

Test Report

Report Number: 3196492MPK-001

Project Number: 3196492

January 25, 2010

Testing performed on the

Air Band Transceiver

Model Number: SP-400

FCC ID: DY7RT8059

to

FCC Part 87

for

Sportsman's Market, Inc.

Test Performed by:

Intertek Testing Services NA, Inc
1365 Adams Court
Menlo Park, CA 94025

Test Authorized by:

Sportsman's Market, Inc.
2001 Sporty's Drive
Batavia , OH 45103-9747 USA

Prepared by:


Bruce Gordon

Date:

January 25, 2010

Reviewed by:


Krishna K Vemuri

Date:


January 25, 2010

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Report No. 3196492MPK-001

Equipment Under Test:	Air Band Transceiver
Trade Name:	Sportsman's Market, Inc.
Model No.:	SP-400
Serial No.:	EMCPROTO1
FCC ID:	DY7RT8059
Applicant:	Sportsman's Market Inc.
Contact:	Mr. Tom Terayama
Address:	2001 Sporty's Drive Batavia , OH 45103-9747
Country	USA
Tel. number:	310-375-6620
Applicable Regulation:	FCC Part 87
Test Site Location:	ITS - Site 1 1365 Adams Drive Menlo Park, CA 94025
Date of Test:	January 11 to 18, 2010

We attest to the accuracy of this report:



Krishna K Vemuri
EMC Test Engineer



Krishna K Vemuri
Senior EMC Test Engineer

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1.0 Introduction

1.1 Product Description

The Equipment Under Test (EUT) is the model SP-400. The SP-400 is an Air Band Transceiver.

Specification of the radio module	
Type	Air Band Transceiver
Rated RF Output Power	32.7 dBm, 1.86 W
Frequency Ranges, MHz	118.0 – 136.975

EUT receive date: January 8, 2010

EUT receive condition: The prototype version of the EUT was received in good condition with no apparent damage. As declared by the Applicant it is identical to the production units.

Test start date: January 11, 2010

Test completion date: January 18, 2010



1.2 Summary of Test Results

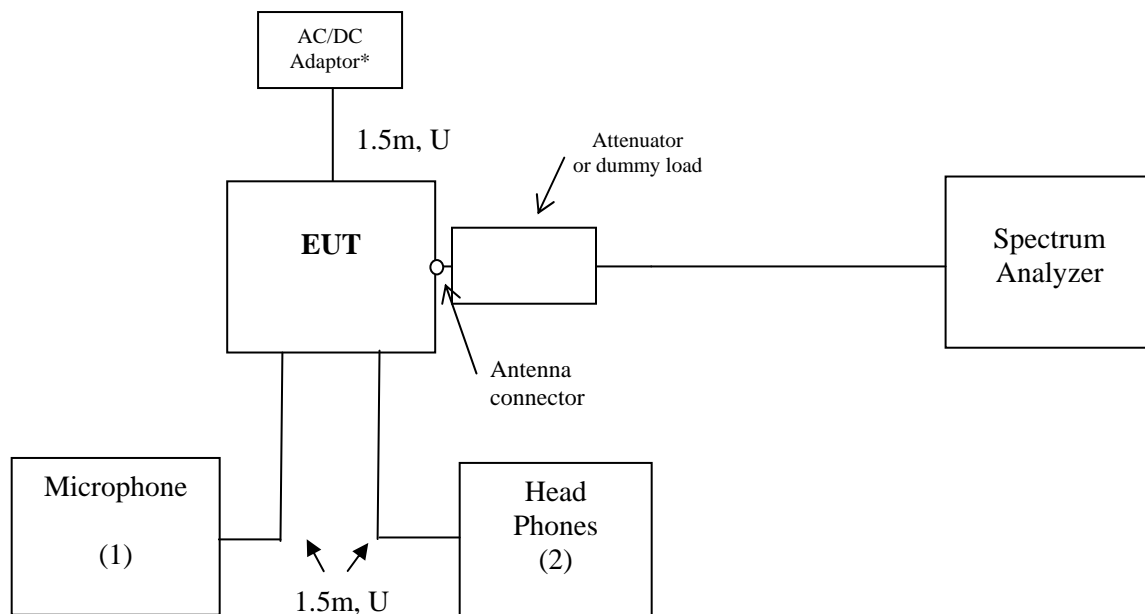
FCC Rule	Description of Test	Result
2.1046, 87.131	RF Power Output	Complies
2.1047, 87.141	Modulation Characteristics and Requirements	Complies
2.1049, 87.135	Occupied Bandwidth	Complies
2.1051, 87.139	Emissions Limitations, Antenna Port Conducted	Complies
2.1053, 87.139	Emissions Limitations, Spurious Radiation	Complies
2.1055, 87.133	Frequency Stability vs. Temperature and Voltage	Complies
15.109, 15.111	Emission from Digital Parts and Receiver	Complies
15.107	AC Line Conducted Emissions	Complies

1.3 Test Configuration

1.3.1 Support Equipment

Item #	Description	Model No.	S/N
1	Microphone	Not Labeled	Not Labeled
2	Headphones	Not Labeled	Not Labeled

1.3.2 Block diagram of Test Setup



*AC/DC Adaptor. Make: HON-KWANG, Model: D12-1A

S = Shielded	F = With Ferrite
U = Unshielded	m = Length in Meters

1.4 Related Submittal(s) Grants

None



2.0 RF Power Output

FCC 2.1046, 87.131

2.1 Test Procedure

The EUT RF output was connected as shown on the diagram in section 1.3.2. The EUT was setup to transmit continuously the maximum power.

The spectrum analyzer was setup to measure the peak power. The attenuation and cable loss were added to the spectrum analyzer reading by using OFFSET function.

Measurements were performed at three frequencies (low, middle, and high channels).

2.2 Test Results

Complies.

Frequency (MHz)	Measured Output Power (dBm)	Measured Output Power (Watt)
118.0	32.7	1.86
127.475	32.7	1.86
136.975	32.5	1.78



3.0 Occupied Bandwidth

FCC 2.1049, 87.135

3.1 Test Procedure

The EUT RF output was connected as shown on the diagram in section 1.3.2. The EUT was setup to transmit the maximum power. The input of the EUT was a level 16 dB higher than that needed to provide 50% modulation.

The spectrum analyzed was setup to measure the Occupied Bandwidth (defined as the 99% Power Bandwidth).

