

Atlas Compliance & Engineering, Inc.

FCC Test Report

FCC CFR 47 Part 15.207, 15.209 and 15.249 COMPLIANCE

• • • • •
PhaseSpace
1933 Davis Street Suite 294
San Leandro, CA 94577 USA

Product:
Motion Capture System RF Transmitter
Model:
BaseStation

FCC ID T2QIMPULSE

IC: 6408A-IMPULSE

Test Report Number: 0612PHSimpulse_249

Date of Report: March 21, 2006

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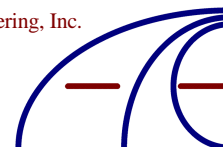


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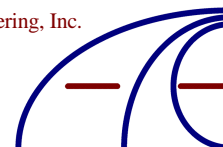
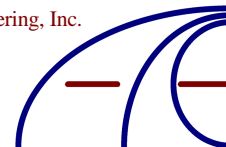


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General Information

Test Report Number: 0612PHSimpulse_249

Date Product Tested: March 19-20, 2006

Date of Report: March 21, 2006

Applicant: PhaseSpace
1933 Davis Street Suite 294
San Leandro, CA 94577 USA

Contact Person: Kan Anant

Equipment Tested: Motion Capture System RF Transmitter

Trade Name: PhaseSpace Impulse

Model: BaseStation

Purpose Of Test: To demonstrate the compliance of the RF Transmitter, BaseStation, with the requirements of FCC CFR 47 Part 15 Rules and Regulations to the limits of Subpart C 15.207, 15.209 and 15.249 using the procedure stated in ANSIC63.4-2003. Also including the requirements for Industry Canada RSS 210.

Frequency Range Investigated: 150 kHz to 24 GHz

FCC ID: T2QIMPULSE

IC: 6408A-IMPULSE

Test Site Locations: Field Strength Measurement Facility:
Atlas Compliance & Engineering, Inc.
726 Hidden Valley Road
Royal Oaks, California 95076
Conducted Interference Measurement Facility:
Atlas Compliance & Engineering, Inc.
1792 Little Orchard Street
San Jose, California 95125

FCC Site Registration Number: 90452

Industry Canada File Number: IC 4929

Test Personnel: Bruce Smith
EMC Engineer



Test Equipment

The following list contains the test equipment that was utilized in making the measurements in this report.

Description	Model	Serial	Manufacturer	Calibration Due
BiLog Antenna _ CBL6112B	2783	Chase Electronics Ltd.	3/31/05	3/31/07
Active Loop Antenna _ 6502	9108-2669	EMCO	8/18/05	8/18/07
Double Ridge Guide Horn Antenna _ 3115	9003-3340	EMCO	8/18/05	8/18/07
Standard Gain Horn Antenna _ 3160-09	00057143	EMCO	11/22/05	11/22/07
LISN _ 3825/2	9007-1683	EMCO	3/16/05	3/16/07
LISN _ 4825/2	9808-1088	EMCO	10/17/05	10/17/07
Pre amp 9kHz-2GHz _ CPA9231A	3259	Schaffner	11/26/03	11/26/05
Pre amp 9kHz-2GHz _ CPA9231A	3323	Schaffner	10/12/05	10/12/07
RF Preselector 20Hz-2GHz _ 85685A	2926A00965	HP	8/30/05	8/30/07
Pre amp 1Ghz-26.5GHz _ 8449B	3008A00910	HP	8/29/05	8/29/07
Spectrum Analyzer 100Hz-22GHz _ 8566B	2542A13058 (IF) 2637A03426 (RF)	HP	8/29/05	8/29/07
Quasi-Peak Adapter _ 85650A	2521A00716	HP	8/30/05	8/30/07
EMI Test Receiver 9 kHz - 2500 MHz _ ESPC	DE15934	Rohde & Schwarz	2/6/04	2/6/06
EMI Test Receiver 9 kHz - 2500 MHz _ ESPC	DE14459	Rohde & Schwarz	1/12/04	1/12/06
OATS – LA290Cable 75 ft.	0001	Semflex	1/27/06	11/27/08



Test Configuration

Customer:	PhaseSpace
Test Date:	March 19-20, 2006
Specification:	FCC CRF 47 Part 15.249 Limits, ANSI C63.4-1992 Methods, Industry Canada RSS 210

EUT Description / Note:

The EUT, BaseStation, a Motion Capture System RF Transmitter operating in the 2.4 to 2.4835 GHz Band, was in a continuous transmitting mode. The EUT is powered from the host system and conducted emissions testing were performed on the HUB/Server while the transmitter continuously operated. There was no change in the DC voltage of the EUT while the AC voltage was varied +/- 15% from the nominal voltage of 117 VAC. EUT frequency of operation is within the 2.4 to 2.4835 GHz band, the lowest transmitter frequency is 2.403 GHz and the highest transmitter frequency is 2.482 GHz. The lowest frequency generated or used in the device is 16 MHz. Scans in the frequency range of 16 MHz to 30 MHz were made and no emissions from the EUT were observed.

EUT Support Program

The software used to test the transmitter in normal operating mode placed the transmitter in a pseudo-random hopping mode with FSK modulation. For 20dB bandwidth measurements the transmitter was not hopping and set to the lowest, middle, and highest operating frequency with FSK modulation. For band edge measurements the transmitter was in normal operating mode.

EUT Modifications for Compliance

There were no modifications performed on the EUT. The test results state the emission levels of the EUT in the condition as it was received on March 17, 2006.



EUT Support Devices

Table 1 - Support Equipment Used For Test

Model:	Description:	S/N	FCC ID#
E551	Dell Monitor	CN-095WUP-46633-31A-0G28	DoC
SK-8110	Dell Keyboard	CN-07N242-38842-315-4Q04	DoC
M-SBF90	Logitech Mouse	HCA50204213	DoC
Impulse HUB/Server	Shuttle XPC Barebone system SN25P with the PhaseSpace HUB and operating system installed	SNp0000602D01682	DoC
Impulse Cameras	PhaseSpace Motion Capture system component	NA	
Impulse LED Driver	PhaseSpace Motion Capture system component	NA	

I/O Ports and Cables

Table 2 - EUT Port Termination's

I/O Port	Cable Type	Length	Connector	Termination
HUB	Shielded, CAT 5	3 + 10 M	RJ45	HUB/Server

Table 3 - Host Port Termination's

I/O Port	Cable Type	Length	Connector	Termination
Video	Shielded, Braid, 2 ferrite cores	1.8 M	15 P 'HD'	Monitor
Keyboard	Shielded, Braid	1.8 M	6 P Mini Din	Keyboard
Mouse	Non-Shielded	1.8 M	4 P Mini Din	Mouse
Ethernet	CAT 5	3 M	RJ45	Ethernet Hub
Power	Non-Shielded	2 M	IEC	Power Mains
HUB 1	Shielded, CAT 5	1.8 M	RJ45	Camera Previous/HUB
HUB 2	Shielded, CAT 5	1.8 M	RJ45	Camera Previous/HUB
HUB 3	Shielded, CAT 5	1.8 M	RJ45	Camera Previous/HUB
HUB 4	Shielded, CAT 5	3 M	RJ45	Camera Previous/HUB
HUB 5	Shielded, CAT 5	3 M	RJ45	BaseStation
Camera Next	Shielded, CAT 5	1.8 M	RJ45	Camera Previous/HUB
LED Driver	Twin lead	0.5 M	Pin header	8 LED's

