)


Agilent 13:58:52 Dec 19, 2013
R T
Mkr1 21.24 GHz
44.04 dBµV
Ref 70 dBµV
Atten 25 dB
Ext PG 50 dB
Peak
Log
10
dB/
Dl
54.0
dBµV
M1 S2
S3 FC
A AA
Start 18 GHz
#Res BW 120 kHz
VBW 300 kHz
Stop 26 GHz
Sweep 1.279 s (401 pts)

4.3 Conducted RF measurements connection losses and setup.

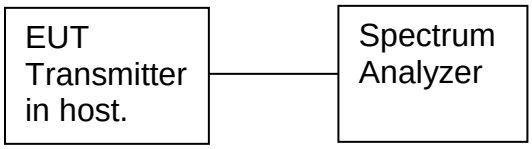
3 dB attenuator and connecting cable loss.



This value (-3.8 dB) is added back into measured values

Equipment list asset numbers : 104.

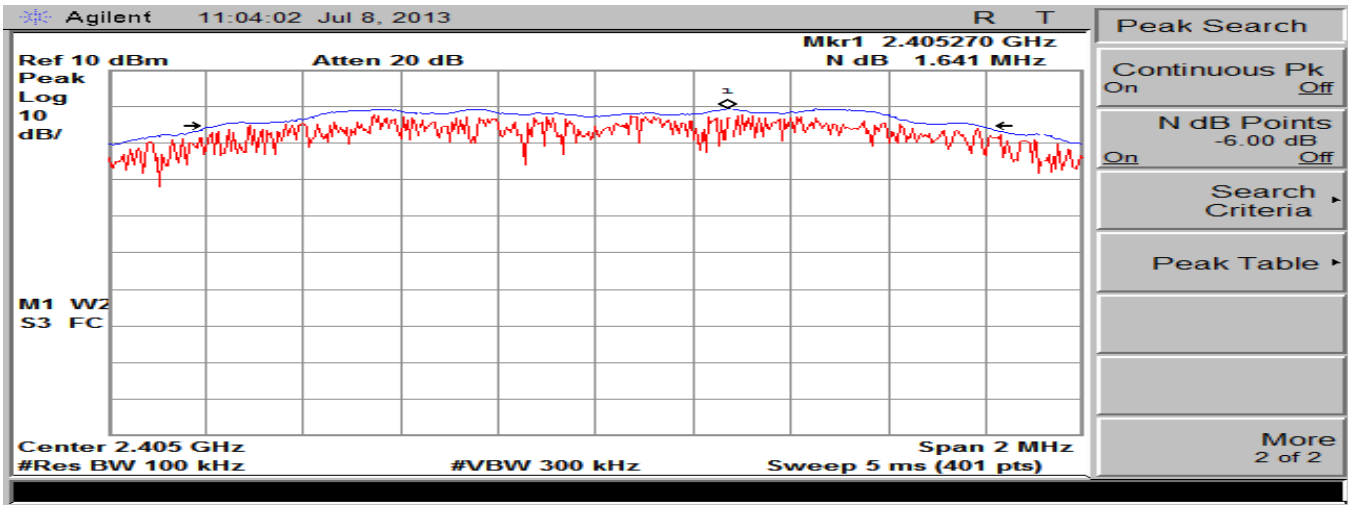
Setup:



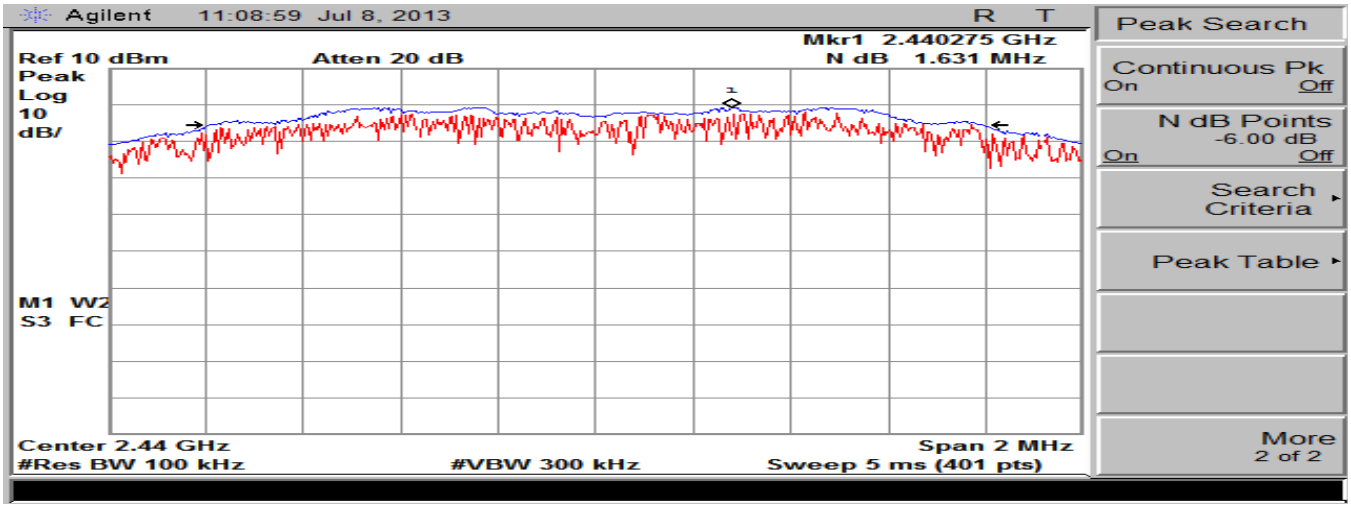
4.4 6 dB Emission Bandwidth. 15.247 (a)(2)

The minimum 6 dB bandwidth of a DTS transmission shall be at least 500 kHz.