3.2 Test Results

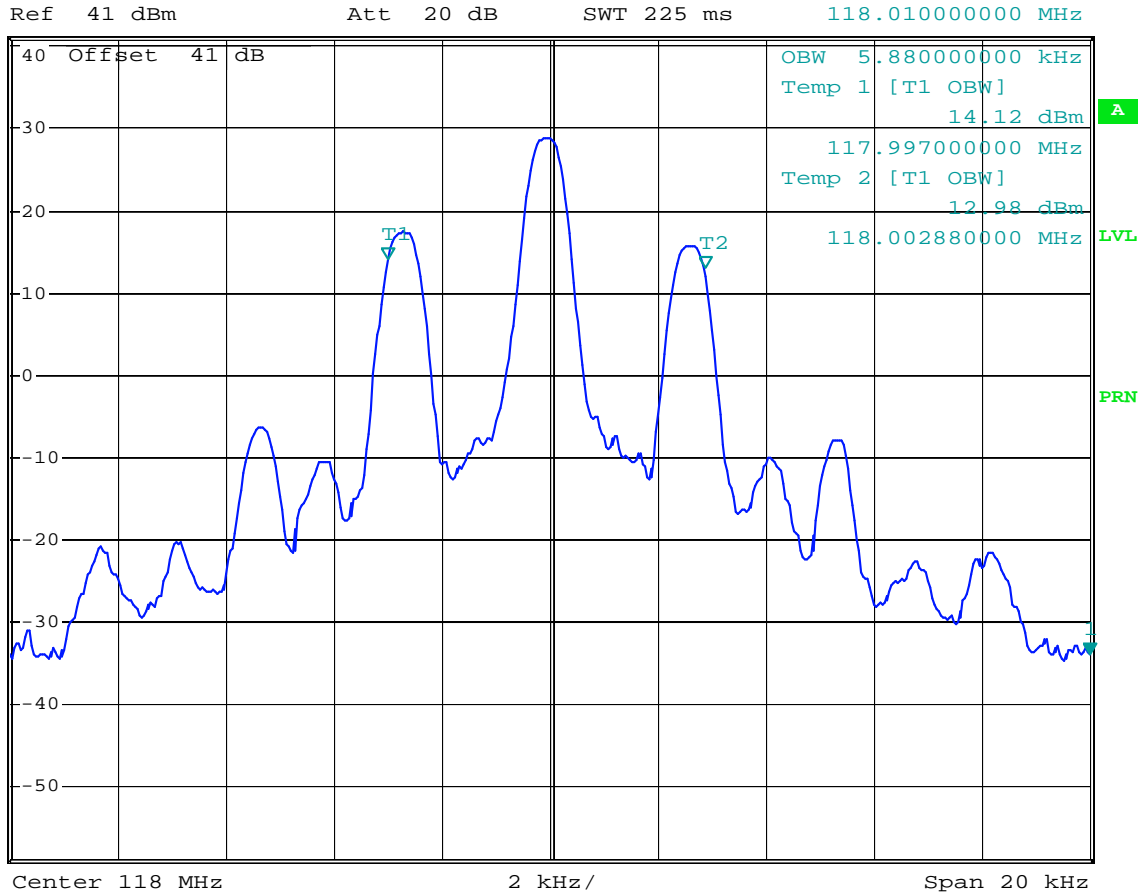
Complies. The test results are summarized in the following table and presented on the Graphs 3.1 – 3.3.

Frequency (MHz)	Measured Occupied Bandwidth (kHz)	Graph
118.0	5.88	3.1
127.475	5.96	3.2
135.0	6.12	3.3