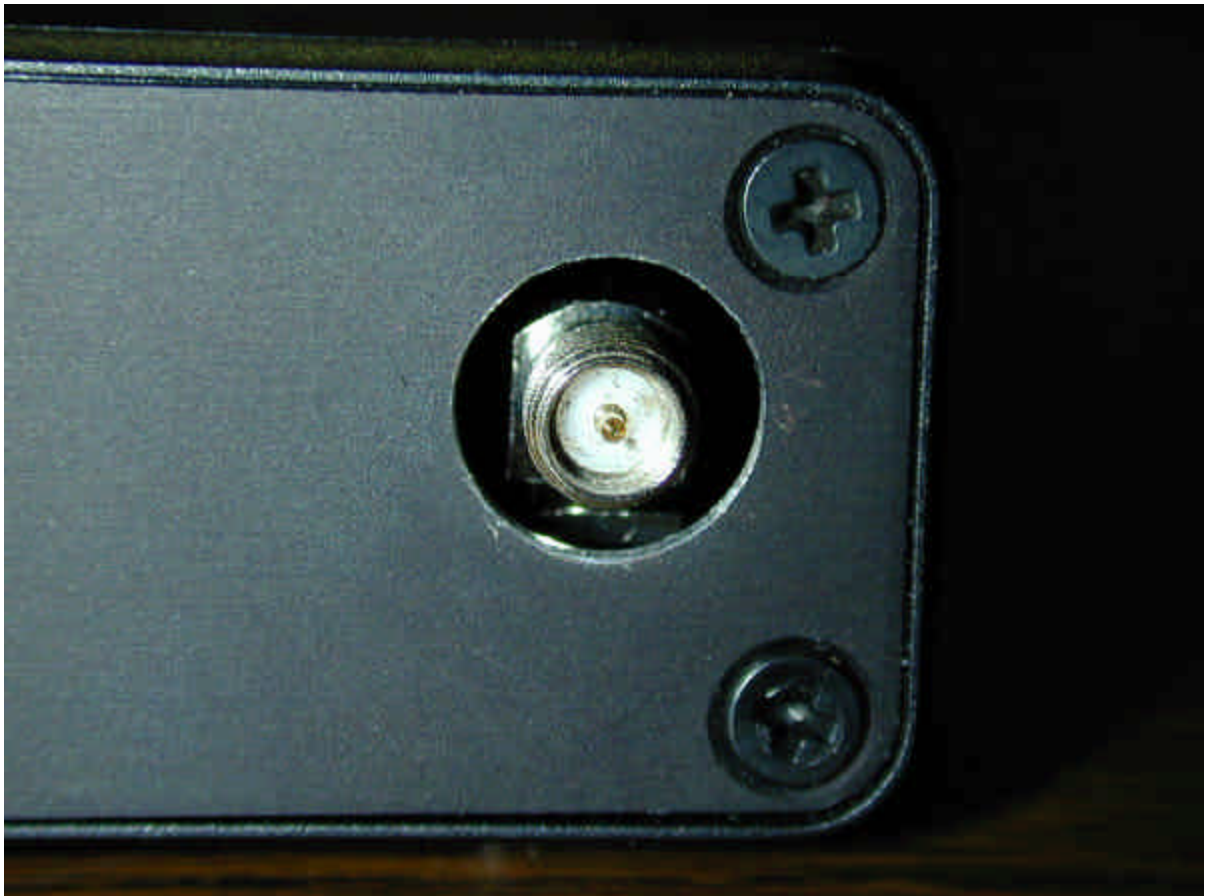
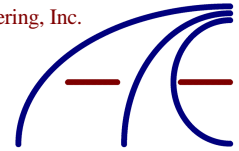


Equipment Under Test

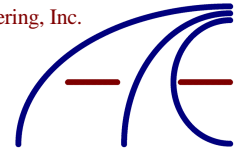
The photographs below show the condition of the EUT for test.

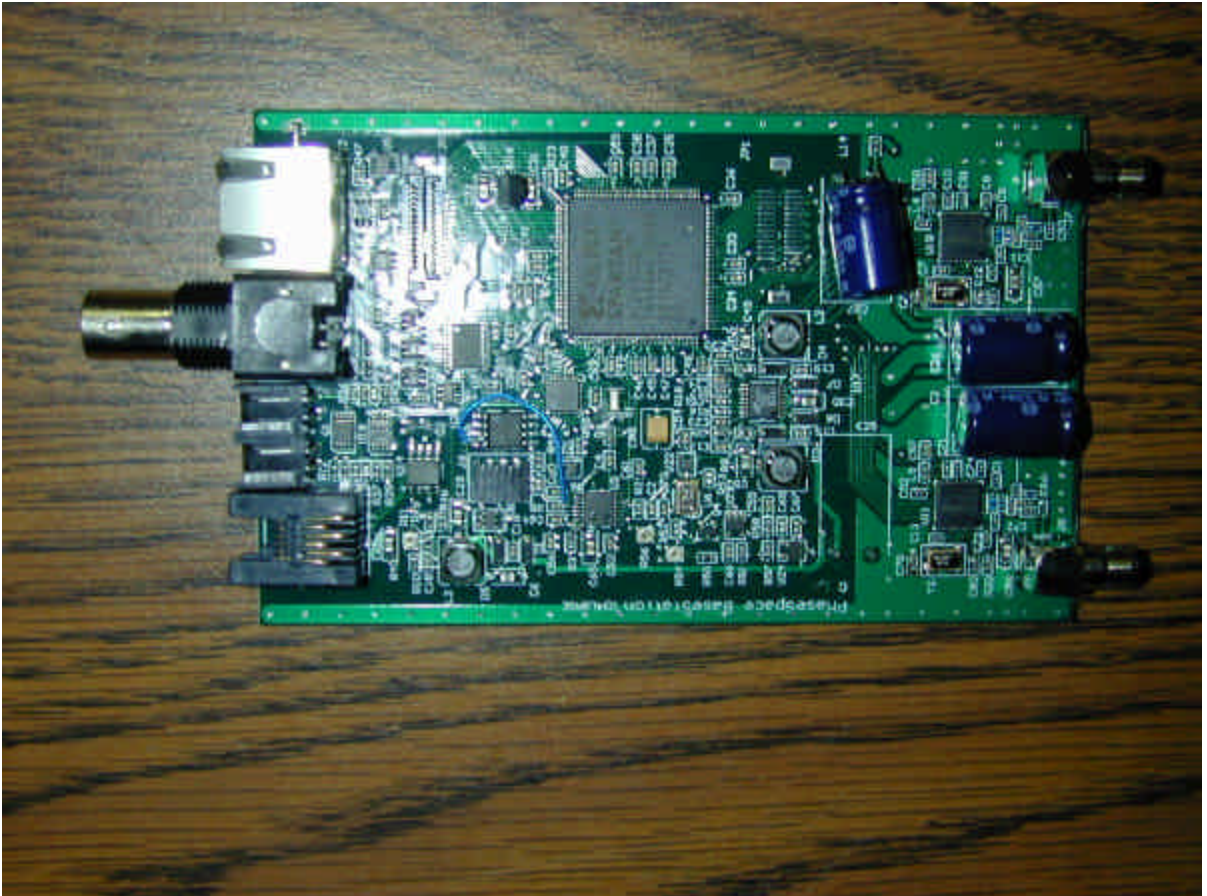
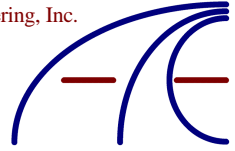


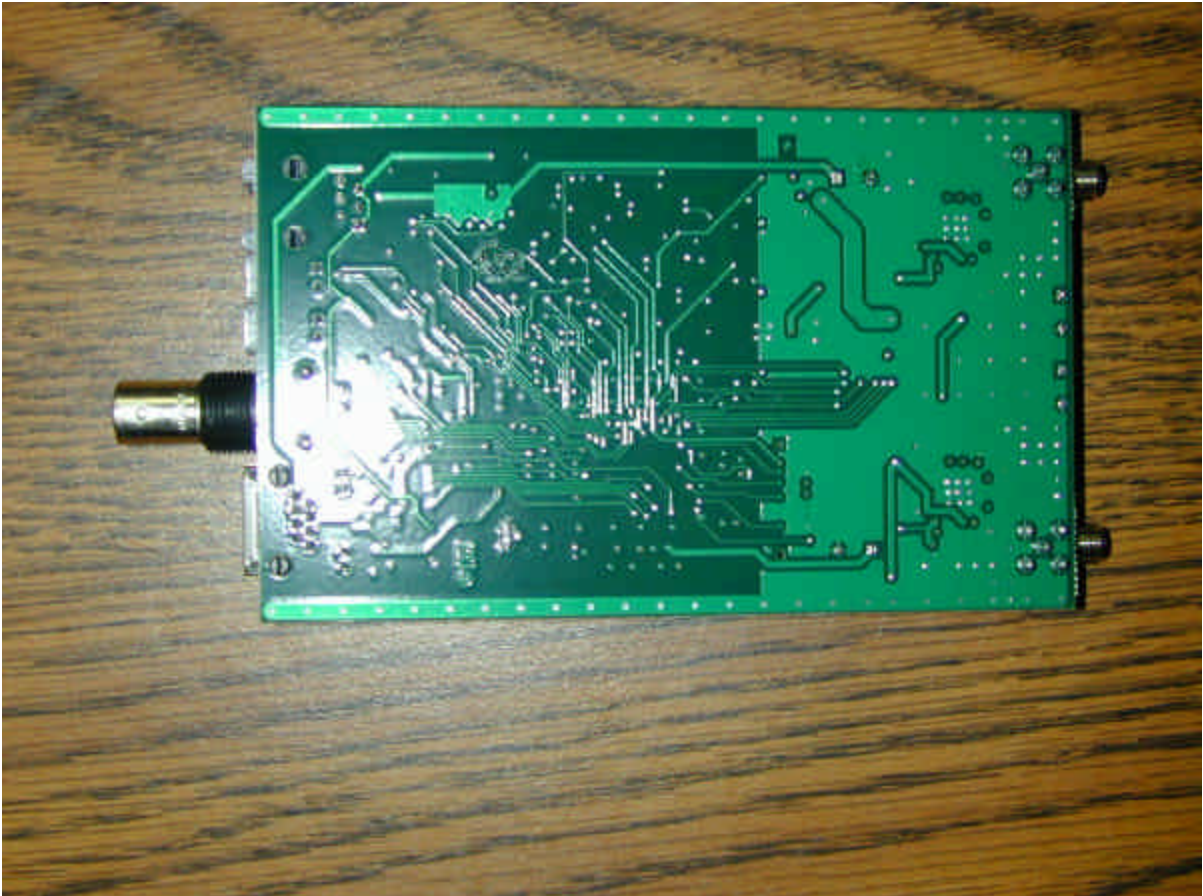
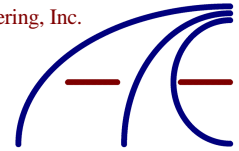