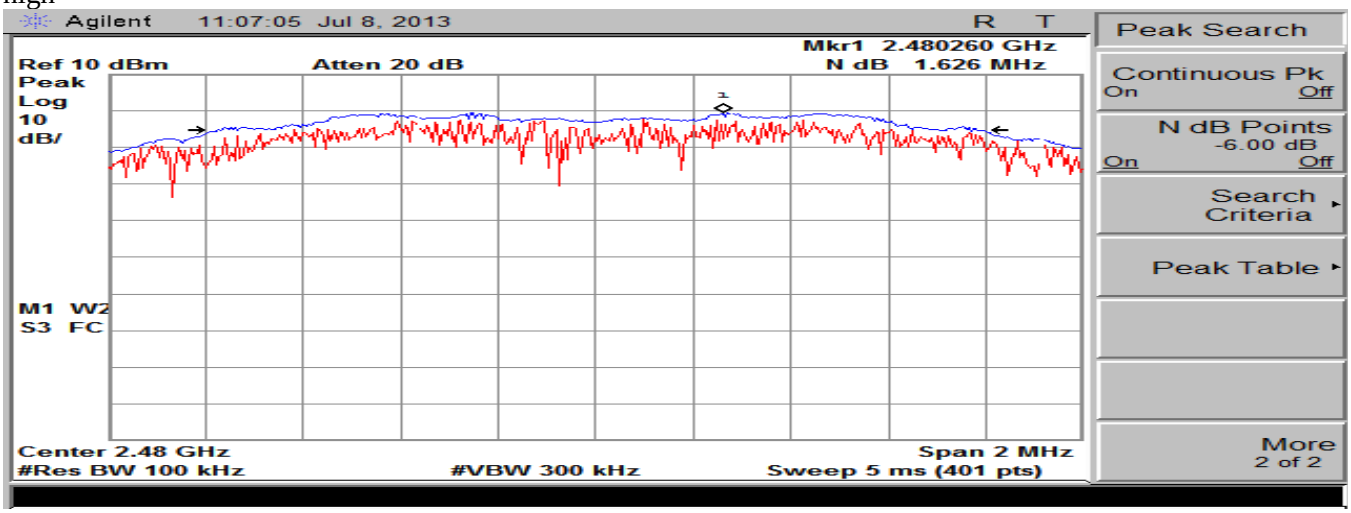
low



middle

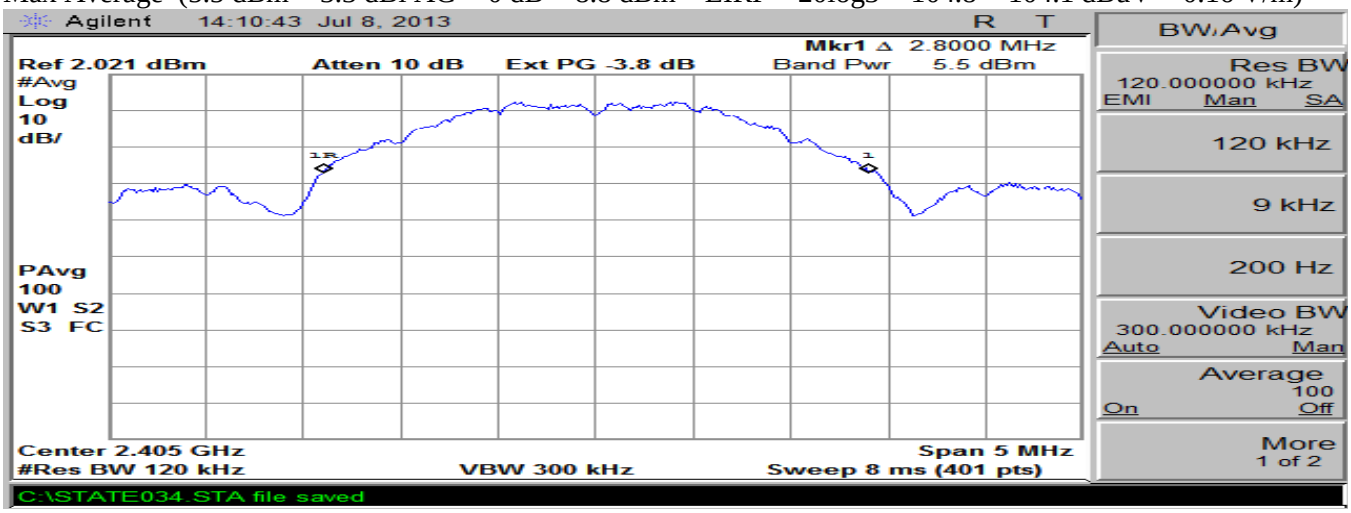


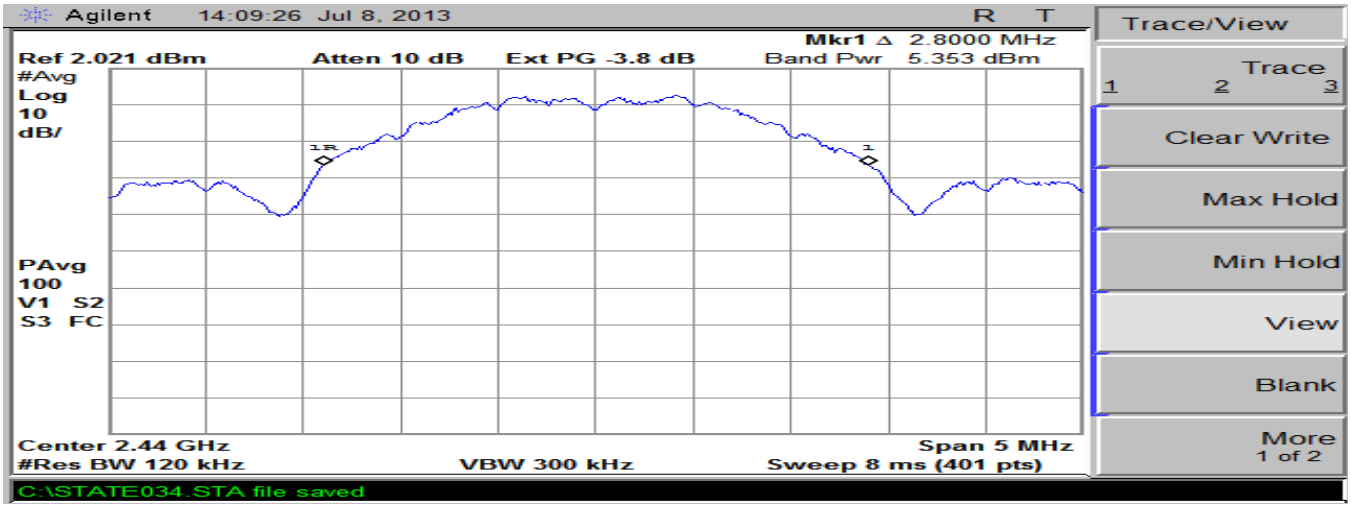
high

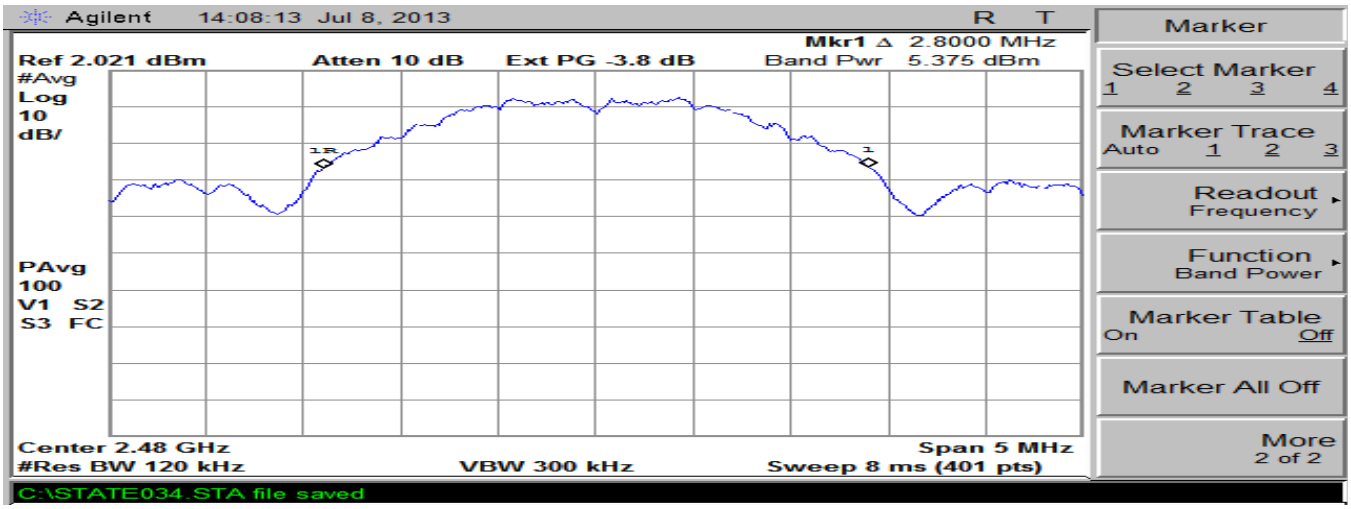


4.5 Max Conducted Power Output, 15.247 (b)(3)

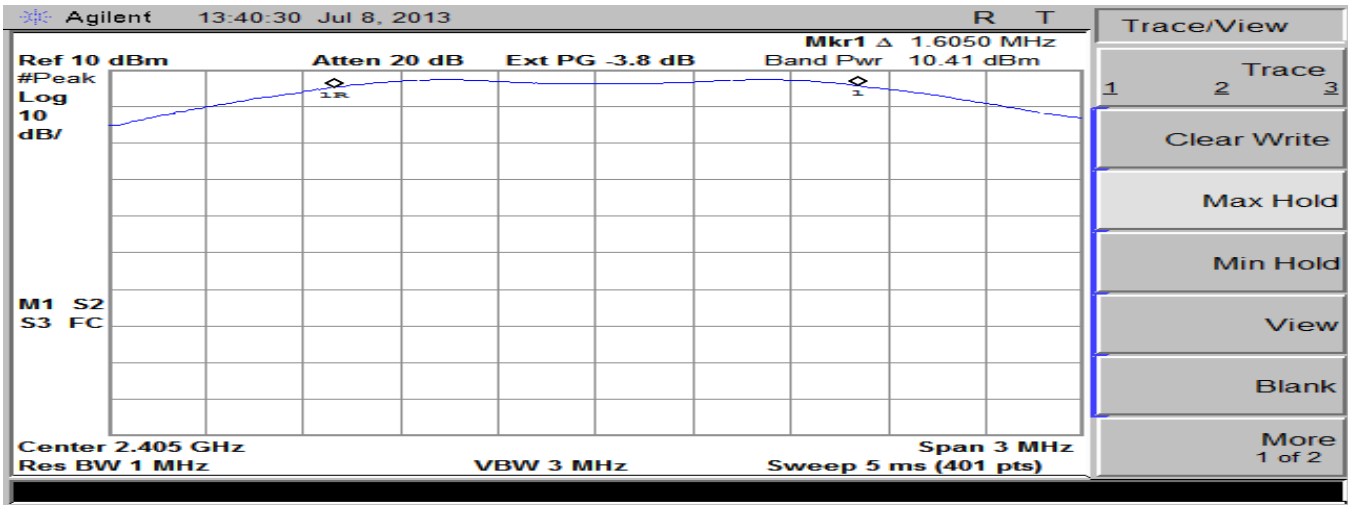
The maximum output power limit for DTS devices is specified as 1 watt (30 dBm) when expressed in terms of either maximum **(average)** conducted output power or maximum **(peak)** conducted output power.
Max Average (5.5 dBm + 3.3 dBi AG + 0 dB = 8.8 dBm EIRP – 20log3 + 104.8 = 104.1 dBuV = 0.16 V/m)

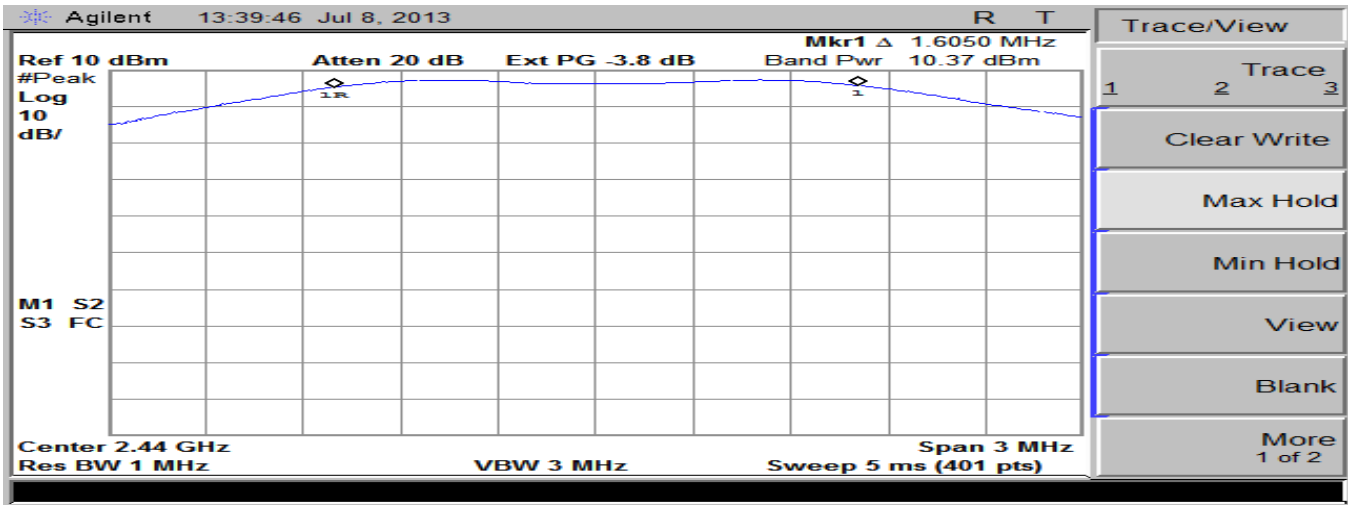


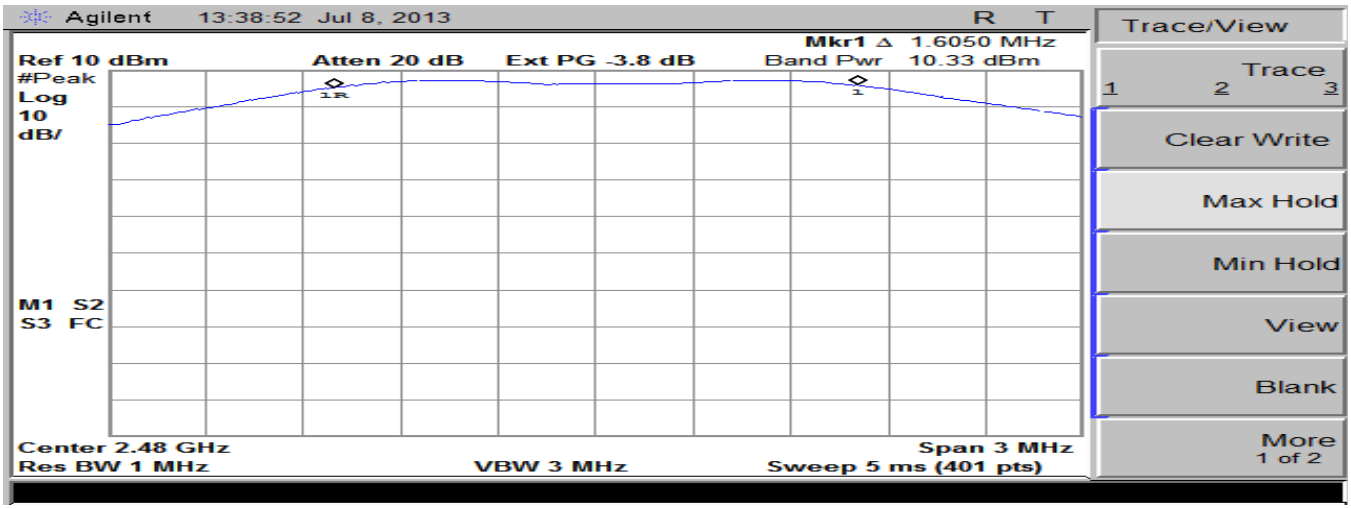




Max Peak Conducted







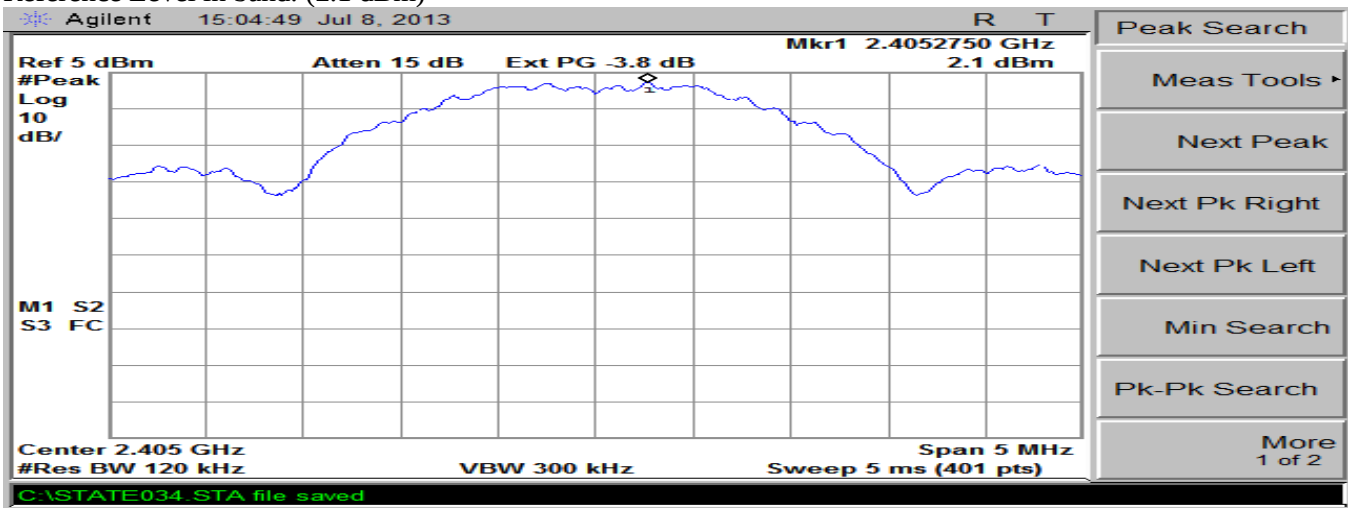
4.6 Spurious RF Conducted Emissions, 15.247 (d)