Graph 3.1



*RBW 300 Hz Marker 1 [T1]
 VBW 1 kHz -33.87 dBm
 SWT 225 ms 118.010000000 MHz

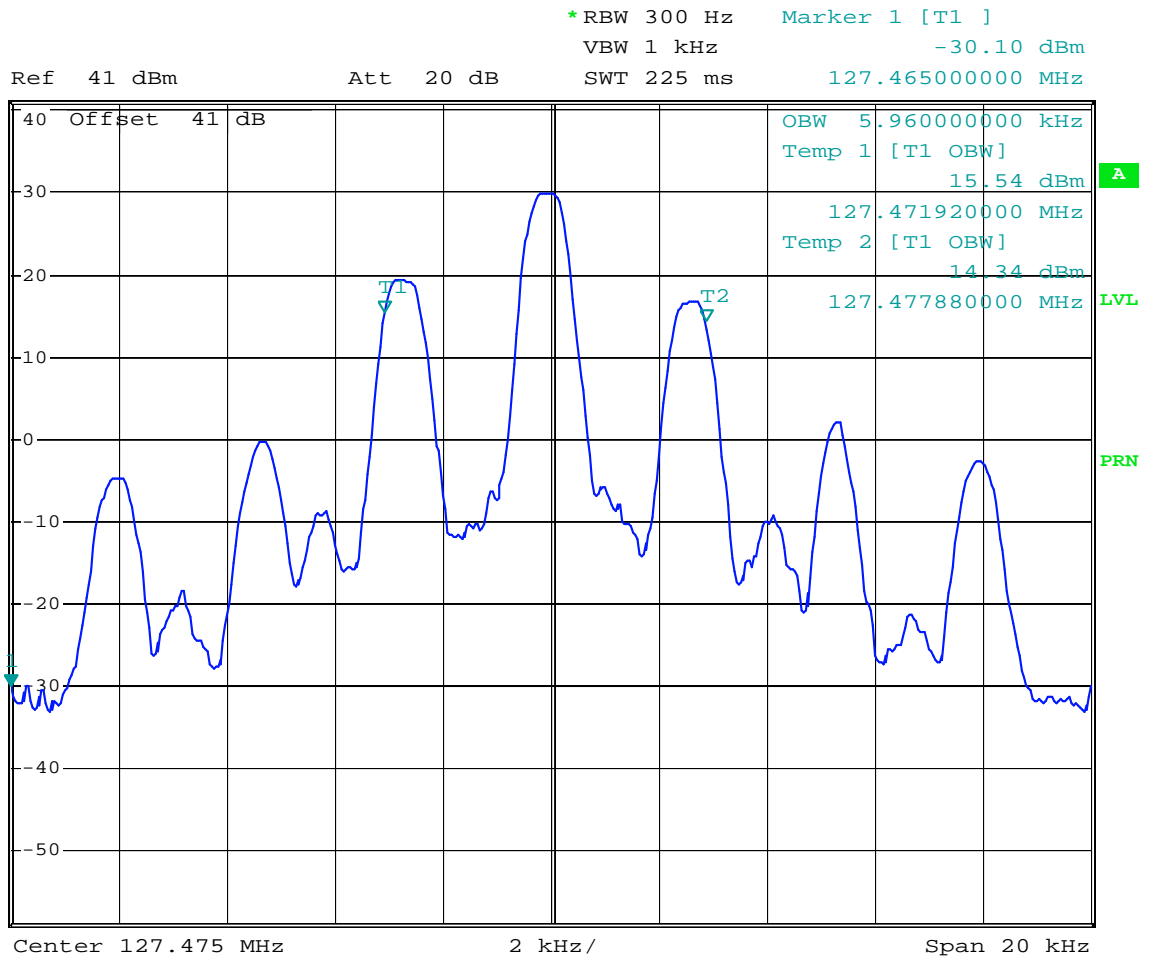


Date: 11.JAN.2010 18:13:21

Graph 3.2



1 PK
VIEW

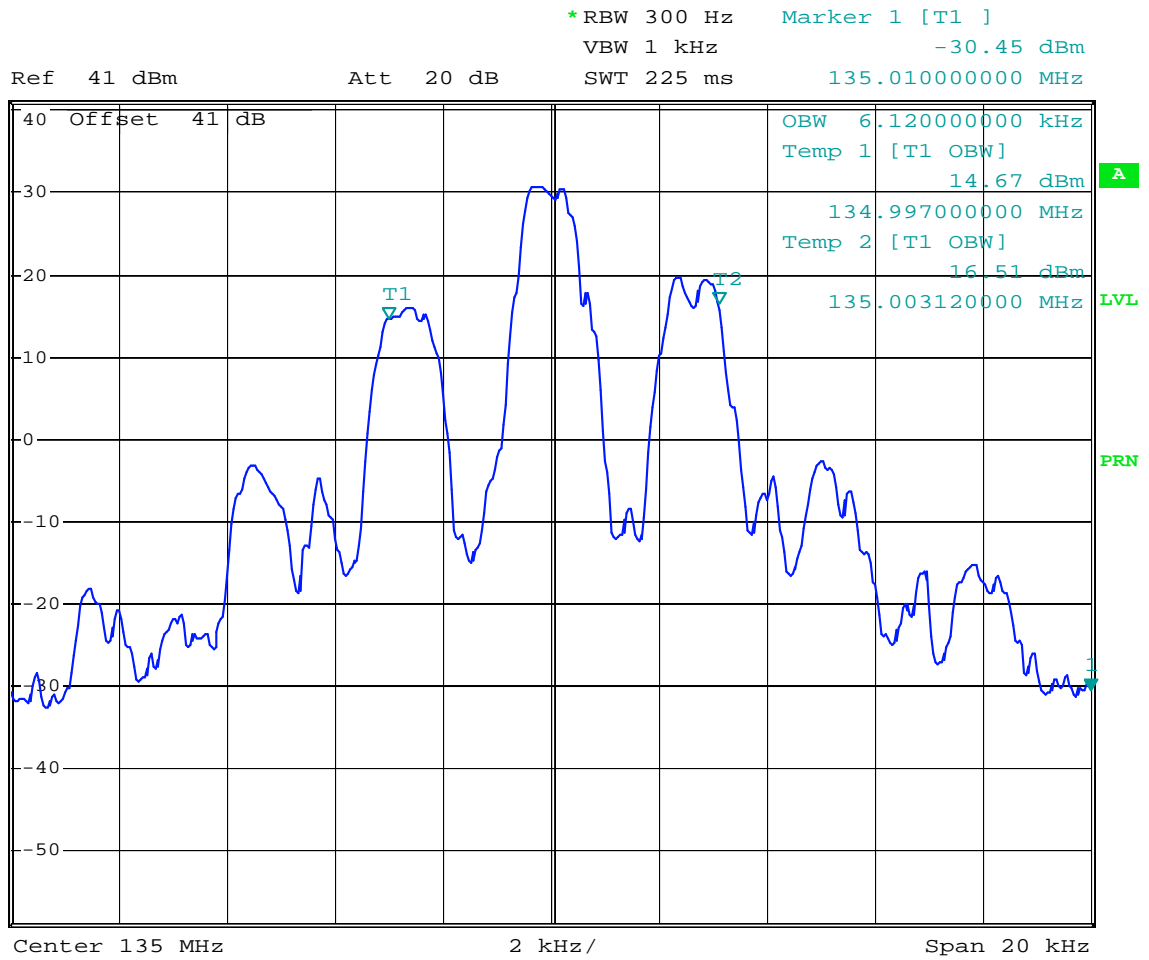


Date: 11.JAN.2010 18:16:53

Graph 3.3



1 PK
VIEW



Date: 11.JAN.2010 18:27:11



4.0 Modulation Limiting and Audio Frequency Response FCC 2.1047, 87.141

4.1 Requirement

Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

When A3E emission is used, the modulation percentage must not exceed 100 percent.

4.2 Test Procedure

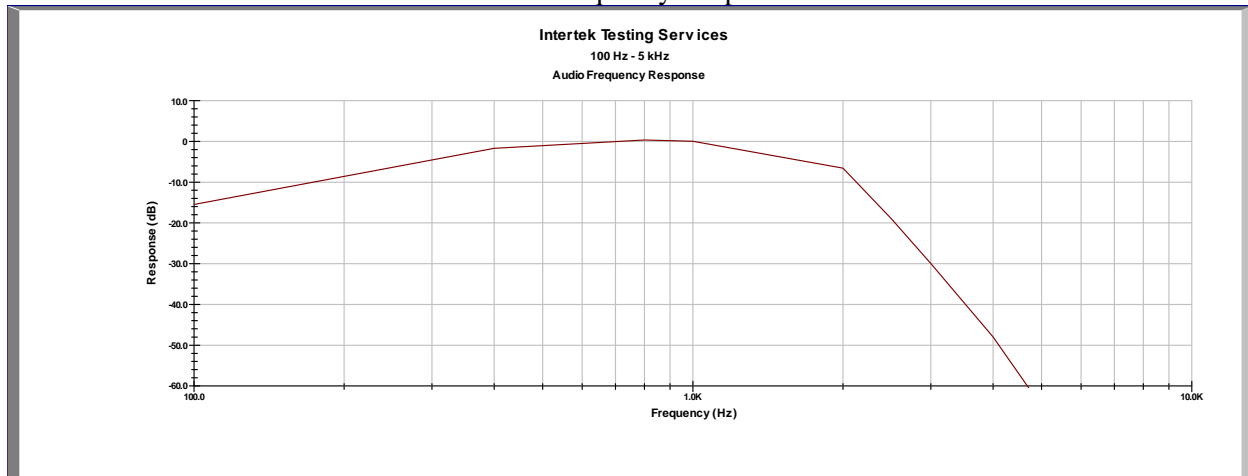
The EUT RF output was connected as shown on the diagram in section 1.3.2. The EUT was setup to transmit the maximum power at the middle frequency of 127.475 MHz. The input of the EUT was set to 1 kHz and the level was adjusted to provide 50% modulation. This level was recorded as the 0 dB reference level. The frequency input to the EUT was varied from 100 Hz to 5 kHz and the level was adjusted to maintain the 50% modulation. The level was recorded and compared to the reference level.

The frequency input to the EUT was varied from 100 Hz to 5 kHz and the level was adjusted until the maximum deviation was achieved.

4.4 Test Results

Complies.

Audio Frequency Response



Maximum Modulation

Audio Frequency (Hz)	Maximum Modulation Measured %	Limit %	Margin %
100	23	100	-77
400	72	100	-28
800	87	100	-13
1000	83	100	-17
2000	72	100	-28
2500	61	100	-39
3000	50	100	-50
4000	33	100	-67
5000	19	100	-81



5.0 Emission Limitations

FCC 2.1051, 87.139

5.1 Requirement

When the frequency is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth the attenuation must be at least 25 dB;

When the frequency is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth the attenuation must be at least 35 dB.