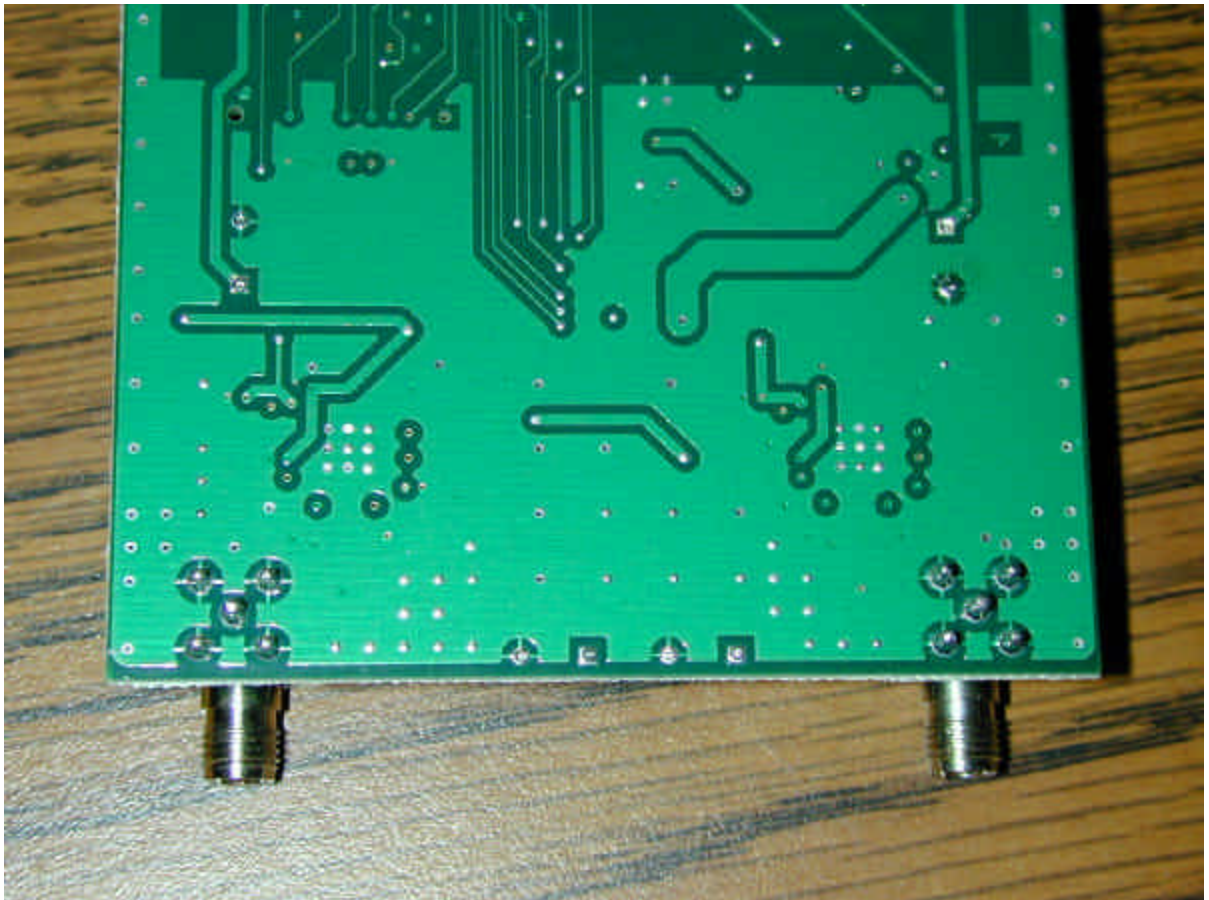


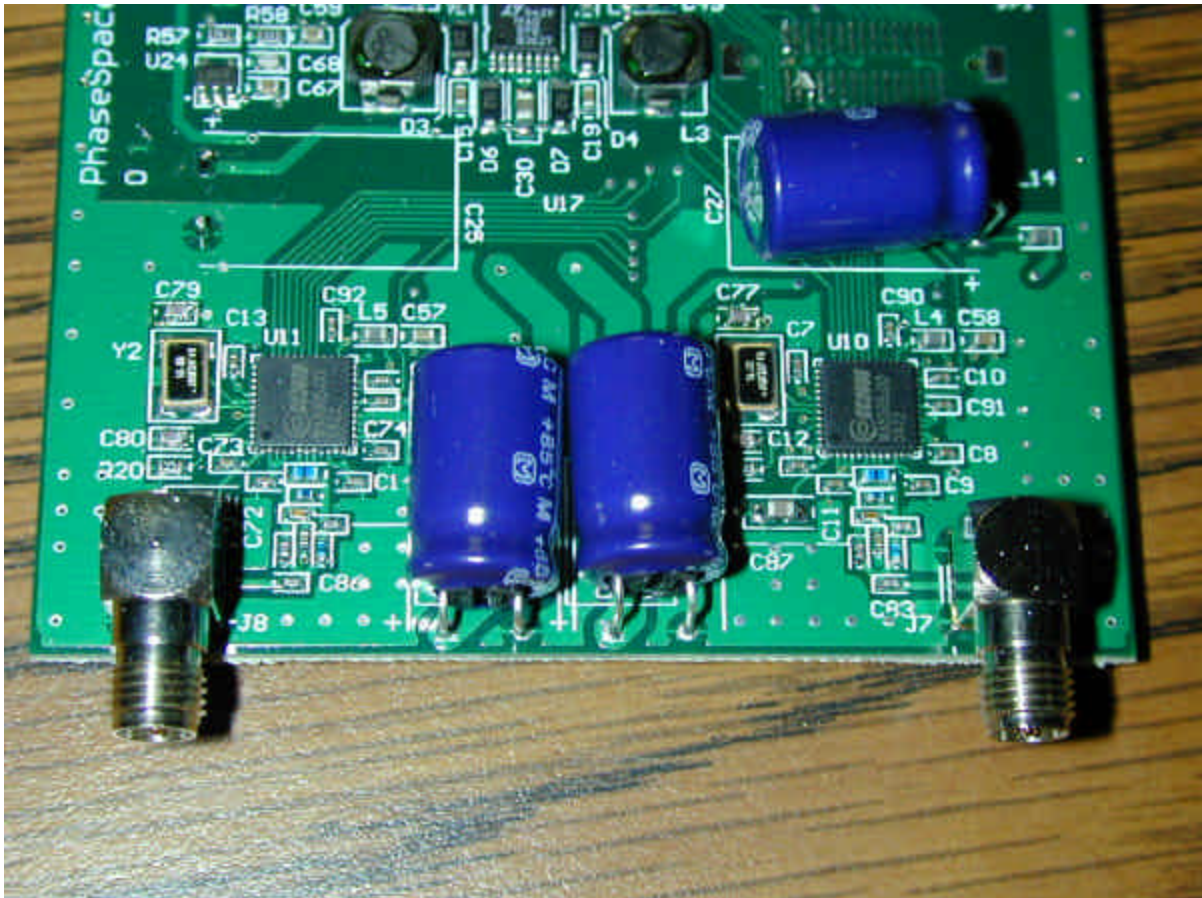










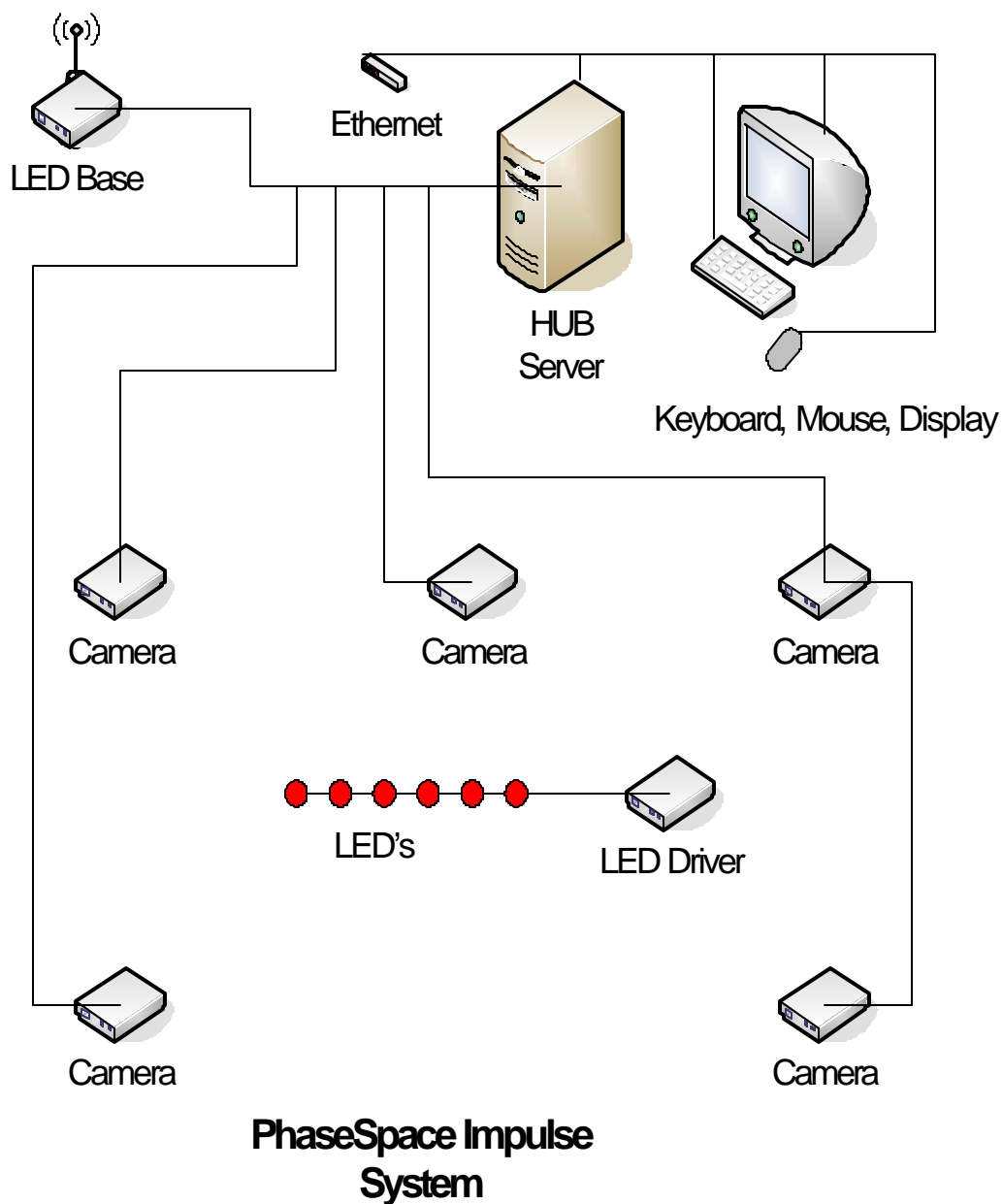


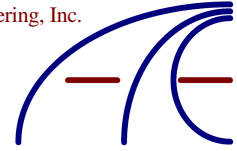


Equipment Block Diagram

Following is the block diagram of the test setup. Refer to TEST CONFIGURATION pages for port connections and information.