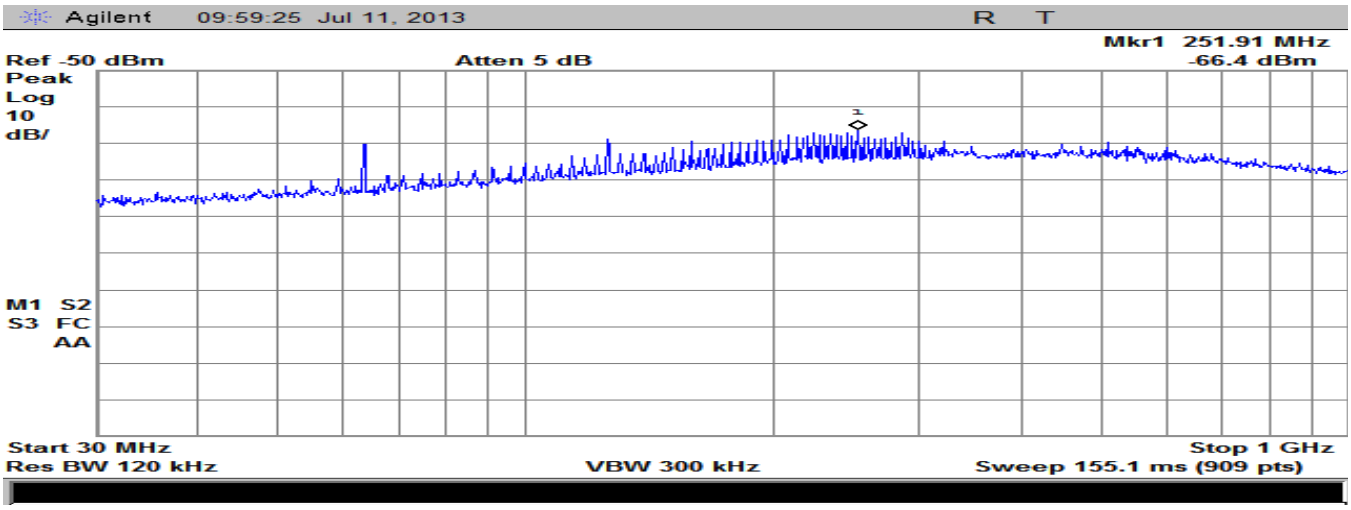
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

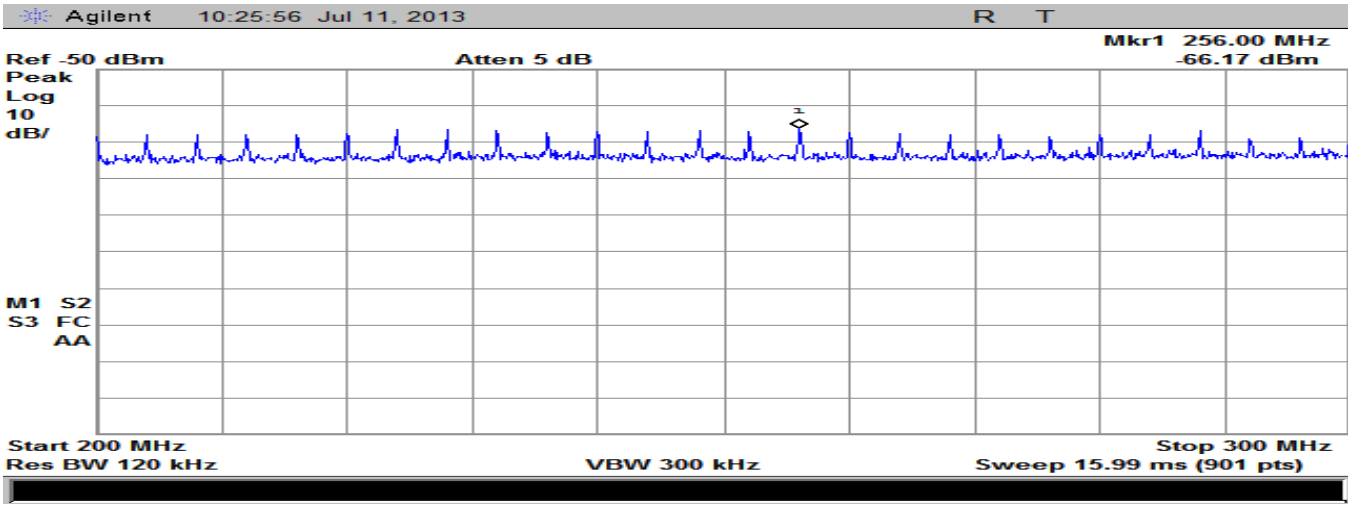
Restricted harmonics

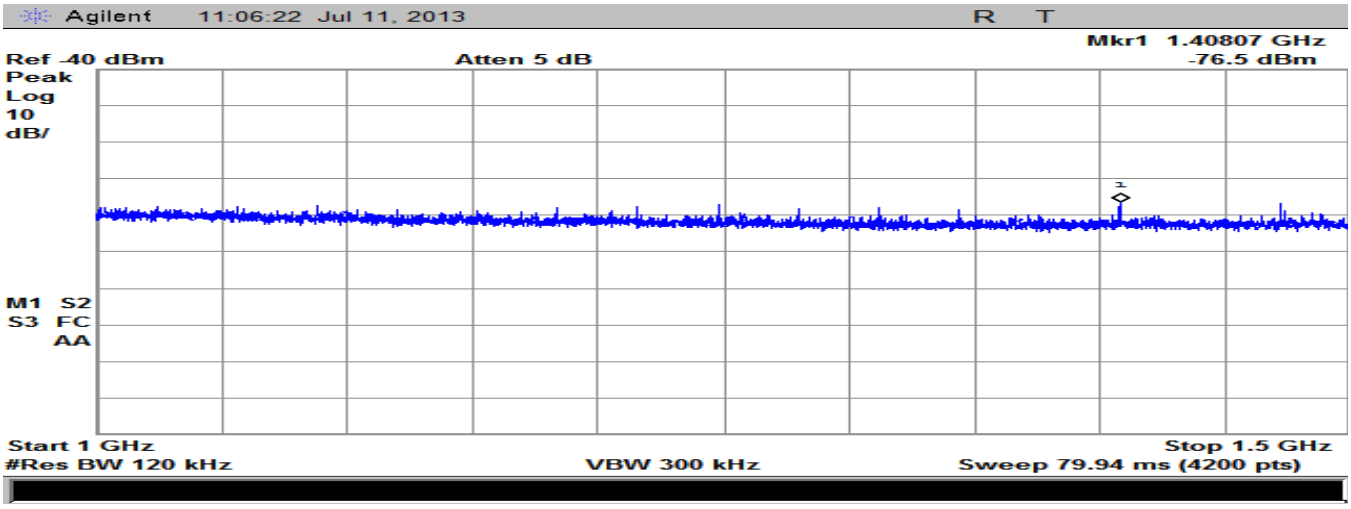
2.405		2.44		2.48	
4.81	r	4.88	r	4.96	r
7.215		7.32	r	7.44	r
9.62		9.76		9.92	
12.025	r	12.2	r	12.4	r
14.43		14.64		14.88	
16.835		17.08		17.36	
19.24	r	19.52	r	19.84	r
21.645		21.96		22.32	r
24.05		24.4		24.8	

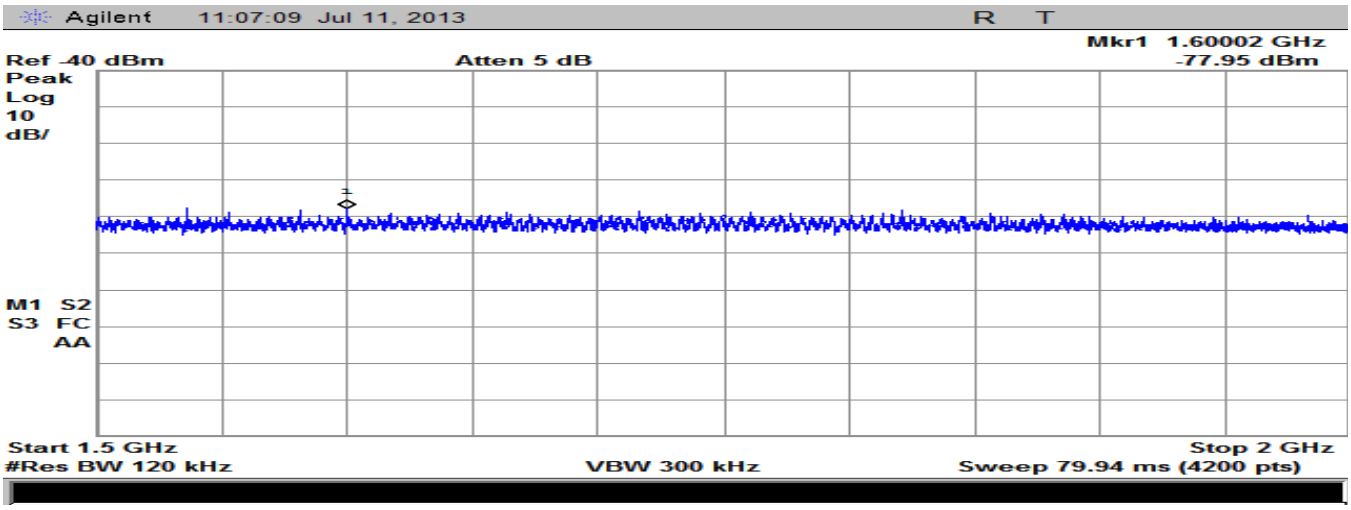
Reference Level in band. (2.1 dBm)