When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth the attenuation for aircraft station transmitters must be at least 40 dB; and the attenuation for aeronautical station transmitters must be at least $43 + 10 \log_{10} P_Y$ dB.

5.2 Test Procedure

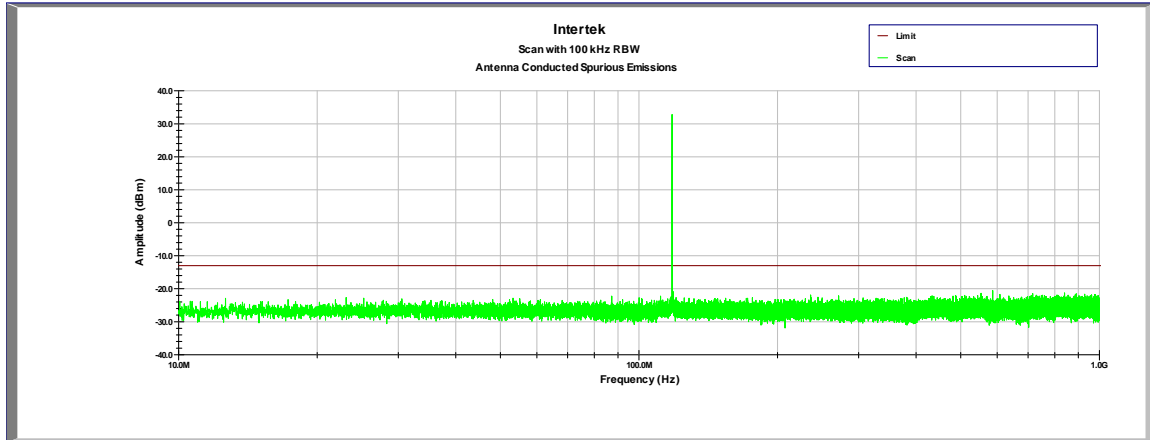
The EUT RF output was connected as shown on the diagram in section 1.3.2. The input of the EUT was a level 16 dB higher than that needed to provide 50% modulation. Limits are based on a 25 kHz authorized bandwidth.

The EUT was setup to transmit the maximum power.

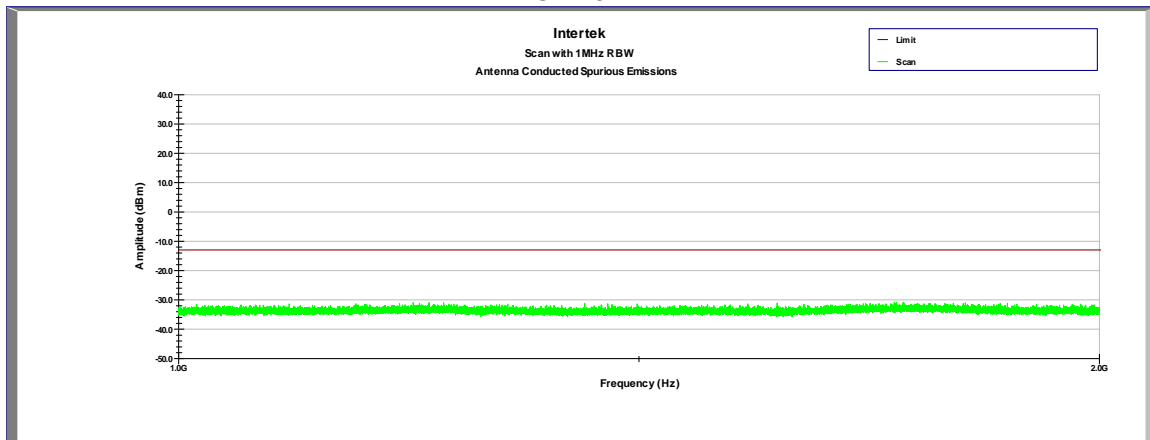
5.3 Test Results

Complies. Refer to the attached Graphs 5.1 – 5.9.