Figure 1 - Test Setup Diagram

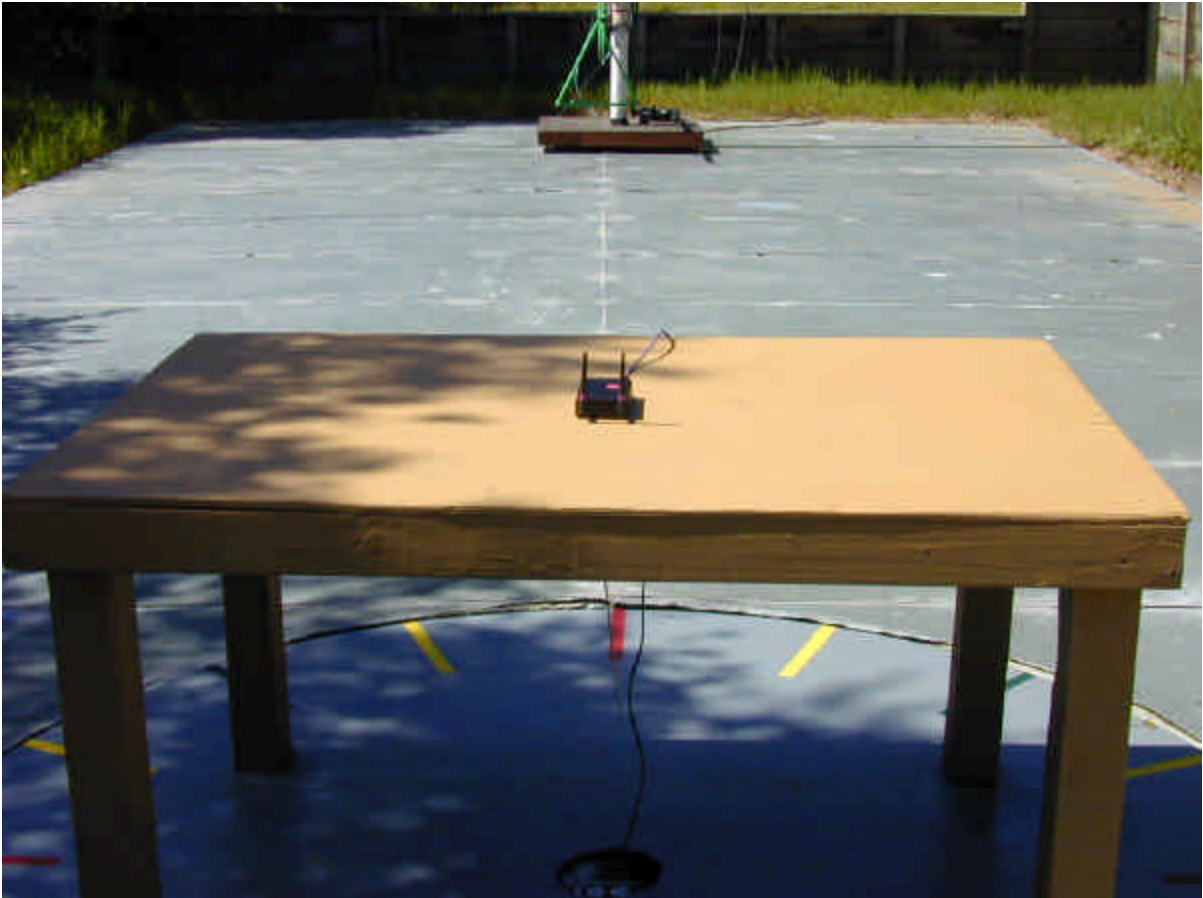


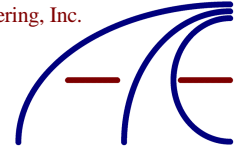


Test Setup (Radiated Emissions)

The photographs below show the test setup for radiated emission testing at 10-meter distance with BiLog antenna.