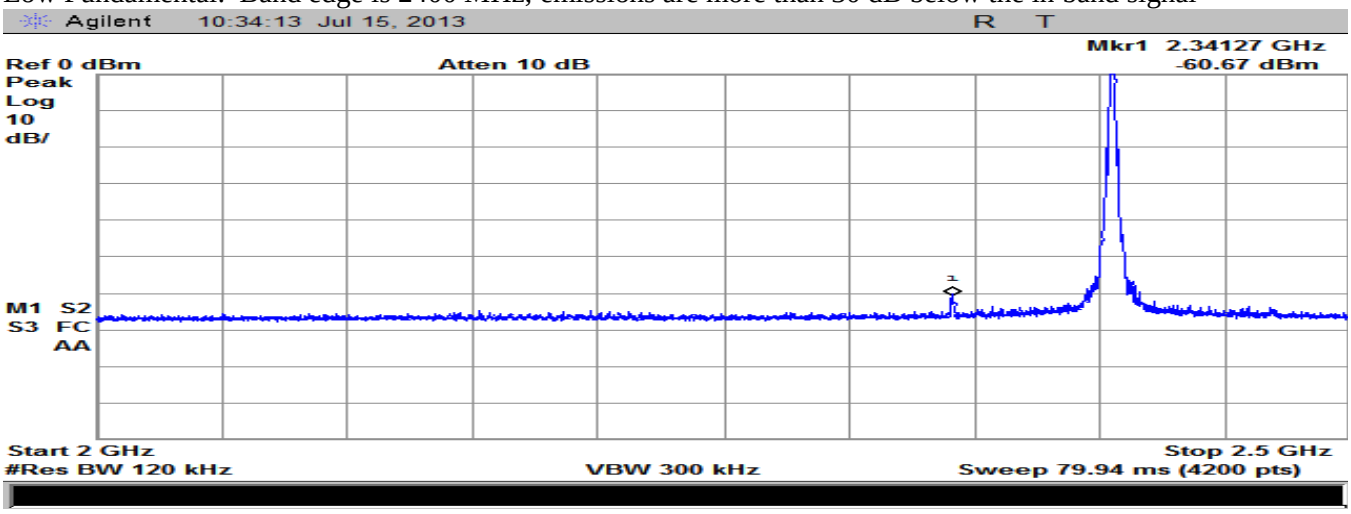

Agilent 09:59:25 Jul 11, 2013
R T
Mkr1 251.91 MHz
-66.4 dBm
Ref -50 dBm
Atten 5 dB
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Start 30 MHz
Res BW 120 kHz
VBW 300 kHz
Stop 1 GHz
Sweep 155.1 ms (909 pts)


Agilent 10:25:56 Jul 11, 2013
R T
Mkr1 256.00 MHz
-66.17 dBm
Ref -50 dBm
Atten 5 dB
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Start 200 MHz
Res BW 120 kHz
VBW 300 kHz
Stop 300 MHz
Sweep 15.99 ms (901 pts)

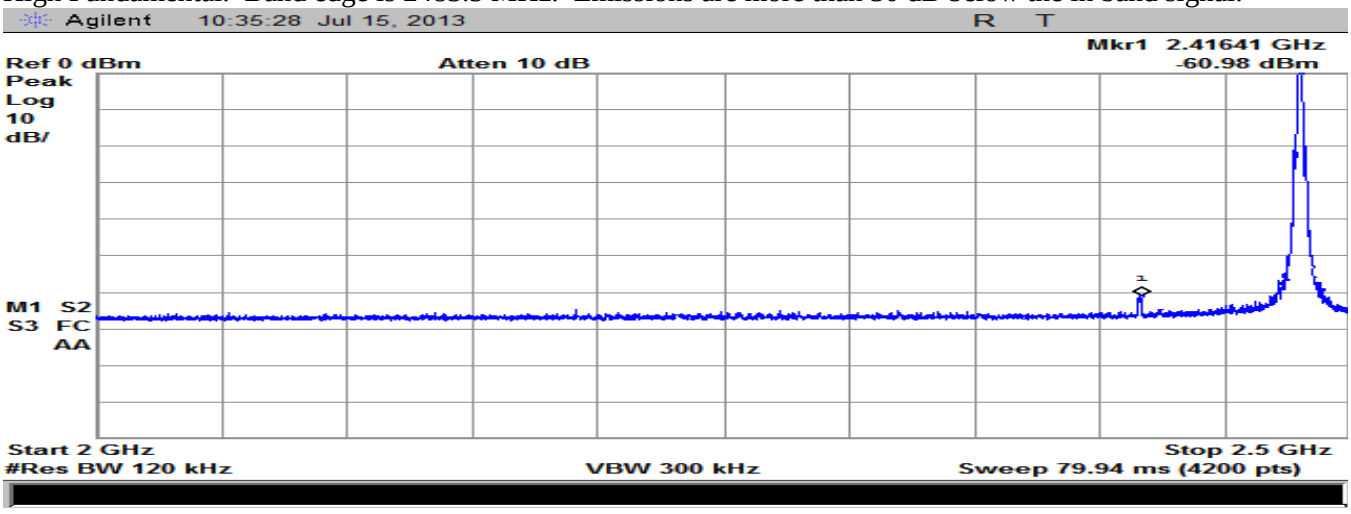

Agilent 11:06:22 Jul 11, 2013
R T
Mkr1 1.40807 GHz
-76.5 dBm
Ref -40 dBm
Atten 5 dB
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Start 1 GHz
#Res BW 120 kHz
VBW 300 kHz
Stop 1.5 GHz
Sweep 79.94 ms (4200 pts)

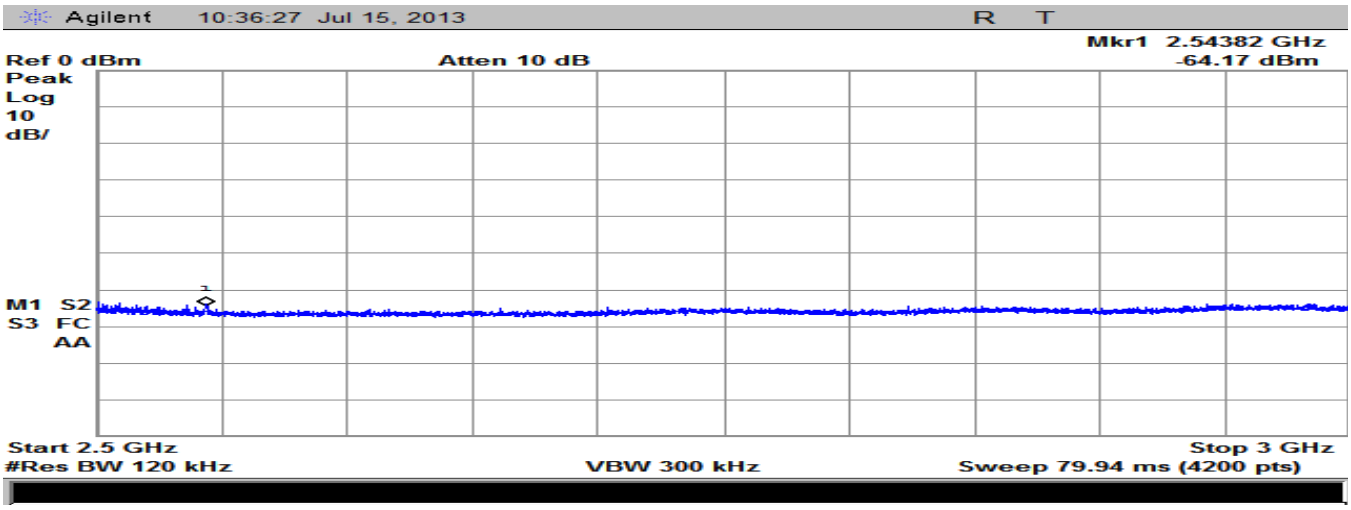


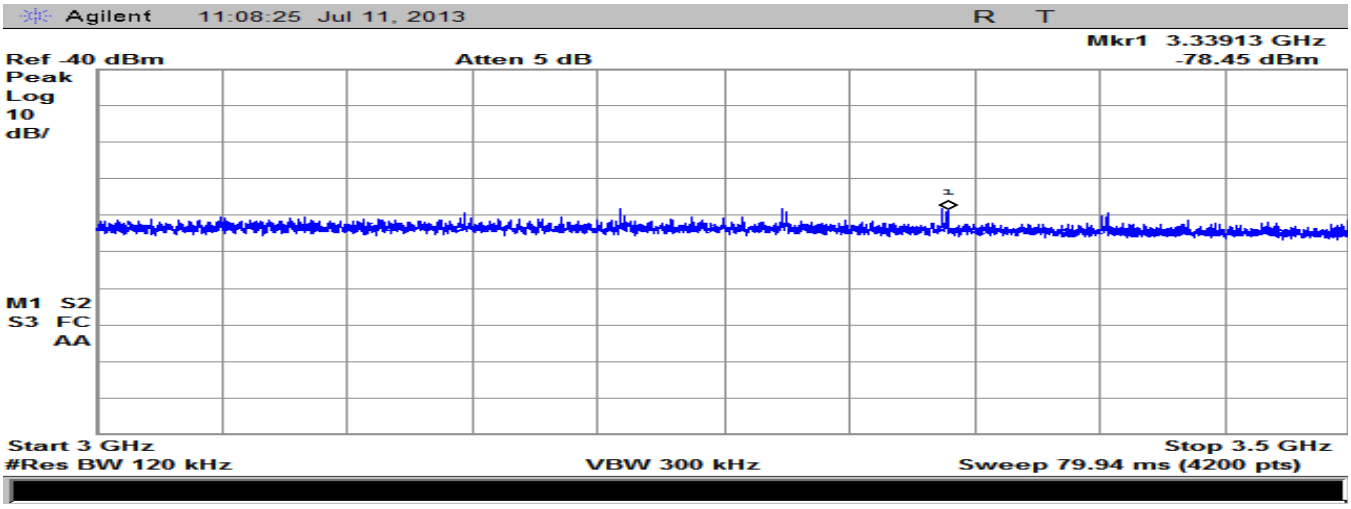
Low Fundamental. Band edge is 2400 MHz; emissions are more than 30 dB below the in band signal