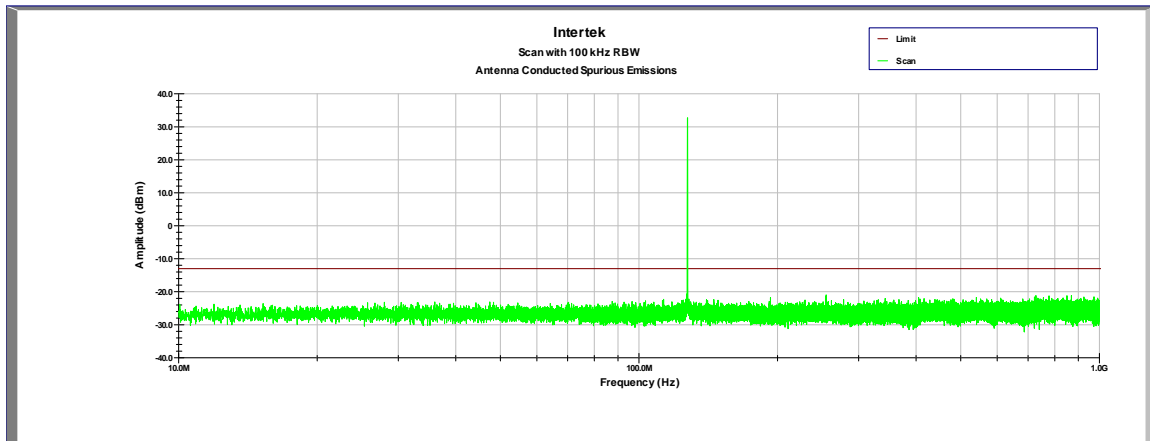
Graph 5.1
Tx @ 118 MHz



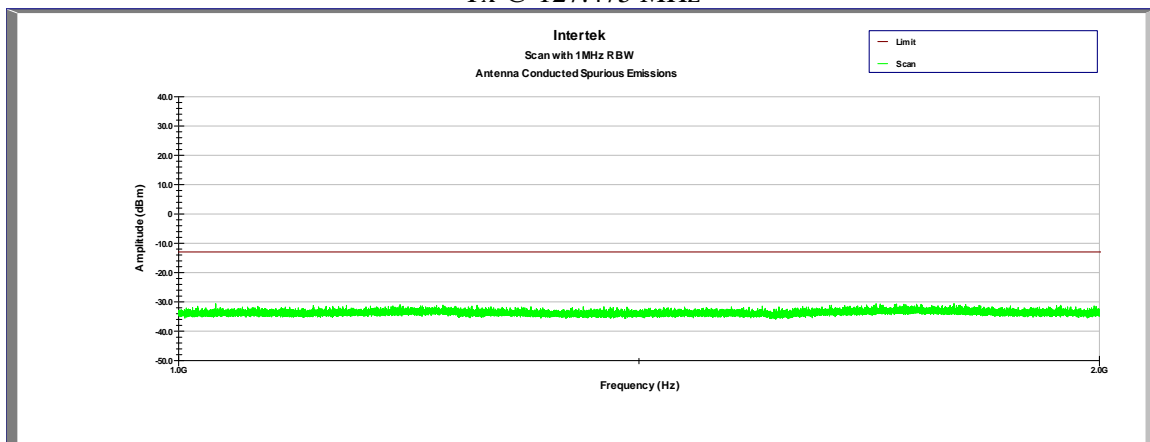
Graph 5.2
Tx @ 118 MHz



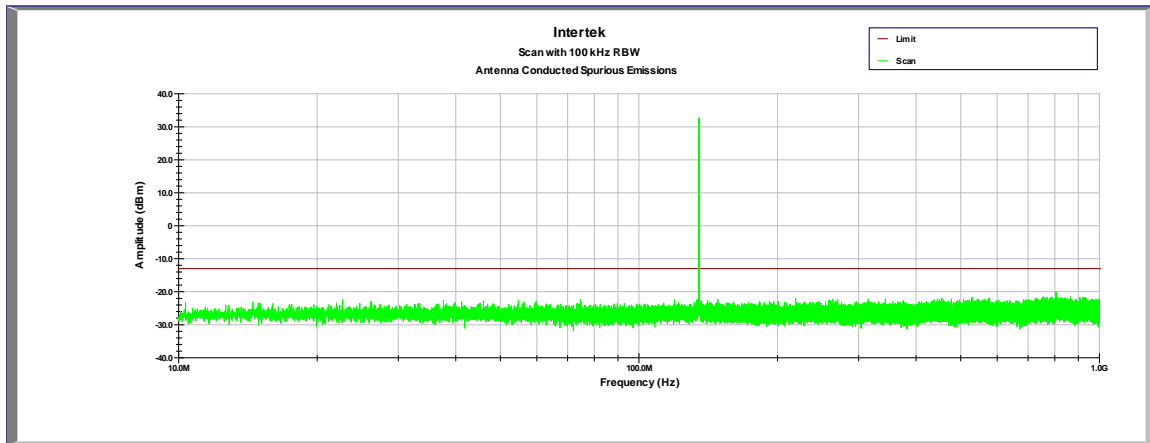
Graph 5.3
Tx @ 127.475 MHz



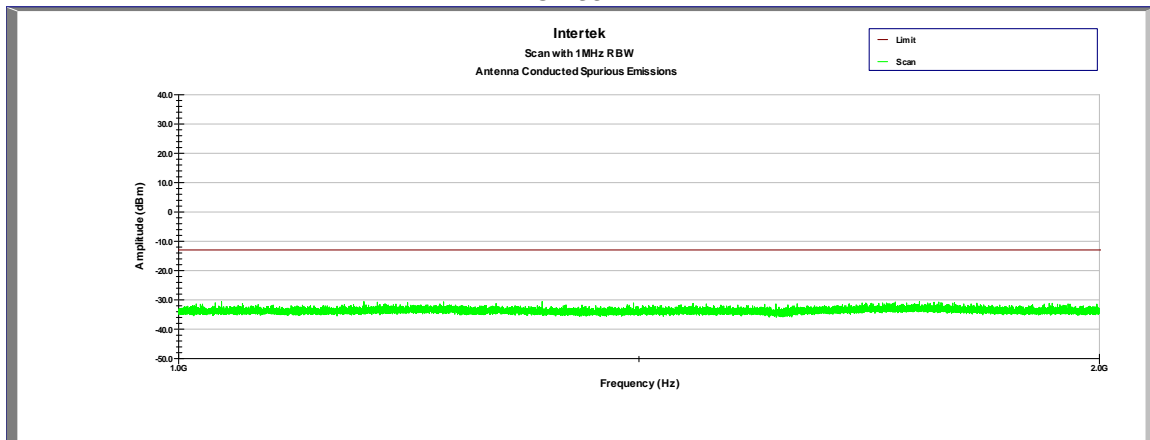
Graph 5.4
Tx @ 127.475 MHz



Graph 5.5
Tx @ 135 MHz



Graph 5.6
Tx @ 135 MHz

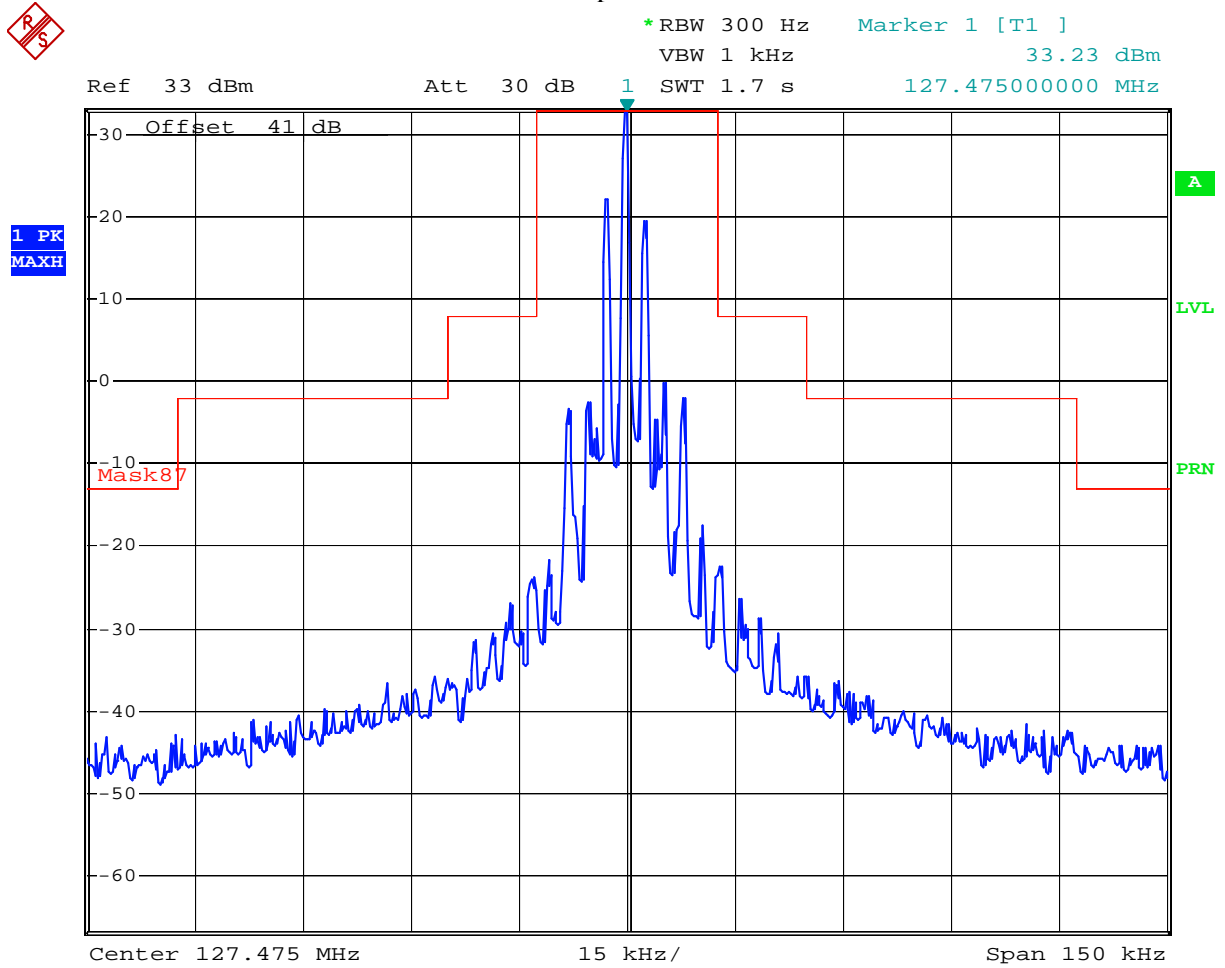


```
*RBW 300 Hz      Marker 1 [T1 ]
VBW 1 kHz              33.19 dBm
SWT 1.7 s           118.00000000 MHz
```