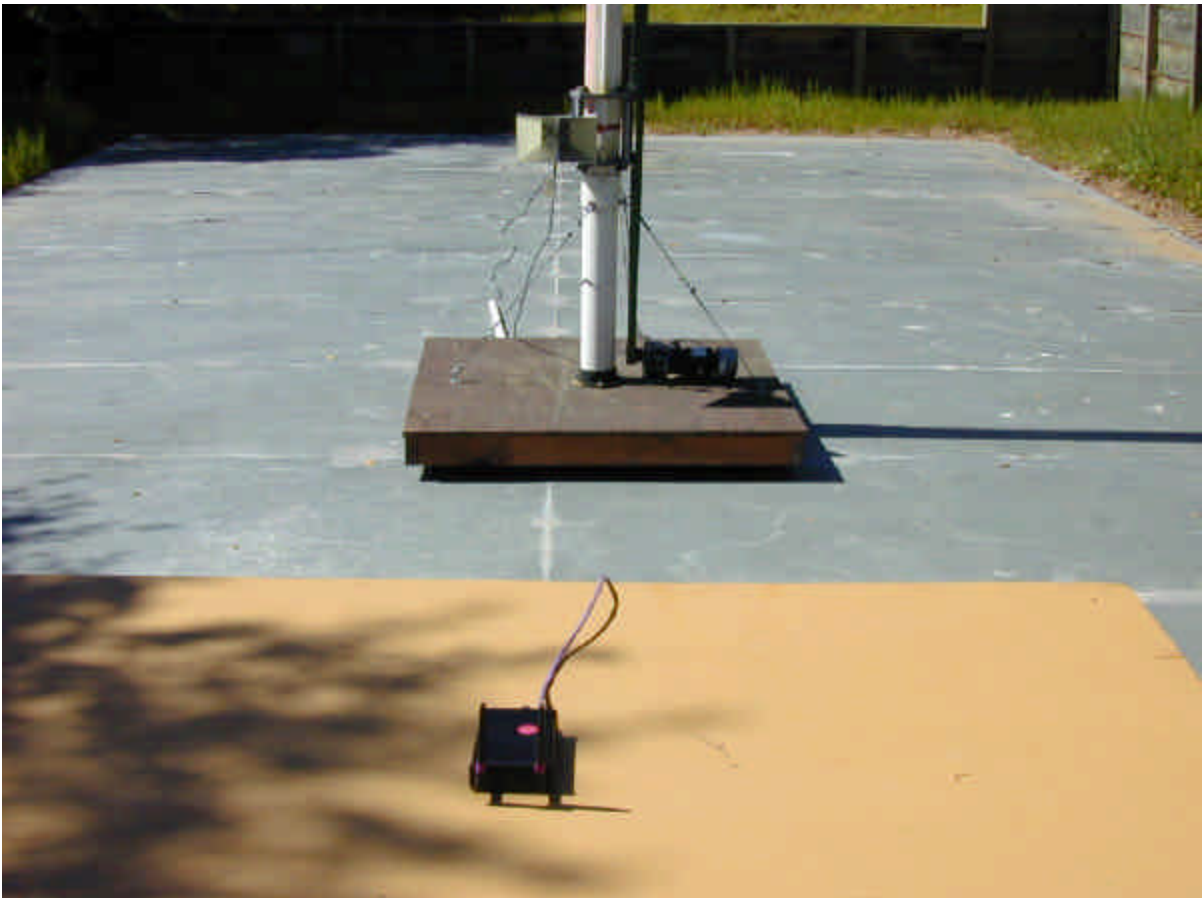


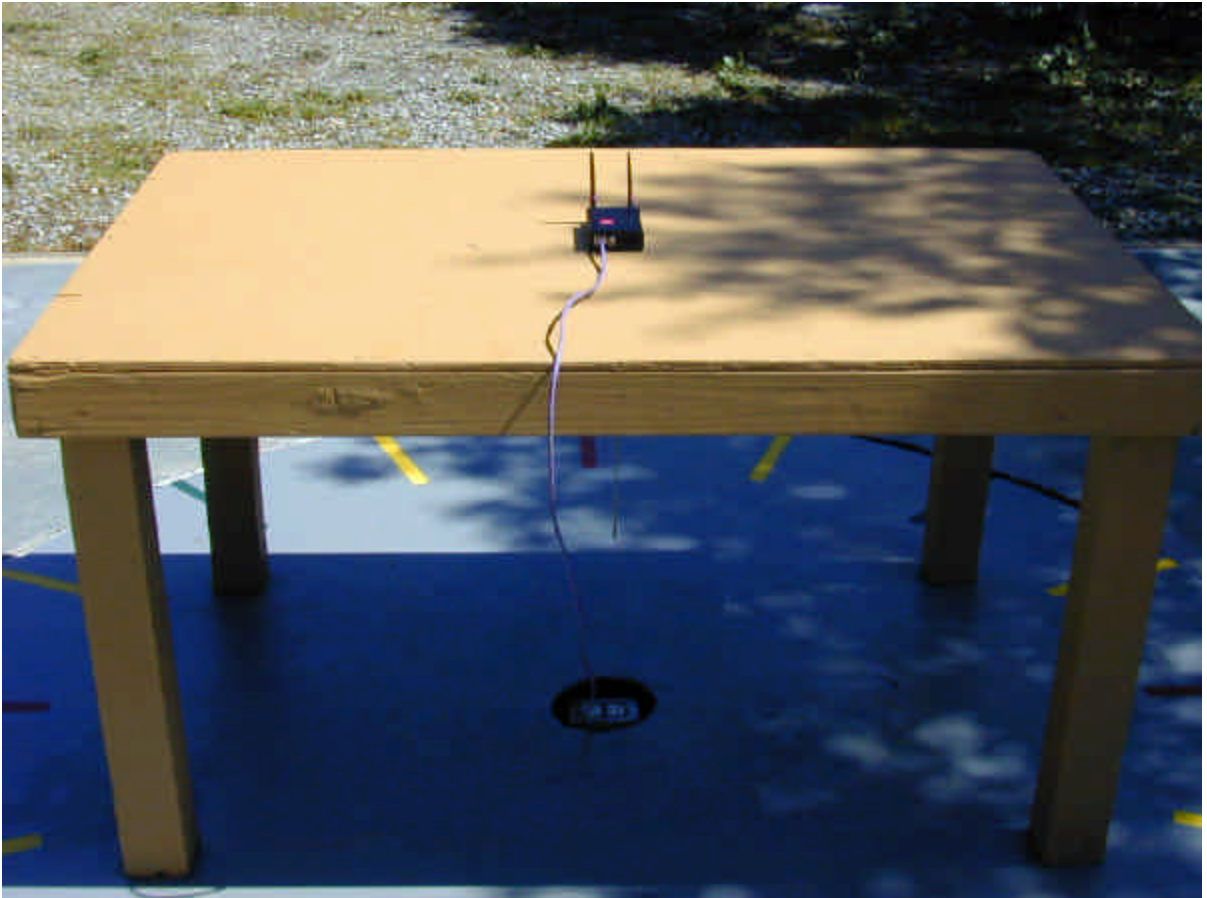




Test Setup (Radiated Emissions)

The photographs below show the test setup for radiated emission testing at 3-meter distance with Horn antenna.

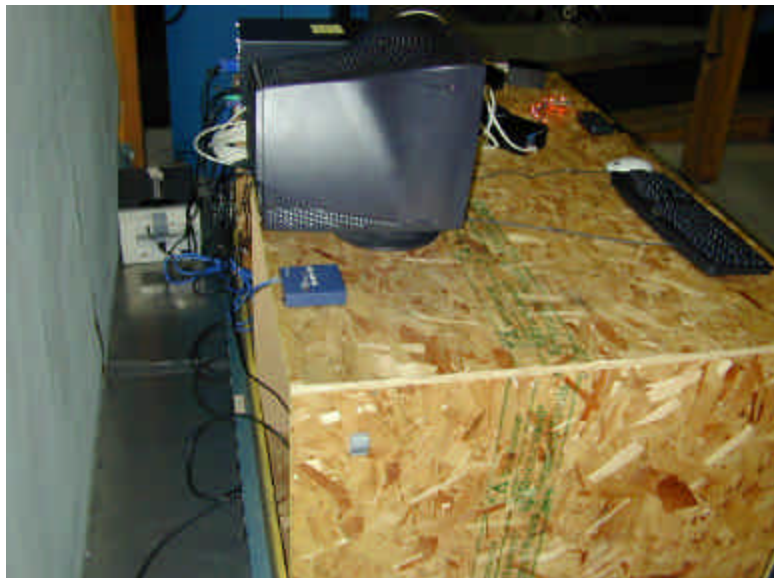






Test Setup (Conducted Emissions)

The photographs below show worst case setup for line conducted testing.





Test Methods for Emissions

The test procedure stated in ANSI C63.4-2003 was used to collect the test data. The radiated emission data of the EUT was taken with the Rohde & Schwarz EMI Test Receiver or HP 8566B. Incorporating the application of correction factors programmed into the Test Receiver and verified for distance, antenna, cable loss, and amplifier gain, the data was reduced as shown in the Sample Calculations. These correction factors are available upon request. The corrected data was then compared to the emission limits to determine compliance.

During radiated emission testing, the EUT was placed on a nonconductive rotating table 0.8 meter above the conductive grid. The nonconductive table dimensions were 1 meter deep by 1.5 meters wide at 0.8 meter high. The EUT is centered on the tabletop and the measurement antenna was placed at the test distance from the EUT as noted in the test data.

For radiated emissions testing, scans in the frequency range of 16 MHz to 24000 MHz were made. Each frequency between 9 kHz and 150 kHz was measured at a bandwidth of 200 Hz, between 150 kHz and 30 MHz was measured at a bandwidth of 10 kHz, between 30 MHz and 1000 MHz was measured at a bandwidth of 120 kHz and between 1000 MHz and above was measured at a bandwidth of 1 MHz. Measurements were made employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz, and above 1GHz which employed an average detector. All readings within 10 dB of the limits were recorded, and those emissions were then measured using the appropriate detector and bandwidth for a 2-second measurement time.

Measurements were made at a distance of 1, 3 and 10 meters.

When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

When average radiated emission measurements are specified, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

Conducted Emission Testing

For the conducted emissions testing, the EMCO LISN, Model No. 3825/2, was used for the EUT and the EMCO LISN, Model No. 4825/2, was used for the support equipment. During conducted emission testing the EUT was located on a wooden test bench measuring 0.8 meter high, 1 meter deep, and 1.5 meters in width. The vertical conducting surface was 0.4 meter from the back of the test bench. The LISNs were placed on the ground plane of the test area in accordance with ANSI C63.4-2003.



The metal plane used for conducted emission testing was grounded to the earth by a heavy gage braided wire attached to the plane. All other objects were kept a minimum of 1 meter away from the EUT during the conducted test.

For conducted emissions testing a scan of the frequency band 150 kHz to 30 MHz was made stepping every 5 kHz. Each frequency was measured at a bandwidth of 10 kHz for 20 msec. Due to the narrow specification of a 6 dB drop, the 10 kHz bandwidth meets the requirements of CISPR 16, band B (150 kHz to 30 MHz) and VDE 0876 as well as of various military standards that require tolerances of 10% for a 10 kHz measurement bandwidth. All readings within 25 dB of the limits were recorded, and those emissions were then measured using the CISPR quasi-peak detector at a bandwidth of 10 kHz for a 2 second measurement time. All emissions within 6 dB of the limit were examined with additional measurements to ensure compliance with the FCC 15.207 limits.

Temperature and Humidity

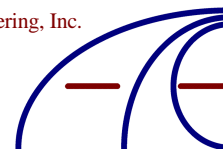
The ambient temperature of the actual EUT was within the range of 10° to 40° C (50° to 104° F) unless the particular equipment requirements specify testing over a different temperature range. The humidity levels were within the range of 10% to 90% relative humidity unless the EUT operating requirements call for a different level.

Sample Calculations

An example of how the EMI Test Receiver reading is converted using correction factors is given for the emissions recorded. These correction factors are programmed into the EMI Test Receiver and verified. For radiated emissions in dBμV/m, the EMI Test Receiver reading in dBμV is corrected by using the following formula:

89.30	Meter Reading (dBμV/m)
33.78	- Pre amp Gain (dB)
5.90	+ Cable Loss (dB)
28.44	+ Antenna Factor (dB)
89.86	= Corrected Reading (dBμV/m)

This reading is then compared to the applicable specification limits and the difference will determine compliance.