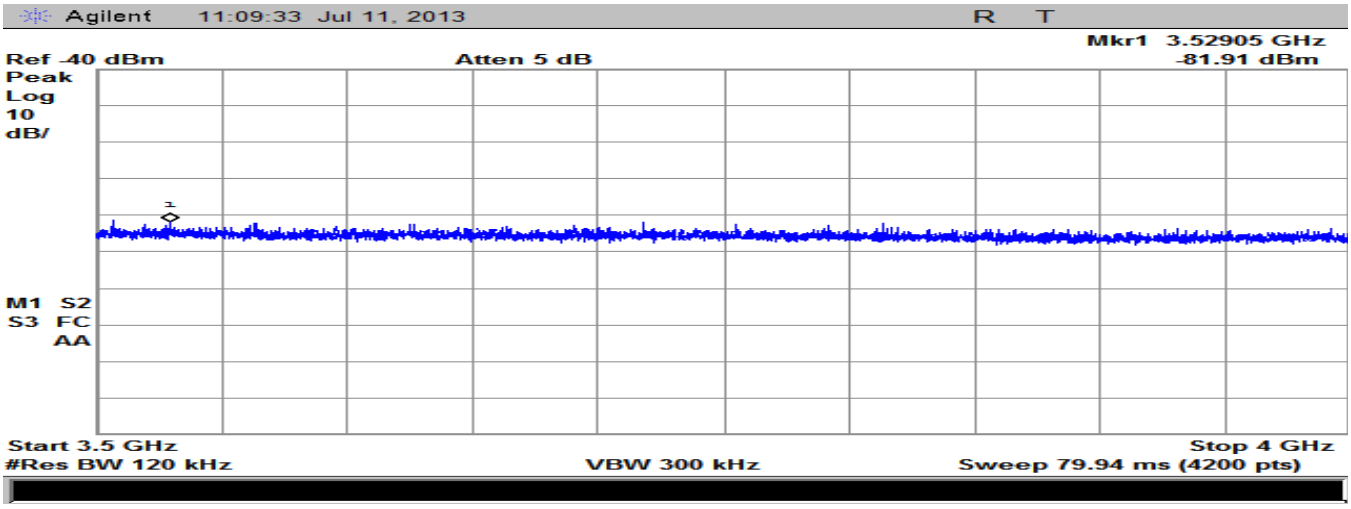


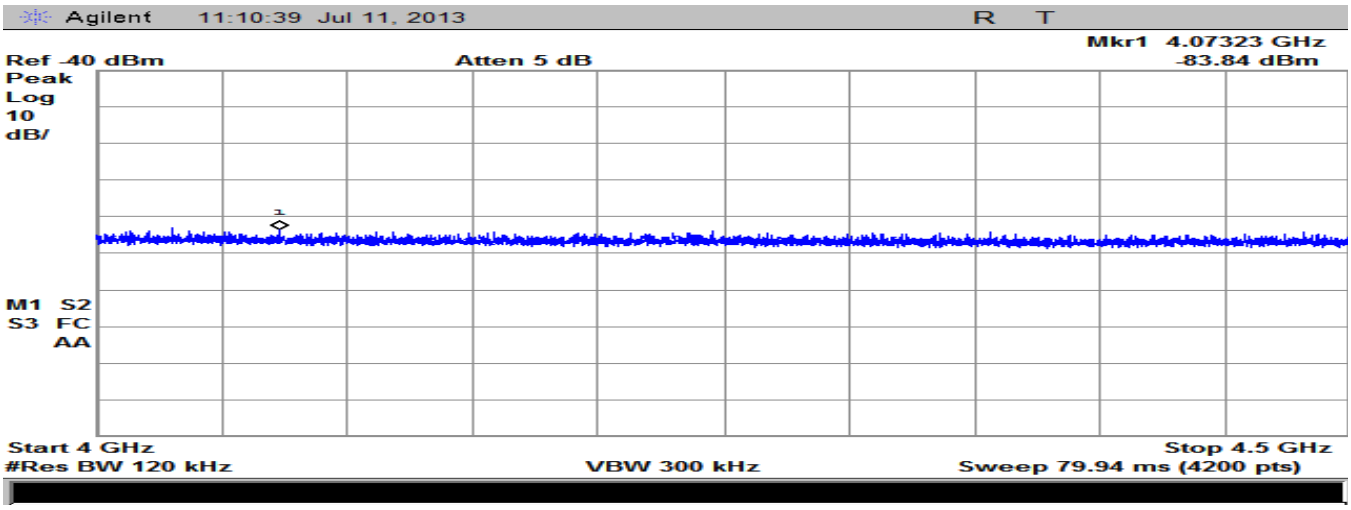
High Fundamental. Band edge is 2483.5 MHz. Emissions are more than 30 dB below the in band signal.



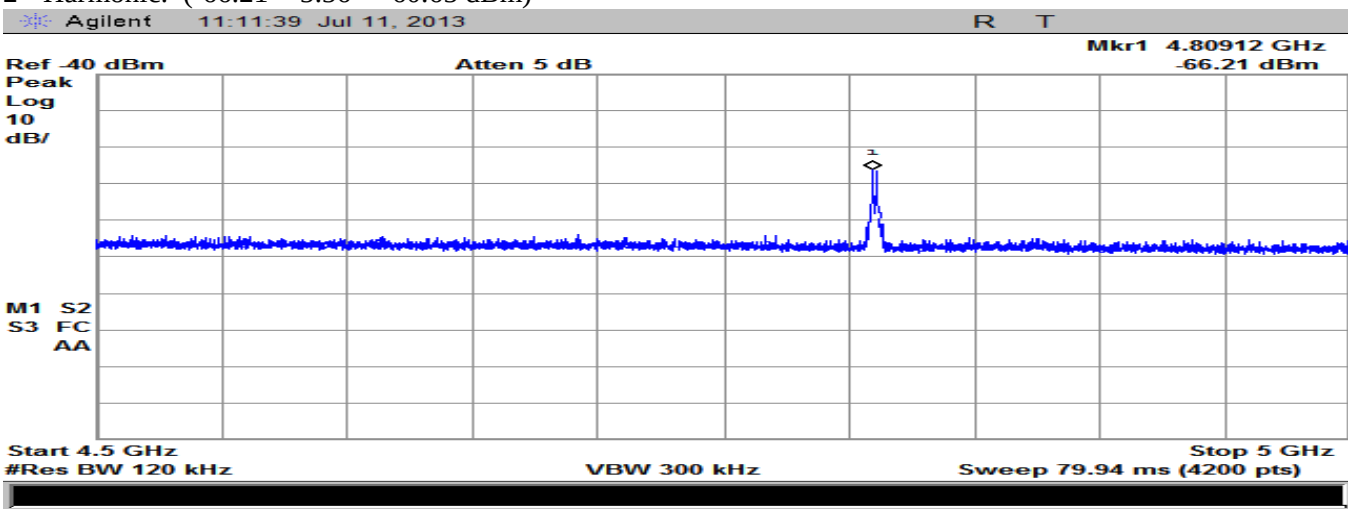

Agilent 10:36:27 Jul 15, 2013
R T
Mkr1 2.54382 GHz
-64.17 dBm
Ref 0 dBm
Atten 10 dB
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Start 2.5 GHz
#Res BW 120 kHz
VBW 300 kHz
Stop 3 GHz
Sweep 79.94 ms (4200 pts)


Agilent 11:08:25 Jul 11, 2013
R T
Mkr1 3.33913 GHz
-78.45 dBm
Ref -40 dBm
Atten 5 dB
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Start 3 GHz
#Res BW 120 kHz
VBW 300 kHz
Stop 3.5 GHz
Sweep 79.94 ms (4200 pts)

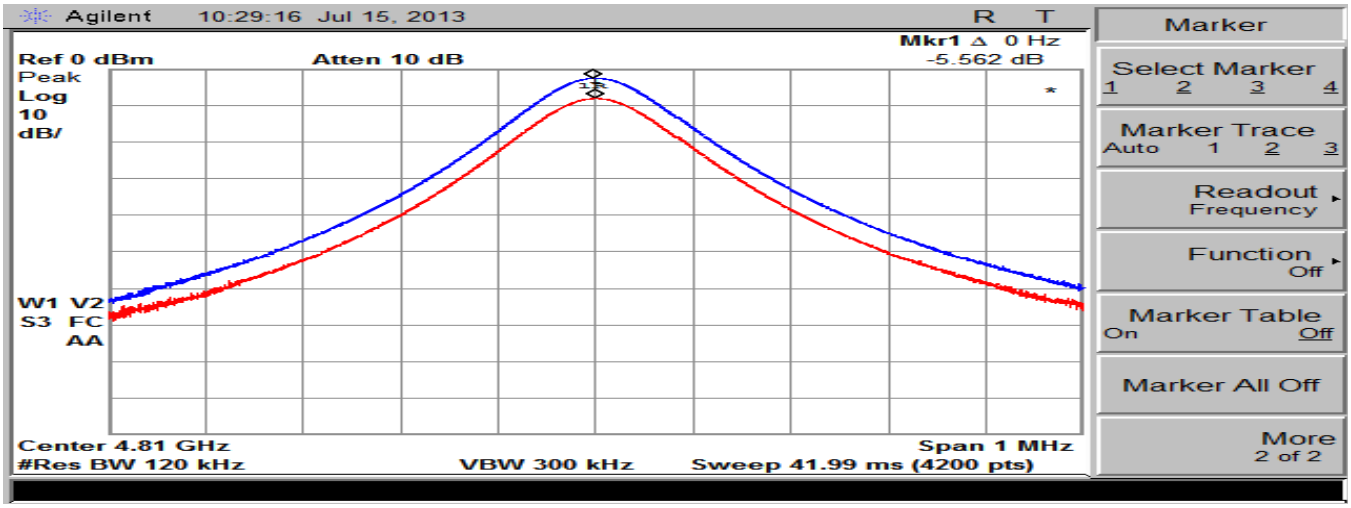

Agilent 11:09:33 Jul 11, 2013
R T
Mkr1 3.52905 GHz
-81.91 dBm
Ref -40 dBm
Atten 5 dB
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Start 3.5 GHz
#Res BW 120 kHz
VBW 300 kHz
Stop 4 GHz
Sweep 79.94 ms (4200 pts)



2nd Harmonic. (-66.21 + 5.56 = -60.65 dBm)

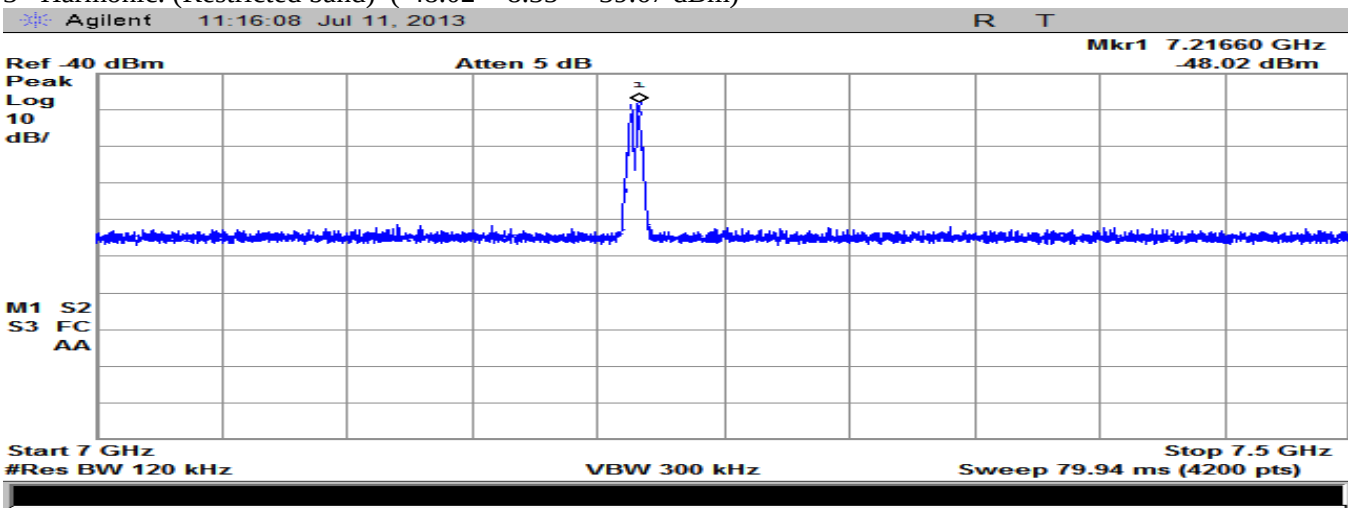


Cable and attenuator loss at 4810 MHz to add back in for level correction.