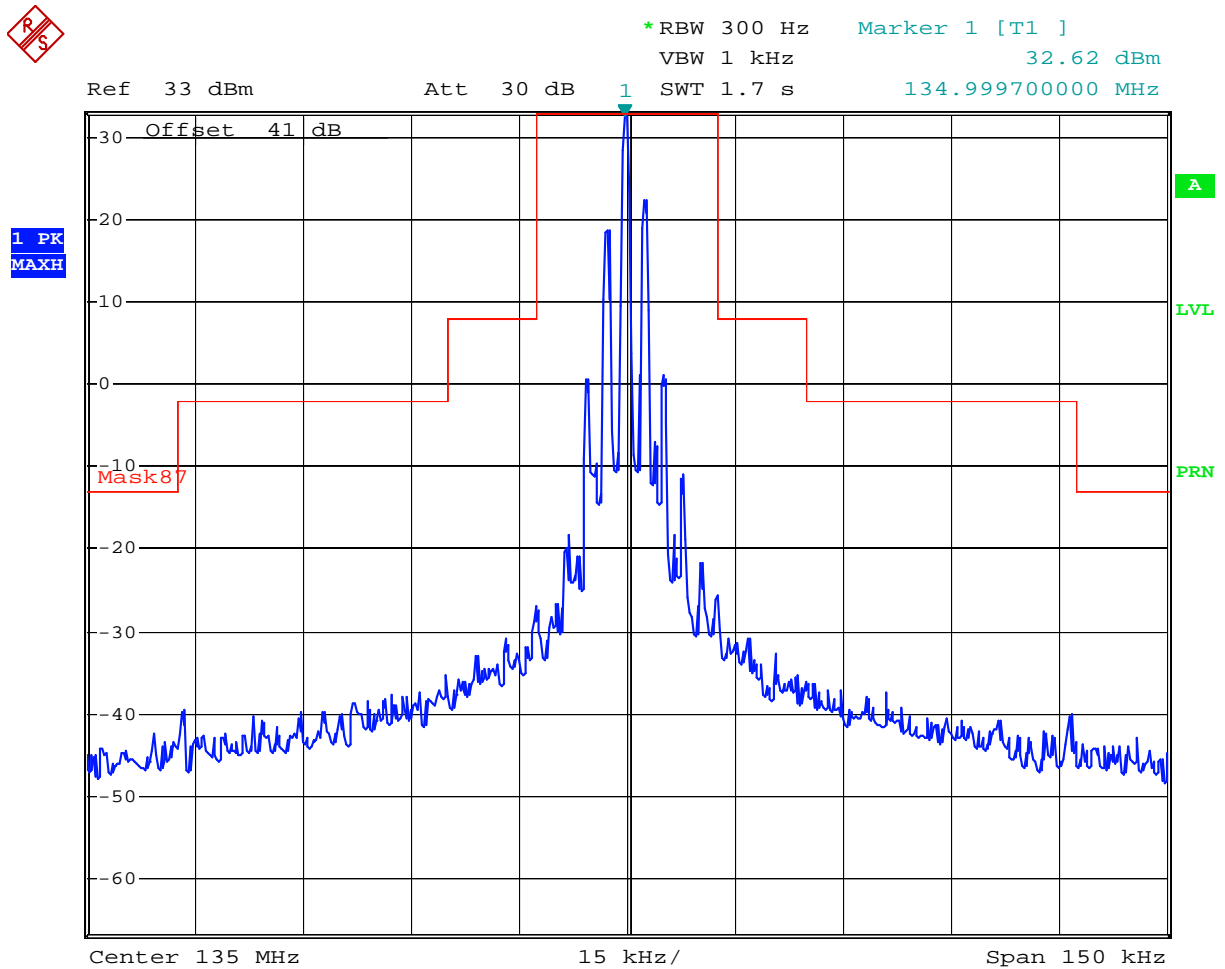
Page 19 of 34

Graph 5.8



Date: 11.JAN.2010 18:58:52

Graph 5.9



Date: 11.JAN.2010 19:03:37



6.0 Spurious Radiation

FCC 2.1053, 87.139

6.1 Requirement

When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth the attenuation for aircraft station transmitters must be at least 40 dB; and the attenuation for aeronautical station transmitters must be at least $43 + 10 \log_{10} Y$ dB.

6.2 Test Procedure

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to 10th harmonic was investigated. The worst case of emissions was reported.

6.3 Test Results

Complies. Refer to the attached data.

Spurious Radiated Emissions

Tx Frequency: 118.0 MHz			
Spurious Emission (MHz)	Emission level dB(uV/m)	Limit (dBuV/m)	Margin (dB)
236.0	71.1	84.4	-13.3
354.0	53.4	84.4	-31.0
472.0	60.9	84.4	-23.5
590.0	58	84.4	-26.4
708.0	55.1	84.4	-29.3
826.0	50.4	84.4	-34.0
944.0	46.1	84.4	-38.3
1062.0	44.8	84.4	-39.6
1180.0	43.7	84.4	-40.7



Spurious Radiated Emissions

Tx Frequency: 127.0 MHz			
Spurious Emission (MHz)	Emission level dB(uV/m)	Limit (dBuV/m)	Margin (dB)
234.0	71.2	84.4	-13.2
361.0	46	84.4	-38.4
488.0	57.4	84.4	-27.0
615.0	53.4	84.4	-31.0
742.0	54.3	84.4	-30.1
869.0	38.4	84.4	-46.0
996.0	24.5	84.4	-59.9
1123.0	45.7	84.4	-38.7
1250.0	50.6	84.4	-33.8

Tx Frequency: 136.0 MHz			
Spurious Emission (MHz)	Emission level dB(uV/m)	Limit (dBuV/m)	Margin (dB)
272.0	64.9	84.4	-19.5
408.0	50.1	84.4	-34.3
544.0	51.8	84.4	-32.6
680.0	51.1	84.4	-33.3
816.0	39.9	84.4	-44.5
952.0	54.8	84.4	-29.6
1088.0	47.7	84.4	-36.7
1224.0	54.3	84.4	-30.1
1360.0	53.0	84.4	-31.4



8.0 AC Line Conducted Emissions

FCC 15.107

8.1 Requirement

FCC Part 15 Limits for Conducted Disturbance at the Mains Ports

Frequency Band MHz	Class B Limit dB (μV)	
	Quasi-Peak	Average
0.15-0.50	66 to 56	56 to 46
	Decreases linearly with the logarithm of the frequency	Decreases linearly with the logarithm of the frequency
0.50-5.00	56	46
5.00-30.00	60	50

Note: At the transition frequency the lower limit applies.