FCC Part 15 Subpart C 15.207 and 15.209 Limits

Table 4 - Conducted Limits

Frequency MHz	Limit Quasi-Peak dB mV	Limit Average dB mV
0.15-0.50	66-56	56-46
0.50-5	56	46
5-30	60	50

NOTE:

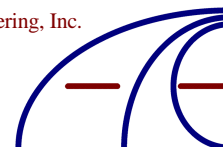
1. The lower limit shall apply at the transition frequencies.
2. Both Quasi-Peak and Average limits for power line conducted testing must be met.
3. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

Table 5 - Radiated Emission Limits, General Requirements

Frequency MHz	Field Strength mV/m	Measurement Distance Meters
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closest point of any part of the device or system.
3. The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission.
4. The emission limits shown are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.



Report of Measurements 15.209 Radiated Data

The following table reports the results of the radiated measurements for the Motion Capture System RF Transmitter, BaseStation.

Table 6 - Six Highest Radiated Emission Levels

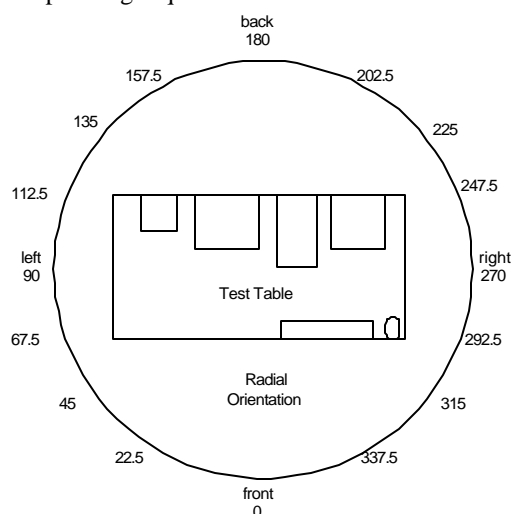
Frequency MHz	QP Level dBμV/m	QP Limit dBμV/m	Margin dB	Azimuth, Height	Antenna, Polarization
576.0	31.54	37.00	5.46	202, 1.5	BiLog, H
448.0	29.74	37.00	7.26	68, 2	BiLog, H
192.0	22.08	30.00	7.92	270, 4	BiLog, H
540.0	28.62	37.00	8.38	315, 2	BiLog, H
420.0	28.57	37.00	8.43	90, 2	BiLog, H
192.0	21.33	30.00	8.67	68, 1	BiLog, V

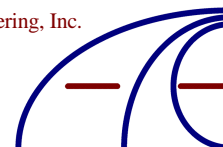
Test Method: ANSI C63.4-2003
 Spec Limit: 15.209 at 10 meter distance

Note: Azimuth in degrees
 Height in meters
 V = vertical
 H = horizontal

COMMENTS: There was no change in the DC voltage of the EUT while the AC voltage was varied +/- 15% from the nominal voltage of 117 VAC. System continuously running. During radiated measurements between 16 MHz and 30 MHz no emissions from the EUT were observed. Measurements above 1000 MHz are peak readings. Ambient temperature 61°F and relative humidity of 45%.

The ambient temperature of the actual EUT was within the range of 10° to 40° C (50° to 104° F) unless the particular equipment requirements specify testing over a different temperature range. The humidity levels were within the range of 10% to 90% relative humidity unless the EUT operating requirements call for a different level.





Report of Measurements 15.207 Conducted Data

The following table reports the results of the conducted measurements for the Motion Capture System RF Transmitter, BaseStation.

Table 7 - Six Highest Conducted Emission Levels

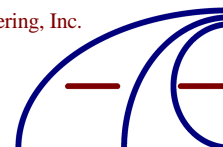
Frequency MHz	Level dB μ V	Detector	Limit dB μ V	Margin dB	Phase	PE Termination
0.53	31.45	AV	46.00	14.55	N	gnd
20.79	34.64	AV	50.00	15.36	N	gnd
0.73	30.40	AV	46.00	15.60	L1	gnd
0.53	29.58	AV	46.00	16.42	L1	gnd
21.45	33.14	AV	50.00	16.86	L1	gnd
1.39	28.64	AV	46.00	17.36	N	gnd

Test Method: ANSI C63.4-2003
 Spec Limit: 15.207

Note: L1 = Line side
 N = Neutral side
 QP = Quasi-Peak
 AV = Average

COMMENTS: Conducted emissions testing on the host system while the transmitter was continuously running, power source 115 VAC, 60 Hz. Ambient temperature 64°F and relative humidity of 36%.

The ambient temperature of the actual EUT was within the range of 10° to 40° C (50° to 104° F) unless the particular equipment requirements specify testing over a different temperature range. The humidity levels were within the range of 10% to 90% relative humidity unless the EUT operating requirements call for a different level.



Radiated Data for 15.209 at 10 Meters

Company - PhaseSpace

Product - Motion Capture System RF Transmitter

Model - BaseStation

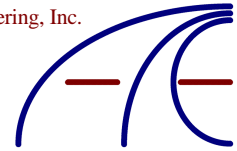
Pre-Scan Settings:

Start Freq.	Stop Freq.	Step	IF BW	Detector	Scan-Time	Atten.
30MHz	2000MHz	50kHz	120kHz	PK	10msec	0dB

Final Measurement: QP detector at 2 second measurement time. Measurements above 1000MHz are peak readings.

Table 8 - Radiated Data

Frequency MHz	QP Level dBμV/m	QP Limit dBμV/m	Margin dB	Azimuth, Height	Antenna, Polarization
180.0	18.12	30.00	11.88	90, 4	BiLog, H
192.0	22.08	30.00	7.92	270, 4	BiLog, H
420.0	28.57	37.00	8.43	90, 2	BiLog, H
448.0	29.74	37.00	7.26	68, 2	BiLog, H
540.0	28.62	37.00	8.38	315, 2	BiLog, H
576.0	31.54	37.00	5.46	202, 1.5	BiLog, H
660.0	22.44	37.00	14.56	135, 1	BiLog, H
704.0	24.02	37.00	12.98	248, 1	BiLog, H
780.0	18.36	37.00	18.64	225, 1	BiLog, H
180.0	21.01	30.00	8.99	90, 1	BiLog, V
192.0	21.33	30.00	8.67	68, 1	BiLog, V
540.0	23.68	37.00	13.32	315, 1	BiLog, V
576.0	27.49	37.00	9.51	0, 1	BiLog, V
660.0	19.01	37.00	17.99	135, 1	BiLog, V
704.0	23.52	37.00	13.48	68, 1	BiLog, V
780.0	18.36	37.00	18.64	225, 1	BiLog, V



Conducted Data for 15.207 Line

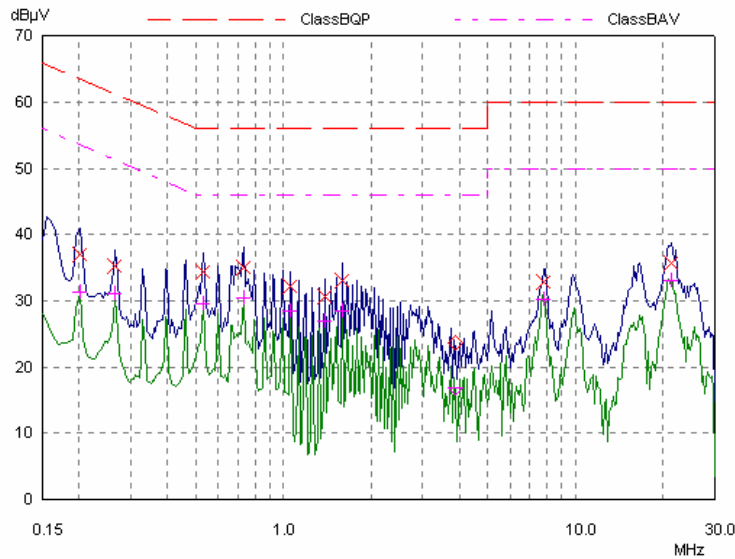


Figure 2 - Line Scan

Pre-Scan Settings:

Start Freq.	Stop Freq.	Step	IF BW	Detector	Scan-Time	Atten.
0.15MHz	30MHz	5kHz	10kHz	PK/AV	20msec	0dB

Blue Trace: Peak Measurement

Green Trace: Average Measurement

Final Measurement: x = QP / + = AV at 2 second measurement time.