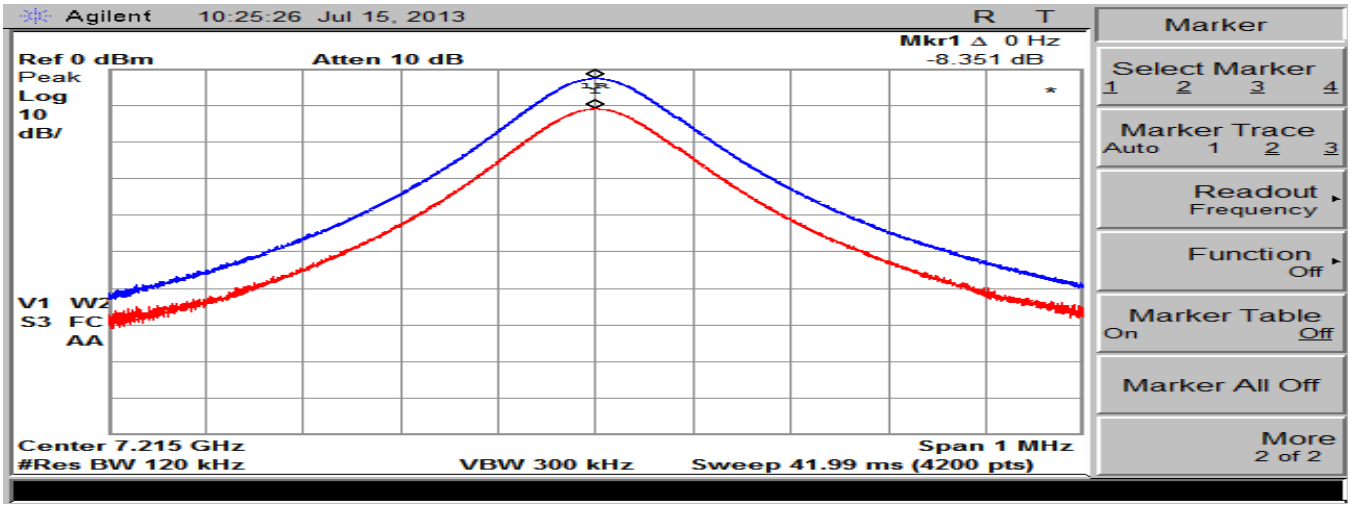


Scans between harmonics did not show any frequencies.

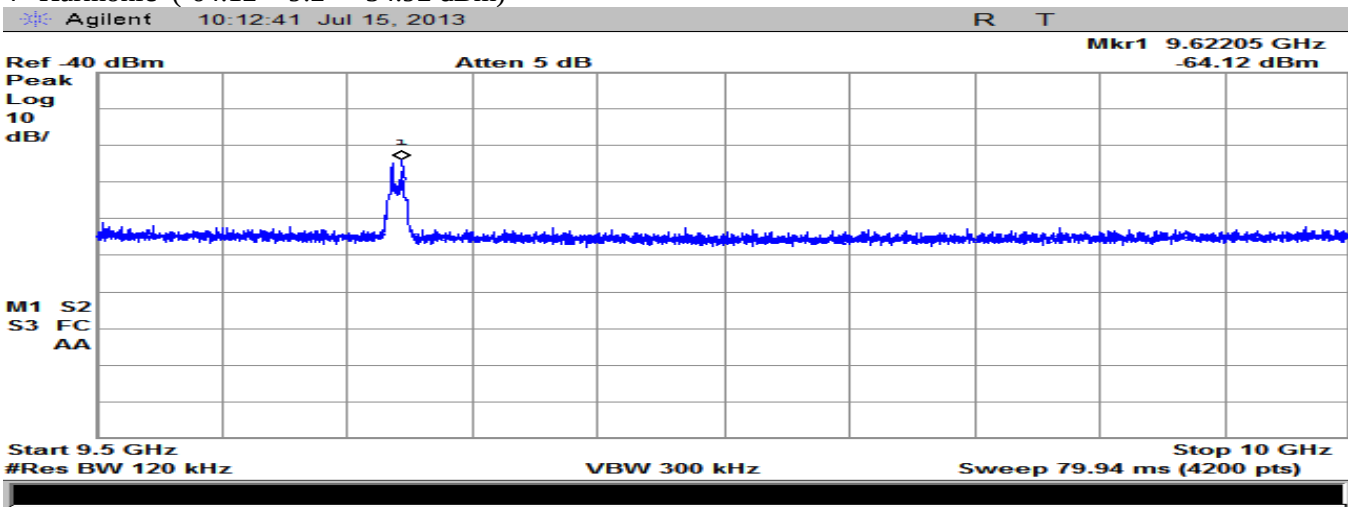
3rd Harmonic. (Restricted band) (-48.02 + 8.35 = -39.67 dBm)



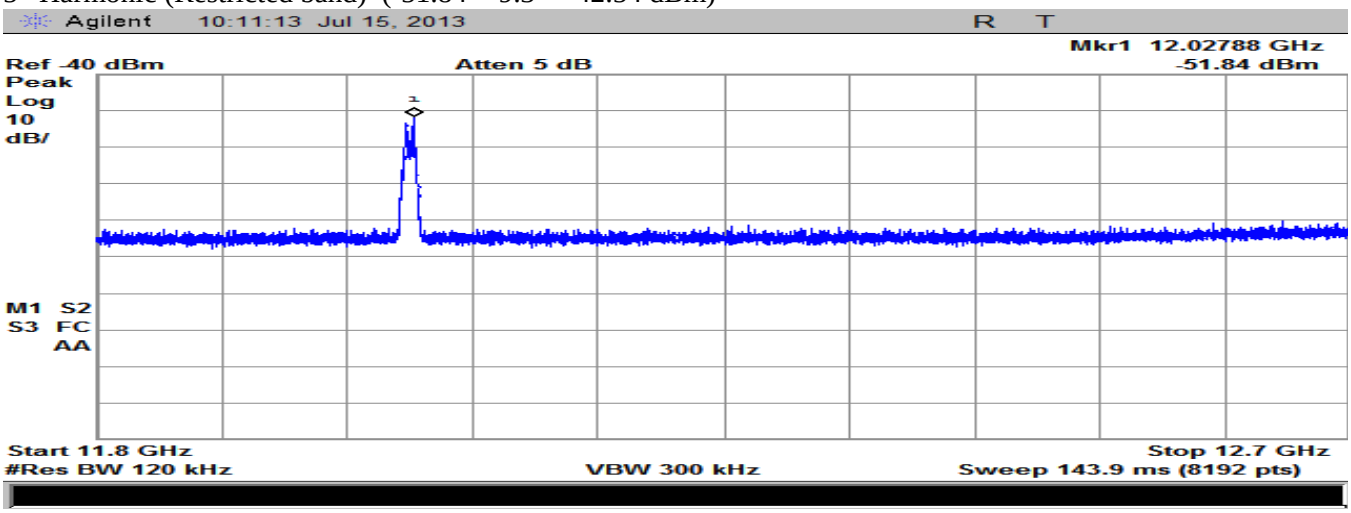
Cable and attenuator loss for level correction.



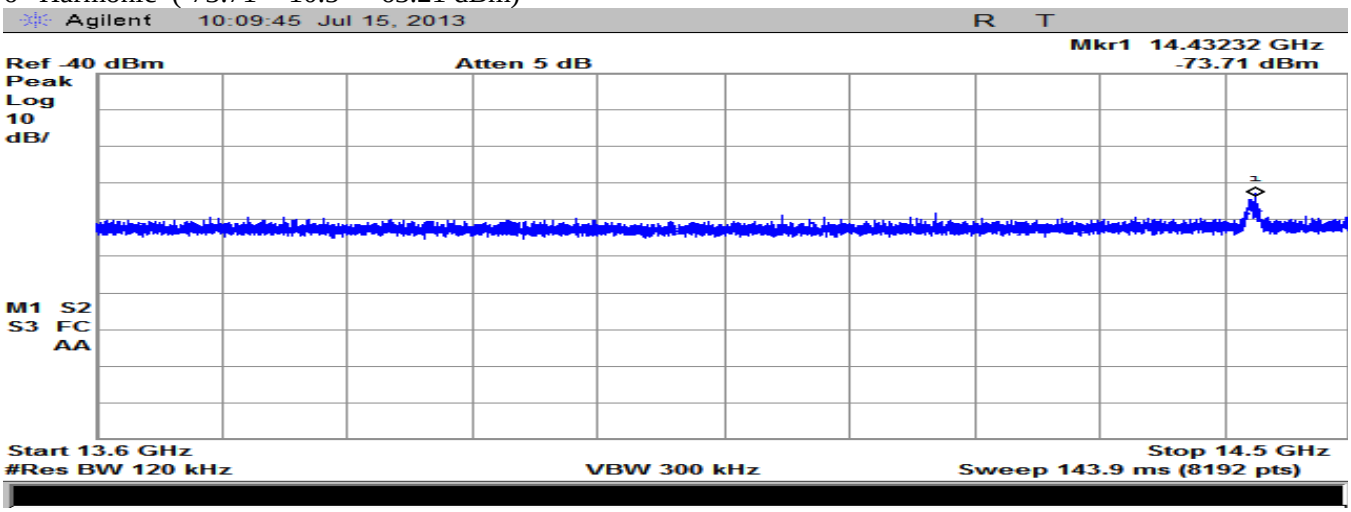
4th Harmonic (-64.12 + 9.2 = -54.92 dBm)



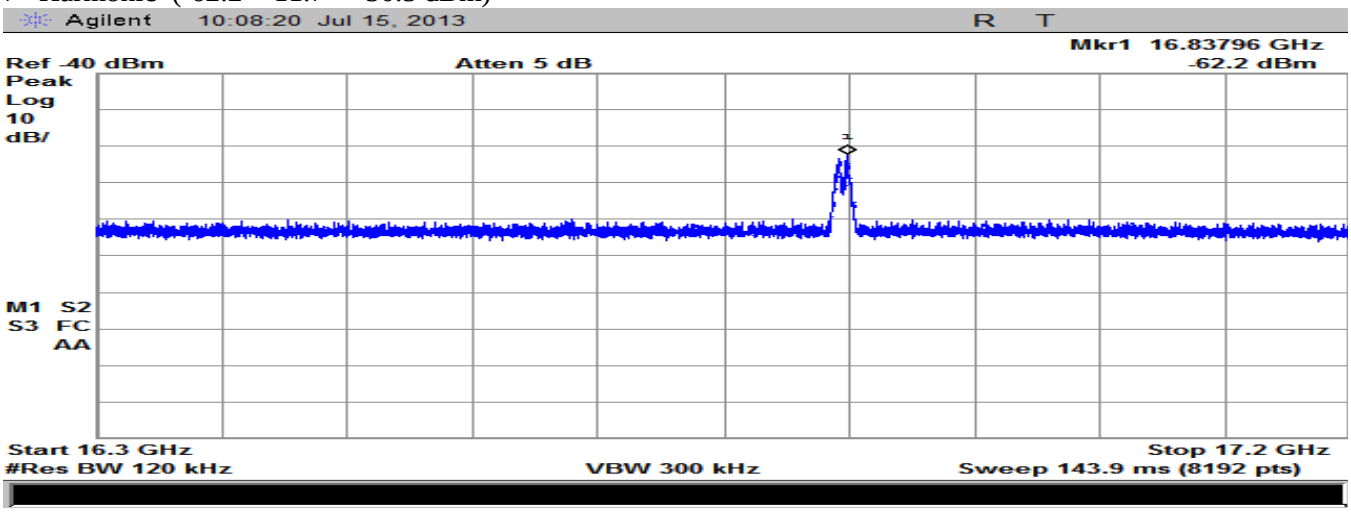
5th Harmonic (Restricted band) (-51.84 + 9.3 = -42.54 dBm)



6th Harmonic (-73.71 + 10.5 = -63.21 dBm)