8.2 Test Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

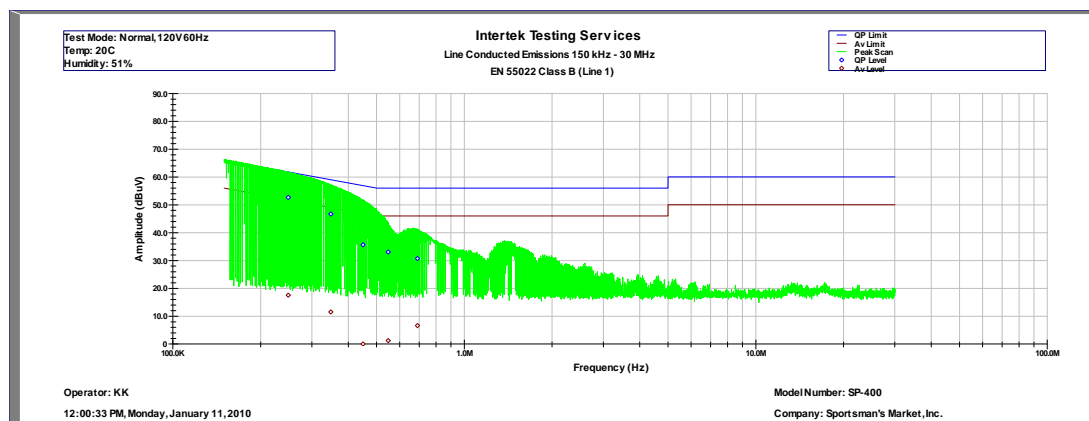
Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4 and EN 55022.



8.3 Test results

Complies. Refer to the attached data.



Intertek Testing Services
Line Conducted Emissions 150 kHz - 30 MHz
EN 55022 Class B (Line 1)

Operator: KK

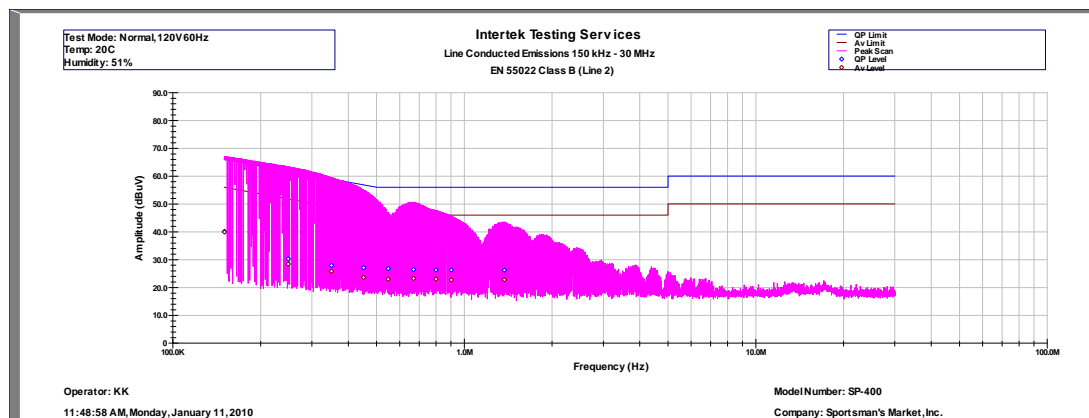
Model Number: SP-400

12:00:33 PM, Monday, January 11, 2010

Company: Sportsman's Market, Inc.

Frequency	Av	QP	Av	QP	Av	QP
Hz	Level	Level	Limit	Limit	Margin	Margin
	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dBuV)
248773	17.5	52.6	53.2	63.2	-35.6	-10.6
348261	11.5	46.7	50.3	60.3	-38.8	-13.7
449375	0.0	35.6	47.4	57.4	-47.5	-21.8
548192	1.2	33.1	46.0	56.0	-44.8	-22.9
690654	6.6	30.7	46.0	56.0	-39.4	-25.3

Test Mode: Normal, 120V 60Hz
Temp: 20C
Humidity: 51%



Intertek Testing Services
Line Conducted Emissions 150 kHz - 30 MHz
EN 55022 Class B (Line 2)

Operator: KK

Model Number: SP-400

11:48:58 AM, Monday, January 11, 2010

Company: Sportsman's Market, Inc.

Frequency	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Margin
Hz	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dBuV)
150349	39.9	40.1	56.0	66.0	-16.1	-25.8
248780	28.4	30.3	53.2	63.2	-24.8	-32.9
350039	25.9	27.9	50.3	60.3	-24.4	-32.4
451202	23.6	27.1	47.4	57.4	-23.7	-30.3
547978	23.0	26.8	46.0	56.0	-23.0	-29.2
669372	23.2	26.4	46.0	56.0	-22.8	-29.6
799184	23.0	26.4	46.0	56.0	-23.0	-29.6
902745	22.7	26.3	46.0	56.0	-23.3	-29.7
1.37E+06	22.8	26.2	46	56	-23.2	-29.8

Test Mode: Normal, 120V 60Hz
Temp: 20C
Humidity: 51%



9.0 Frequency Stability vs Temperature and Voltage

FCC 2.1055, 87.133

9.1 Test Procedure

The EUT was placed inside the temperature chamber. The RF power output was connected to frequency counter. The EUT was setup to transmit the maximum power.

After the temperature stabilized for approximately 20 minutes, the transmitting frequency was measured by the frequency counter and recorded. The measured frequency at each temperature was compared to the reference frequency.

The input voltage was varied by +/- 15%. the transmitting frequency was measured by the frequency counter and recorded. The measured frequency at each voltage level was compared to the reference frequency.

9.3 Test Results

Complies. Refer to the attached data.

