

ENGINEERING EVALUATION DATA

1. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	Asset	Cal Date	Cal Due
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	01/19/11	01/19/12
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	07/12/10	07/12/11
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01176	08/10/10	08/10/11
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01171	07/12/10	07/12/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	01/27/11	01/27/12
Antenna, Horn, 18 GHz	EMCO	3115	C00872	06/30/11	06/30/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	07/14/10	07/14/11

2. RADIATED EMISSION TEST RESULTS

2.1. TX RADIATED SPURIOUS EMISSION

LIMITS

FCC §15.231 (b)

IC A1.1.2

In addition to the provisions of § 15.205, the field strength of emissions from Intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental Frequency (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 ¹	125 to 375 ¹
174 - 260	3,750	375
260 - 470	3,750 to 12,500 ¹	375 to 1,250 ¹
Above 470	12,500	1,250

¹ Linear interpolation

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	⁽²⁾
13.36 - 13.41	322 - 335.4		

1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

2 Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 88	100 **	3
88 216	150 **	3
216 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 72 MHz, 76 88 MHz, 174 216 MHz or 470 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

RESULTS

No non-compliance noted:

HARMONICS AND TX SPURIOUS EMISSIONS ABOVE 1GHz

Project #: 11U13908

Date: 07/08/11

Test Engineer: Doug Anderson

Configuration: EUT Battery Powered / Z-Position

Mode: Continuous Tx

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.231

Hi Frequency Cables			HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz
3' cable 22807700	12' cable 22807600	20' cable 22807500			
3' cable 22807700	12' cable 22807600	20' cable 22807500			

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Ftr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.277	3.0	55.4	44.3	25.4	2.7	-37.9	0.0	0.0	45.6	34.5	75.89	55.89	-30.3	-21.4	V
1.917	3.0	54.6	44.7	27.5	3.4	-37.0	0.0	0.0	48.5	38.6	75.89	55.89	-27.4	-17.3	V
2.236	3.0	55.4	47.0	27.9	3.7	-36.5	0.0	0.0	50.5	42.1	74.00	54.00	-23.5	-11.9	V
2.875	3.0	53.2	43.4	29.3	4.2	-36.0	0.0	0.0	50.8	41.0	74.00	54.00	-23.2	-13.0	V
2.233	3.0	56.7	51.4	27.9	3.7	-36.6	0.0	0.0	51.8	46.5	74.00	54.00	-22.2	-7.5	H
2.873	3.0	52.9	42.9	29.3	4.2	-36.0	0.0	0.0	50.5	40.5	74.00	54.00	-23.5	-13.5	H
No Other Emissions Detected Above the Noise Floor															

Rev. 07.22.09

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

2.2. RX RADIATED SPURIOUS EMISSION

LIMITS

IC RSS-Gen Issue 2, section 7.2.3.2

All spurious emissions shall comply with the limits shown below:

Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dB μ V/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54
Note: The lower limit shall apply at the transition frequency.	

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to receive in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 5th harmonic is investigated with the transmitter set to the middle channel.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

RESULTS

No non-compliance noted:

RECEIVER SPURIOUS EMISSION (30MHz - 1GHz)

Manufacturer: Point Central										
Project: 11U13908										
Model: PC-R100										
Description: Rx Harmonic / Spurious Emissions										
Date: 07/08/11										
Range 1 30 - 1000MHz										
Test Freq. (MHz)	Meter Reading (dBuV)	Detector	Cable Loss [dB]	Pre-Amp Gain [dB]	Antenna Factor [dB]	dBuV/m	FCC 3 m Limit	Margin	Height [cm]	Polarity
31.1631	30.63	PK	0.6	-28.3	19.4	22.33	40	-17.67	251	Horz
32.52	30.6	PK	0.6	-28.3	18.8	21.7	40	-18.3	176	Horz
33.8769	33.13	PK	0.6	-28.3	18.1	23.53	40	-16.47	99	Horz
712.528	30.12	PK	2.8	-28.3	19.2	23.82	46	-22.18	251	Horz
764.6723	31.79	PK	2.8	-28.1	20.2	26.69	46	-19.31	99	Horz
Range 2 30 - 1000MHz										
Test Freq. (MHz)	Meter Reading (dBuV)	Detector	Cable Loss [dB]	Pre-Amp Gain [dB]	Antenna Factor [dB]	dBuV/m	FCC 3 m Limit	Margin	Height [cm]	Polarity
32.52	36.48	PK	0.6	-28.3	18.8	27.58	40	-12.42	176	Vert
32.9077	34.32	PK	0.6	-28.3	18.6	25.22	40	-14.78	176	Vert
34.4584	32.43	PK	0.6	-28.3	17.8	22.53	40	-17.47	251	Vert
308.749	32.09	PK	1.8	-27.3	13.6	20.19	46	-25.81	176	Vert
389.0008	31.62	PK	2.1	-27.8	14.8	20.72	46	-25.28	176	Vert
428.739	34.12	PK	2.1	-28.1	15.5	23.62	46	-22.38	99	Vert
PK - Peak detector										
QP - Quasi-Peak detector										
LnAv - Linear Average detector										
LgAv - Log Average detector										
Av - Average detector										
CAV - CISPR Average detector										
RMS - RMS detection										
CRMS - CISPR RMS detection										