Table 9 - Line Scan Data

Freq. MHz	Level dBμV	Detector	Limit dBμV	Margin dB	Phase	PE
0.2	36.94	QP	63.61	26.67	L1	gnd
0.265	35.20	QP	61.27	26.07	L1	gnd
0.53	34.31	QP	56.00	21.69	L1	gnd
0.73	35.12	QP	56.00	20.88	L1	gnd
1.06	32.22	QP	56.00	23.78	L1	gnd
1.39	30.62	QP	56.00	25.38	L1	gnd
1.59	33.02	QP	56.00	22.98	L1	gnd
7.845	32.95	QP	60.00	27.05	L1	gnd
21.45	35.65	QP	60.00	24.35	L1	gnd
0.2	31.28	AV	53.61	22.33	L1	gnd
0.265	31.22	AV	51.27	20.05	L1	gnd
0.53	29.58	AV	46.00	16.42	L1	gnd
0.73	30.40	AV	46.00	15.60	L1	gnd
1.06	28.57	AV	46.00	17.43	L1	gnd
1.39	26.96	AV	46.00	19.04	L1	gnd
1.59	28.47	AV	46.00	17.53	L1	gnd
7.845	30.16	AV	50.00	19.84	L1	gnd
21.45	33.14	AV	50.00	16.86	L1	gnd



Conducted Data for 15.207 Neutral

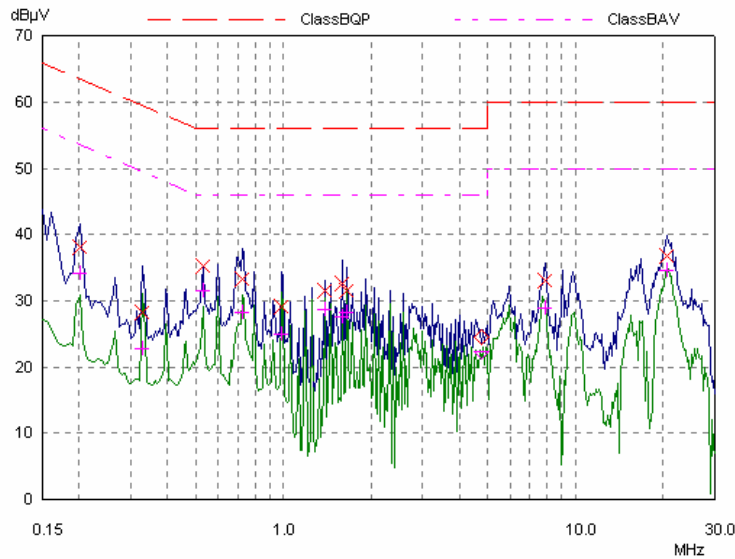


Figure 3 - Neutral Scan

Pre-Scan Settings:

Start Freq.	Stop Freq.	Step	IF BW	Detector	Scan-Time	Atten.
0.15MHz	30MHz	5kHz	10kHz	PK/AV	20msec	0dB

Blue Trace: Peak Measurement

Green Trace: Average Measurement

Final Measurement: x = QP / + = AV at 2 second measurement time.

Table 10 - Neutral Scan Data

Freq. MHz	Level dBμV	Detector	Limit dBμV	Margin dB	Phase	PE
0.2	38.23	QP	63.61	25.38	N	gnd
0.33	28.32	QP	59.45	31.13	N	gnd
0.53	35.20	QP	56.00	20.80	N	gnd
0.725	33.32	QP	56.00	22.68	N	gnd
0.99	29.16	QP	56.00	26.84	N	gnd
1.39	31.45	QP	56.00	24.55	N	gnd
1.59	32.59	QP	56.00	23.41	N	gnd
1.655	31.44	QP	56.00	24.56	N	gnd
7.875	33.15	QP	60.00	26.85	N	gnd
20.79	36.72	QP	60.00	23.28	N	gnd
0.2	34.11	AV	53.61	19.50	N	gnd
0.33	22.80	AV	49.45	26.65	N	gnd
0.53	31.45	AV	46.00	14.55	N	gnd
0.725	28.18	AV	46.00	17.82	N	gnd
0.99	24.99	AV	46.00	21.01	N	gnd
1.39	28.64	AV	46.00	17.36	N	gnd
1.59	27.60	AV	46.00	18.40	N	gnd
1.655	28.23	AV	46.00	17.77	N	gnd
7.875	28.82	AV	50.00	21.18	N	gnd
20.79	34.64	AV	50.00	15.36	N	gnd



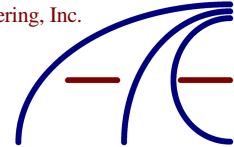
FCC Part 15 Subpart C 15.249 Limits

*Table 11 - Radiated Emission Limits,
Operation within the bands 902 – 928 MHz, 2400 – 2483.5 MHz,
5725 – 5875 MHz, and 24.0 – 24.25 GHz.*

Frequency MHz	Field Strength of fundamental millivolts/meter	Field Strength of harmonics microvolts/meter
902 – 928	50	500
2400 – 2483.5	50	500
5725 – 5875	50	500
24000 – 24250	250	2500

NOTE:

1. Field strength limits are specified at a distance of 3 meters.
2. Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in 15.209, whichever is the lesser attenuation.
3. As shown in 15.35(b), for frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.



Report of Measurements 15.249 Data

Radiated emissions measurements were performed from 16 MHz to 30 MHz at 3-meter distance. The loop antenna was placed at 1-meter height and was rotated about its vertical axis. The EUT was also rotated 360 degrees in front of the antenna. No emissions were observed from the EUT in this frequency range.

Radiated emissions measurements were performed in the frequency range of 30 MHz to 2 GHz at 10-meter distance. The Bilog antenna was searched from 1 to 4 meters in height in both horizontal and vertical orientation. The EUT was also rotated 360 degrees in front of the antenna. Data in this frequency range is stated in tables 6 and 8.

Measurements were performed in the frequency range of 2 GHz to 24 GHz at 3-meter and 1-meter distance. The Horn antenna was searched from 1 to 4 meters in height in both horizontal and vertical orientation. The EUT was also rotated 360 degrees in front of the antenna. Measurements were made at the lowest, middle and highest operating frequency to determine the worst case level. The fundamental frequency of 2.403 GHz was found to be the highest and was then measured in horizontal and vertical orientation to determine the configuration that produced the maximum emission level. The rest of the frequencies were searched to find any level of emission. The antenna was moved to 1 meter to try and identify any emissions from the EUT. No harmonics of the transmitter was observed. The second harmonic frequency and above of the transmitter were measured and the levels recorded are the baseline of the noise floor. Data in this frequency range is stated in table 12.

The band edge measurements were made at 2.4 GHz and 2.4835 GHz with the transmitter operating in normal mode with FSK modulation. The measurements were made with the average detector and data is stated in table 12.

The 20dB bandwidth measurements were made at the lowest, middle and highest operating frequency. The data is included in stated in table 12.

The operating frequency band was measured to find the amount of hopping frequencies when the device is running in normal mode. The amount of frequencies observed was 79, the plots of these scans are included in figures 4 and 5. The lowest operating frequency was at 2.403 GHz and the highest operating frequency was at 2.482 GHz.



Report of Measurements 15.249 Radiated Data

The following table reports the results of the radiated measurements for the Motion Capture System RF Transmitter, BaseStation.

Table 12 - 15.249 Radiated Emission Level

15.249 Limit dB μ V/m	Fundamental Frequency MHz	Level dB μ V/m	Detector	Test Distance	Antenna	Polarity	Margin dB
114 @ 3 meters PK	2403	80.26	PK	3	Horn	H	33.74
		89.86	PK	3	Horn	V	24.14
94 @ 3 meters AV	2403	39.76	AV	3	Horn	V	54.24
114 @ 3 meters PK	2442	88.77	PK	3	Horn	H	25.23
114 @ 3 meters PK	2482	89.69	PK	3	Horn	H	24.31

15.249 Limit dB μ V/m	Harmonic Frequency MHz	Level dB μ V	Detector	Test Distance	Antenna	Polarity	Margin dB
54 @ 3 meters	4806 ⁽¹⁾	37.73	AV	3	Horn	V	16.27
54 @ 3 meters	7209 ⁽¹⁾	43.41	AV	3	Horn	V	10.59
54 @ 3 meters	9612 ⁽¹⁾	47.47	AV	3	Horn	V	6.53
54 @ 3 meters	12015 ⁽¹⁾⁽²⁾	41.87	AV	3	Horn	V	12.13
54 @ 3 meters	14418 ⁽¹⁾⁽²⁾	49.75	AV	3	Horn	V	4.25
54 @ 3 meters	16821 ⁽¹⁾⁽²⁾	48.42	AV	3	Horn	V	5.58
54 @ 3 meters	19224 ⁽¹⁾	<					
54 @ 3 meters	21627 ⁽¹⁾	<					
54 @ 3 meters	24030 ⁽¹⁾	<					

20dB Bandwidth 2403	2.015MHz	20dB Bandwidth 2442	1.855MHz	20dB Bandwidth 2482	2.080MHz
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54 @ 3 meters	Bandedge 2400	25.05	AV	3	Horn	V	28.95
54 @ 3 meters	Bandedge 2483.5	26.19	AV	3	Horn	V	27.81

Test Method: ANSI C63.4-1992
 Spec Limit: FCC 15.249
 No other emissions were observed.

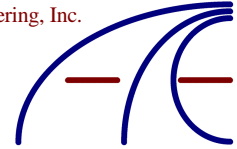
Note: QP = Quasi-Peak
 AV = Average
 H = Horizontal
 V = Vertical

NOTE:

⁽¹⁾ These frequencies are baseline measurements and no emissions were observed at 3 meter or 1 meter test distance.

⁽²⁾ These frequencies were measurements at 1 meter test distance and extrapolated to the specified distance using an extrapolation factor of 20 dB/decade.