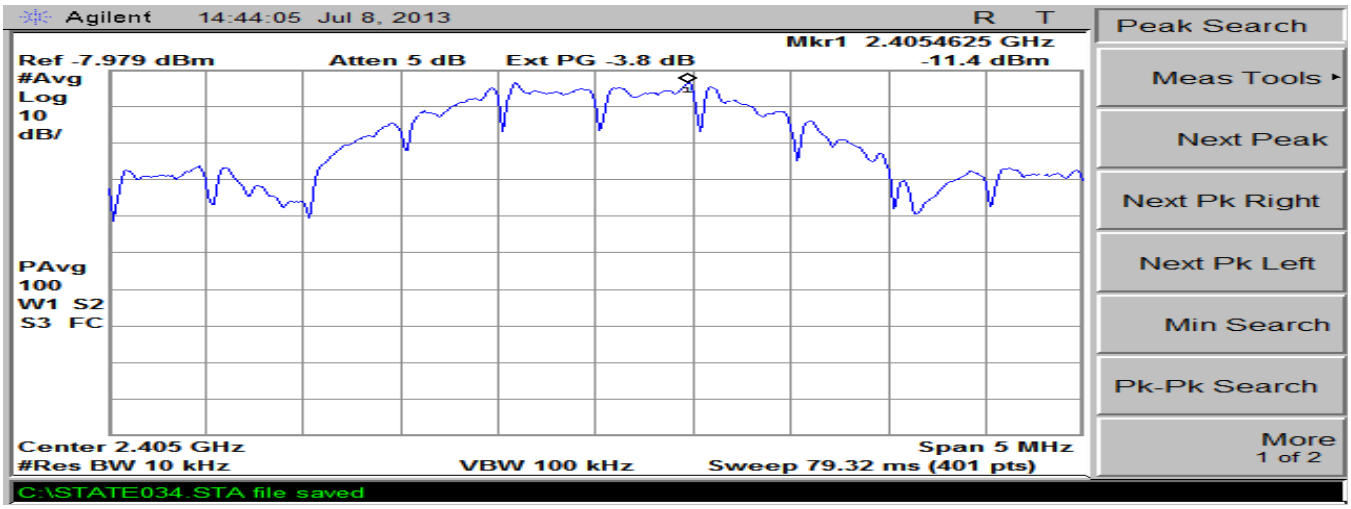
7th Harmonic (-62.2 = 11.7 = -50.5 dBm)

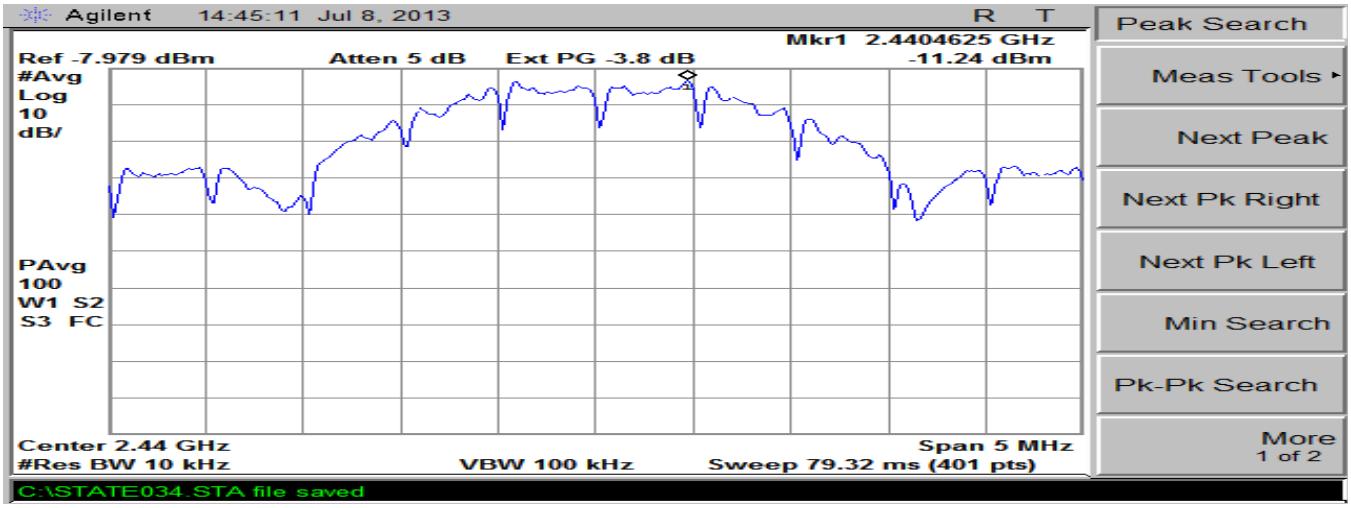


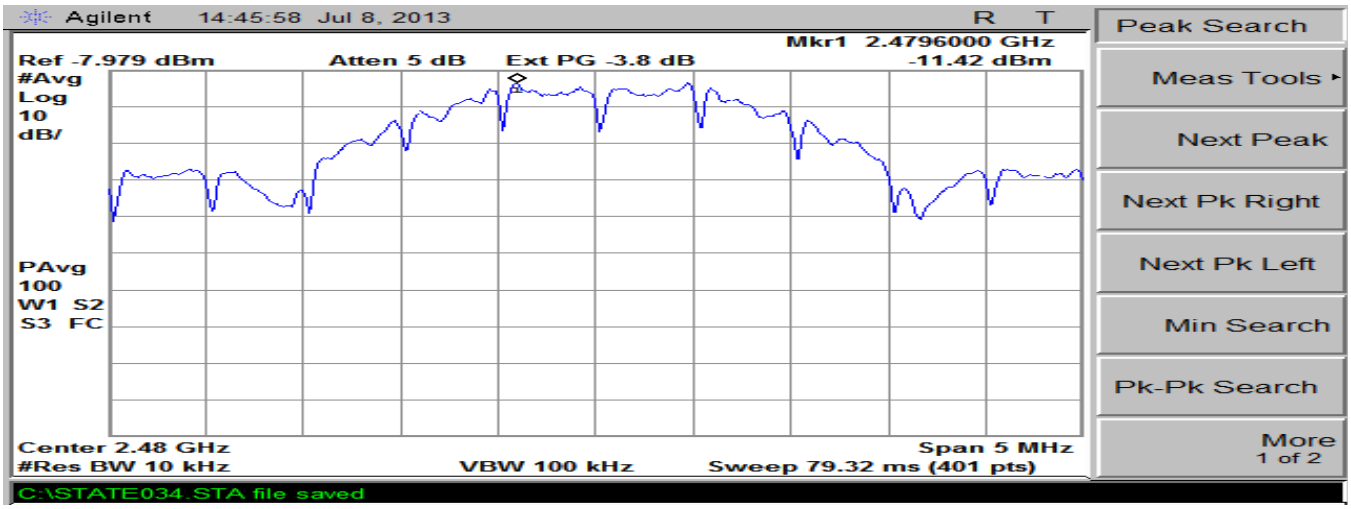
No more harmonics or emissions were detected in scans up to ten times the fundamental.

4.7 Maximum power spectral density level in the fundamental emission. 15.247 (e)

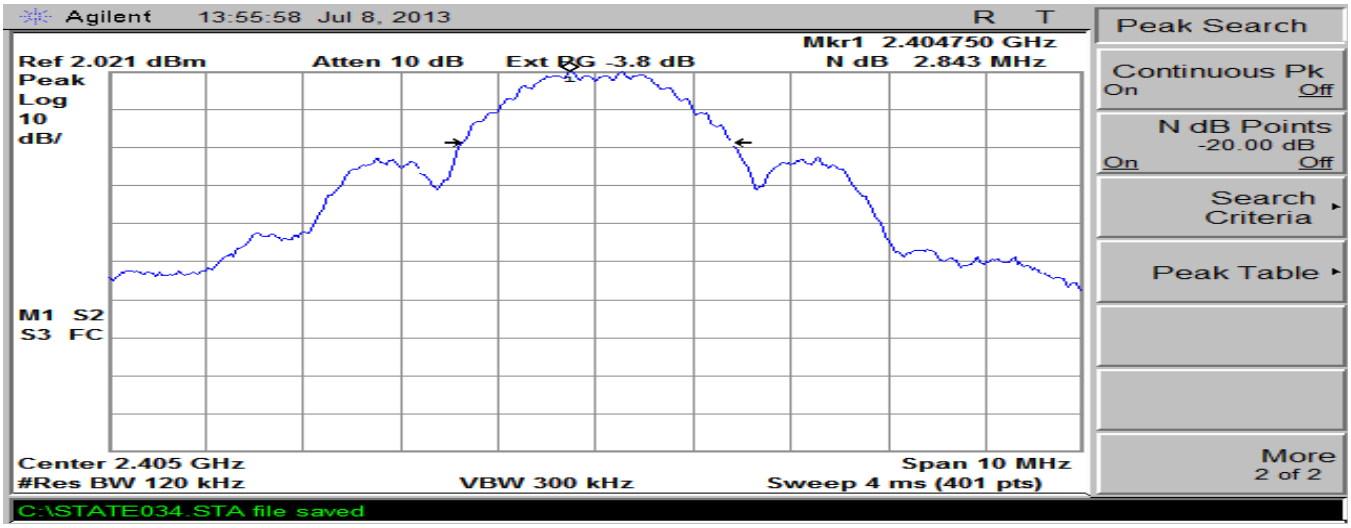
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