RECEIVER SPURIOUS EMISSION ABOVE 1GHz

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Point Central
Project #: 11U13908
Date: 07/08/11
Test Engineer: Doug Anderson
Configuration: EUT Battery Powered / Z-Position
Mode: Continuous Rx

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC Class B

Hi Frequency Cables			HPF	Reject Filter	Peak Measurements RBW=VEW=1MHz Average Measurements RBW=1MHz ; VEW=10Hz
3' cable 22807700	12' cable 22807600	20' cable 22807500			
3' cable 22807700	12' cable 22807600	20' cable 22807500			

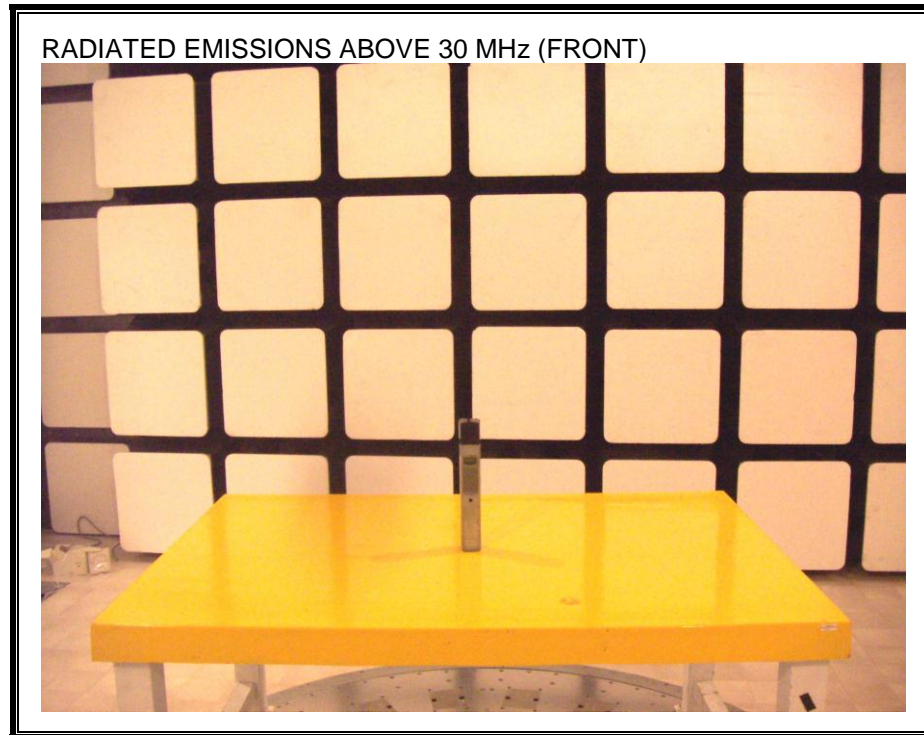
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fldr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.222	3.0	46.3	32.0	25.2	2.6	-38.0	0.0	0.0	36.2	21.8	74	54	-37.8	-32.2	V / Noise Floor
1.128	3.0	46.1	32.4	24.9	2.5	-38.1	0.0	0.0	35.5	21.7	74	54	-38.5	-32.3	H / Noise Floor
No Emissions Above the Noise Floor Were Detected															

Rev. 07.22.09

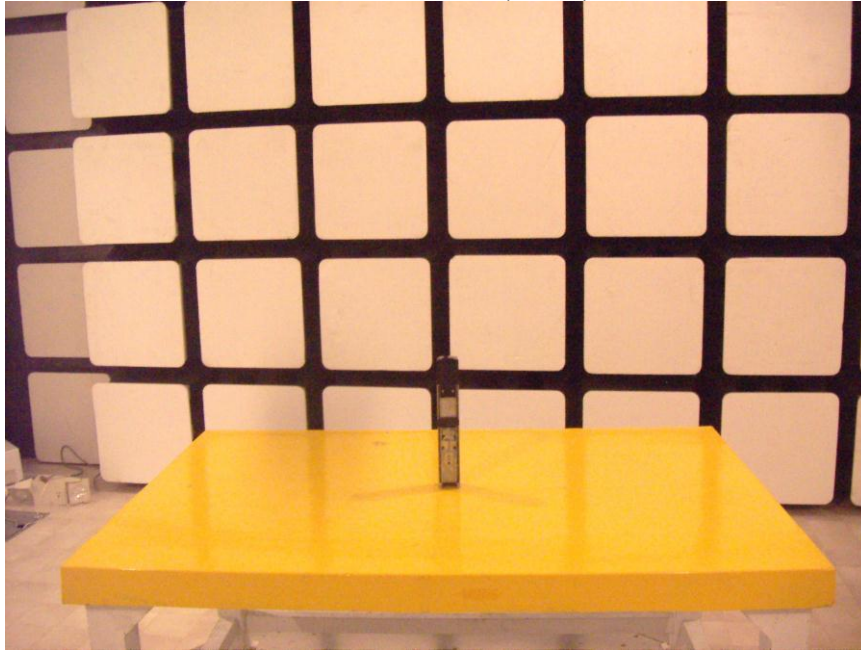
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

3. SETUP PHOTOS

RADIATED EMISSION ABOVE 30 MHz



RADIATED EMISSIONS ABOVE 30 MHz (BACK)



END OF REPORT