COMMENTS: System continuously running. Ambient temperature was 61°F and relative humidity of 45%. Test distance of 3 meters and 1 meter. No emissions observed after the second harmonic, measurements taken are baseline measurements after the second harmonic.



Report of Measurements Operating Frequency Bandwidth Data

The following plots report the results of the Operating Frequency Bandwidth measurements for the Motion Capture System RF Transmitter, BaseStation.

Figure 4 - Plot of Lower Operating Frequency Band

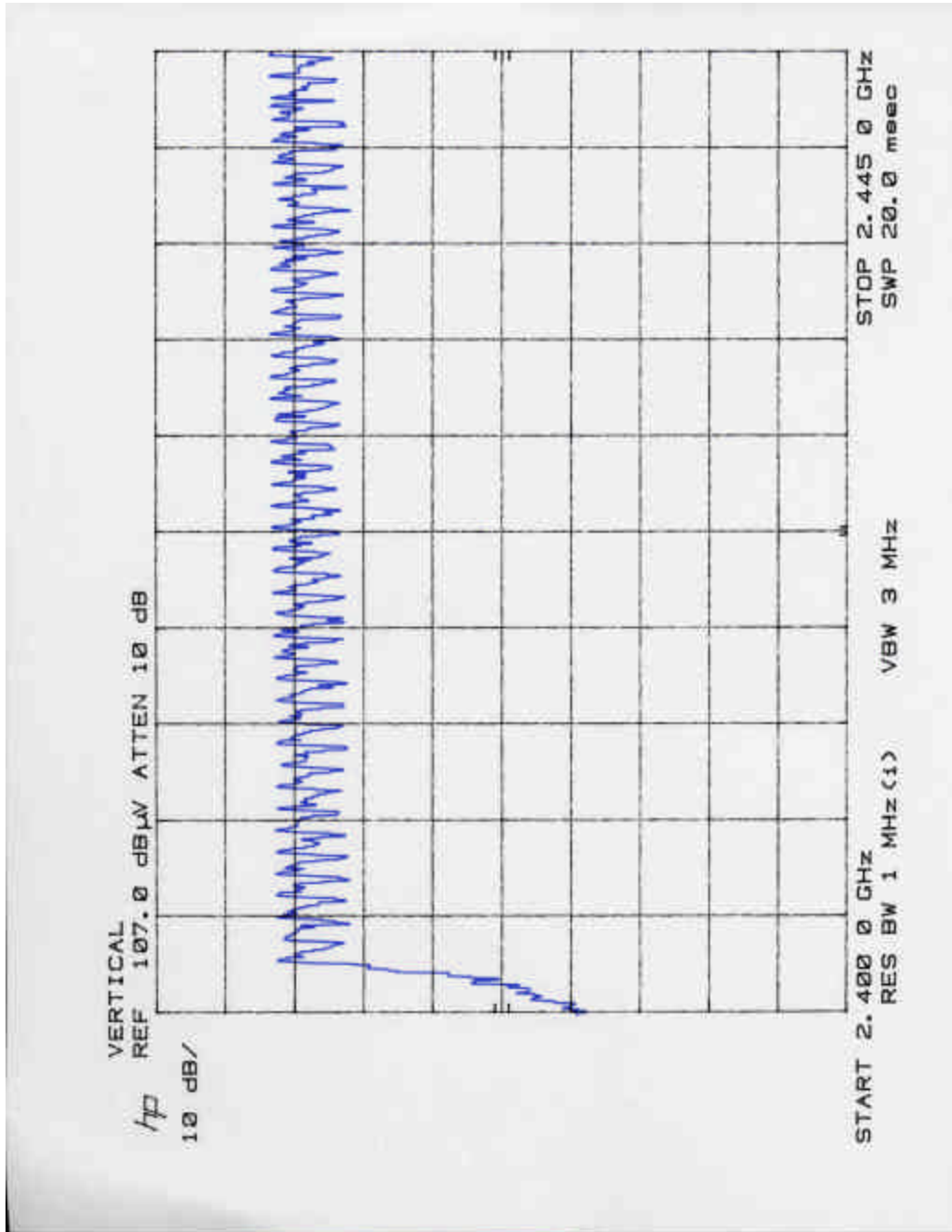
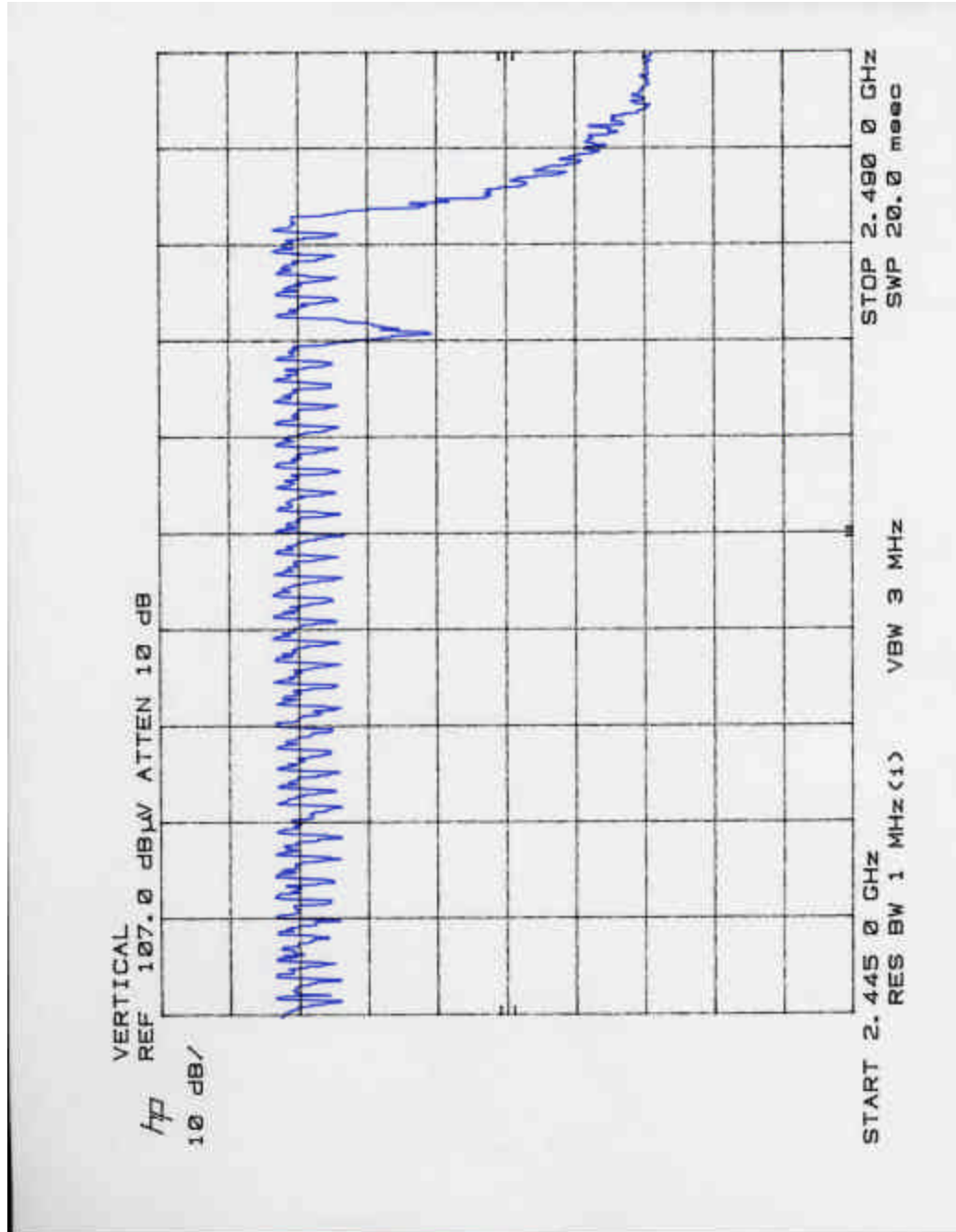




Figure 5 - Plot of Upper Operating Frequency Band





COMPLIANCE VERIFICATION REPORT

TEST CERTIFICATE

APPLICANT: PhaseSpace
1933 Davis Street Suite 294
San Leandro, CA 94577 USA

Trade Name: Motion Capture System RF Transmitter

Model: BaseStation

I HEREBY CERTIFY THAT:

The measurements shown in this report were made in accordance with the procedures indicated and that the energy emitted by this equipment, as received, was found to be within the FCC CFR 47 Part 15 Subpart C section 15.249 and 15.209 for Radiated emissions and FCC CFR 47 Part 15 Subpart C section 15.207 for Conducted emissions. Additionally, it should be noted that the results in this report apply only to the items tested, as identified herein.

I FURTHER CERTIFY THAT:

On the basis of the measurements taken at the test site, the equipment tested is capable of operation in compliance with the requirements set forth in FCC CFR 47 Part 15.207, 15.209 and 15.249 Rules and Regulations and Industry Canada RSS 210.

FCC measurement facility registration number 90452
Industry Canada test site file number IC 4929

On this Date: March 21, 2006

Bruce Smith

Atlas Compliance & Engineering, Inc.

Printed Name

Signature

PhaseSpace Representative