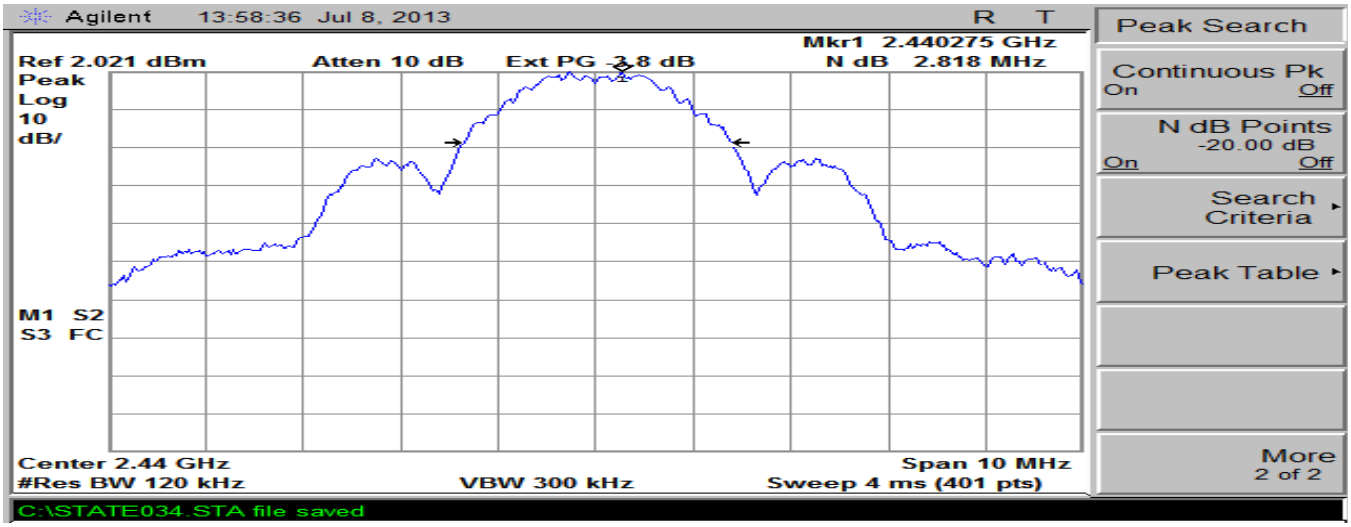


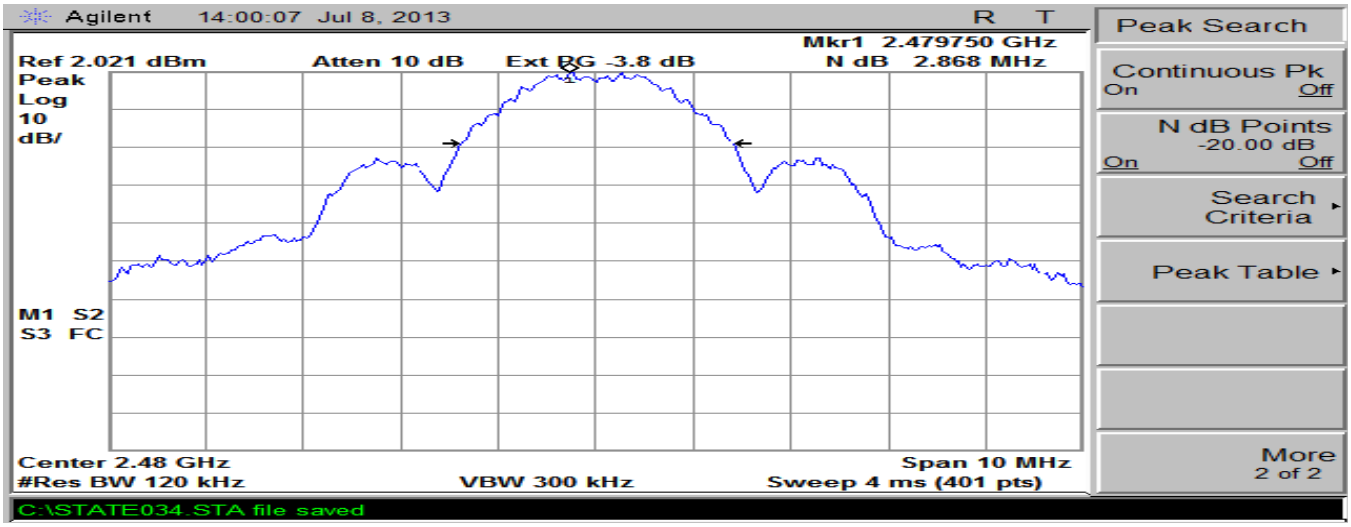




4.8 20 dBc Bandwidth from highest level



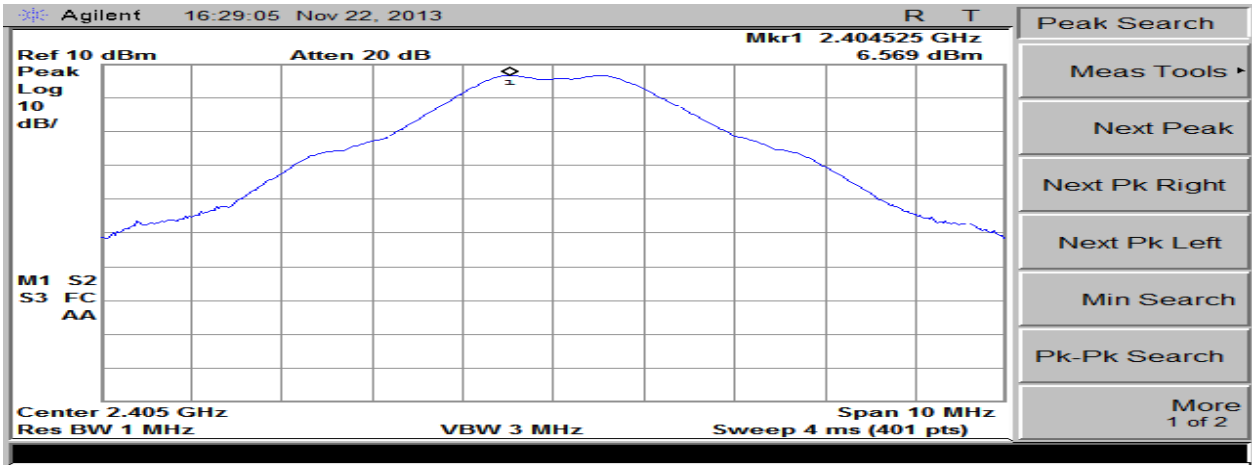




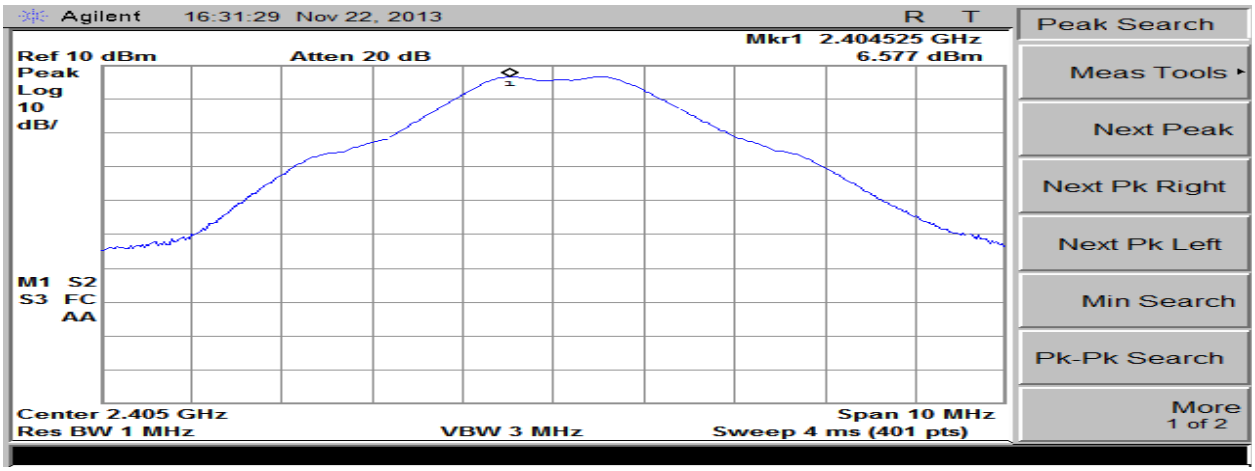
4.9 Input Voltage Variation, 15.31(e).

Output power set to Maximum, 7 dBm.

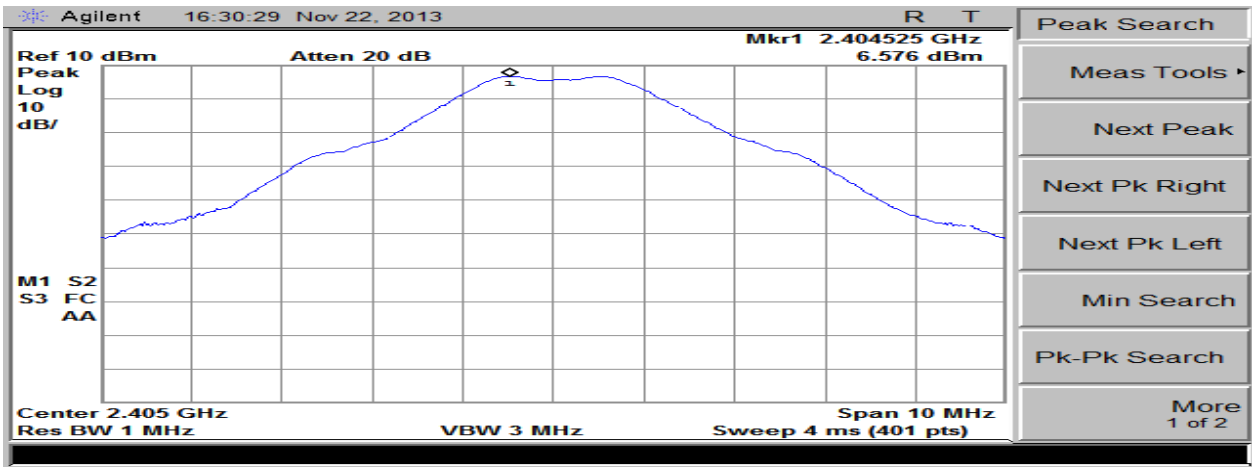
Voltage vac	Peak Signal Level dBm
102	6.569
120	6.577
138	6.576



102 vac



120 vac



138 vac

4.10 RF Exposure Compliance Requirements per 15.247 (b) (5), 2.1093 (d)(1) Portable

Operating Band Center Frequency = 2441.75 MHz, Range 2400-2483.5 MHz
EUT Max Output Power = 7 dBm
Antenna Gain = 3.3 dBi => Numeric Gain = 2.14
MPE Power Density Limit for General Population is S = 1 mW/cm^2
(CFR 47 Part 1.1310, Table 1)

Minimum MPE safe distance (using equation below) = 0.92 cm

Calculations:
Power Density Pd = (Pt*G)/(4*pi*d^2)
Solve for d
d^2 = (Pt*G)/(4*pi*Pd)
d = SqrRoot((Pt*G)/(4*pi*Pd))
d = SqrRoot((5.01mWatt*2.14gain)/(4*pi*1 mWatt/cm^2)
d = SqrRoot((10.72/4*pi*1)cm^2)
d = SqrRoot(.853/pi)cm^2
d = 0.92 cm

Where
Pt= Transmit Power In mWatts
G = Numeric Antenna Gain
d = Distance in cm
Pd = Power Density in mW / square cm

Per IC: RSS-102i4, 4.2.
Power Density Limit for General Population is S = 1 mW/cm^2 = 10 W/m^2
Same as above;

5 EQUIPMENT LIST

ID	Description	Manufacturer	Model	Serial #	Last Ca	DueDate
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-13	04-Mar-14
12	Loop Antenna	Electro Metrics	ALP -70	163	30-Aug-13	29-Aug-15
13	Directional Coupler	Werlatone	C3910	6706	06-Mar-13	06-Mar-14
14	RF Power Meter	Boonton	4231-30	53701	06-Mar-13	06-Mar-14
16	Directional Coupler	Werlatone	C5673	11481	06-Mar-13	06-Mar-14
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-13	04-Mar-14
37	Line Imp Stable Network	EMCO	3816/2NM	1064	04-Mar-13	04-Mar-14
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-13	06-Mar-14
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-13	06-Mar-14
176	Electrostatic Discharge Simulator	Kikusui Electronics	KES4021A	SE002201	08-May-13	08-May-15
177	Power Sensor	Boonton	51100-9E	35669	06-Mar-13	06-Mar-14
178	Signal Generator	Agilent	N5183A	MY50141499	06-Mar-13	06-Mar-14
187	Dual Directional Coupler	Werlatone	C6148-10	95097	06-Mar-13	06-Mar-14

6 ANTENNA FACTORS.

Date of Calibration = 4/May/2009
Date Printed: Monday, May 04, 2009 2:41 PM
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.
CAL CERT #: 2009042912

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

Date of Calibration = April 3, 2009
Date Printed: Friday, April 03, 2009 1:51 PM
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
NOTES:
CAL CERT #: 2009033120

Freq (MHz)	Vertical ACF (dB)	Horizontal ACF (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

Date of Calibration = April 3, 2009
Date Printed: Friday, April 03, 2009 1:41 PM
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
NOTES:
CAL CERT #: 2009033116

Freq (MHz)	Vertical ACF (dB)	Horizontal 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

Date of Calibration = 2/Apr/2009
Date Printed: Thursday, April 02, 2009 3:33 PM
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.
CAL CERT #: 2009033119

Freq (MHz)	Vertical ACF (dB)	Horizontal 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