Nominal frequency: 127.475 MHz

Temperature (°C)	Maximum deviation from 20°C Hz	Maximum deviation from 20°C ppm
-30	127,475,318	1.7
-20	127,475,205	0.8
-10	127,475,065	0.3
0	127,475,389	2.2
10	127,475,254	1.2
20 (Reference)	127,475,105	0
30	127,474,916	1.1
40	127,475,199	0.7
50	127,475,231	1.8

DC Voltage, V	Maximum deviation from nominal, Hz	Maximum deviation from nominal, ppm
10.2	127,475,368	2.1
12.0 (Reference)	127,475,105	0
13.8	127,475,294	1.5



10.0 Emission from Digital Part and Receiver

FCC 15.109

10.1 Test Limit

Radiated Emission Limit for FCC Part 15 Subpart B

Radiated Emission Limits for Class B at 3 meters	
Frequency (MHz)	Quasi-Peak limits, dB (μV/m)
30 to 88	40.0
88 to 216	43.5
216 to 960	46.0
960 and up	54.0

10.2 Test Procedure

Measurements are conducted with a quasi-peak detector instrument in the frequency range of 30 MHz to 1000 MHz and with the average detector instrument in the frequency range above 1000 MHz. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

Measurements of the radiated field are made with the antenna located at a distance of 10 meters from the EUT. If the field-strength measurements at 10m cannot be made because of high ambient noise level or for other reasons, measurements of Class B equipment may be made at a closer distance, for example 3m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for a larger EUT.

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4 (2003).



Example Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor. Then by subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - PA$$

Where FS = Field Strength in dB ($\mu\text{V}/\text{m}$)
 RA = Receiver Amplitude (including preamplifier) in dB (μV)
 CF = Cable Attenuation Factor in dB
 AF = Antenna Factor in dB (1/m)
 PA = Preamplifier Factor in dB

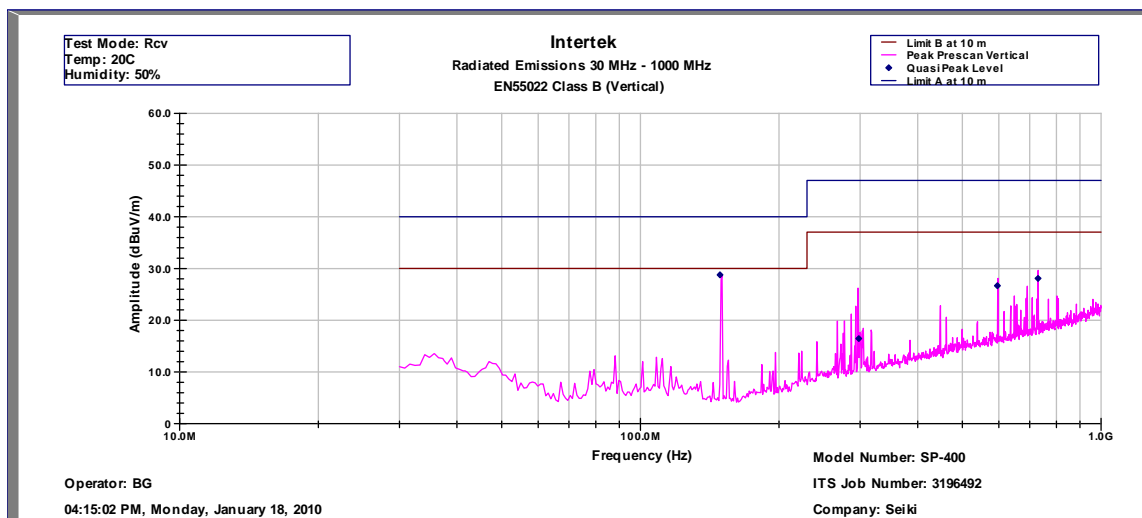
Assume a receiver reading of 52.0 dB (μV) is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB ($\mu\text{V}/\text{m}$).

$$\begin{aligned} RA &= 52.0 \text{ dB } (\mu\text{V}) \\ AF &= 7.4 \text{ dB (1/m)} \\ CF &= 1.6 \text{ dB} \\ PA &= 29.0 \text{ dB} \\ FS &= RA + AF + CF - PA \\ FS &= 52.0 + 7.4 + 1.6 - 29.0 \\ FS &= 32 \text{ dB } (\mu\text{V}/\text{m}) \end{aligned}$$



10.3 Test Results

Complies. Refer to the attached data.



Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
EN55022 Class B (QP-Vertical)

Operator: BG

18-Jan-10

Model Number: SP-400

ITS Job Number: 3196492

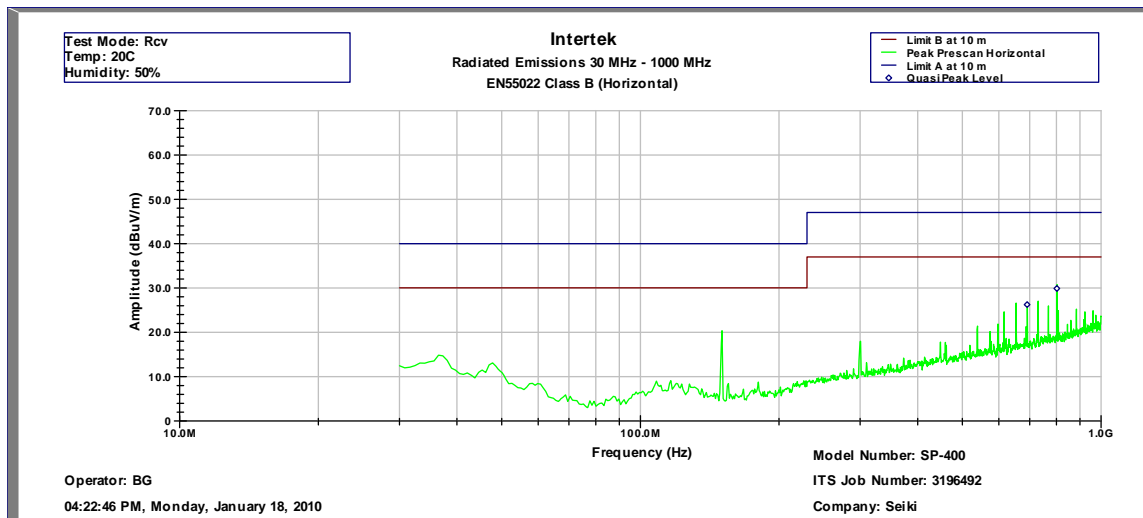
Company: Sportsman's Market, Inc.

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	AG	AF	CF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
1.490E+08	28.8	30.0	-1.2	51.0	32.0	12.6	1.4
2.979E+08	16.4	37.0	-20.6	32.7	32.0	14.3	2.0
5.958E+08	26.7	37.0	-10.3	37.0	32.3	19.5	2.9
7.296E+08	28.1	37.0	-8.9	36.3	32.3	21.5	3.2

Test Mode: Rcv

Temp: 20C

Humidity: 50%



Intertek
Radiated Emissions 30 MHz - 1000 MHz
EN55022 Class B (QP-Horizontal)

Operator: BG
18-Jan-10

Model Number: SP-400
ITS Job Number: 3196492
Company: Sportsman's Market, Inc.

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	AG	AF	CF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
6.912E+08	26.2	37	-10.8	35.6	32.4	20.9	3.1
8.018E+08	29.9	37	-7.1	37.7	32.2	21.7	3.4

Test Mode: Rcv
Temp: 20C
Humidity: 50%



11.0 Receiver Antenna Conducted Emissions FCC 15.111(a)

The power at the antenna terminal shall not exceed 2.0 nanowatts (-57 dBm).

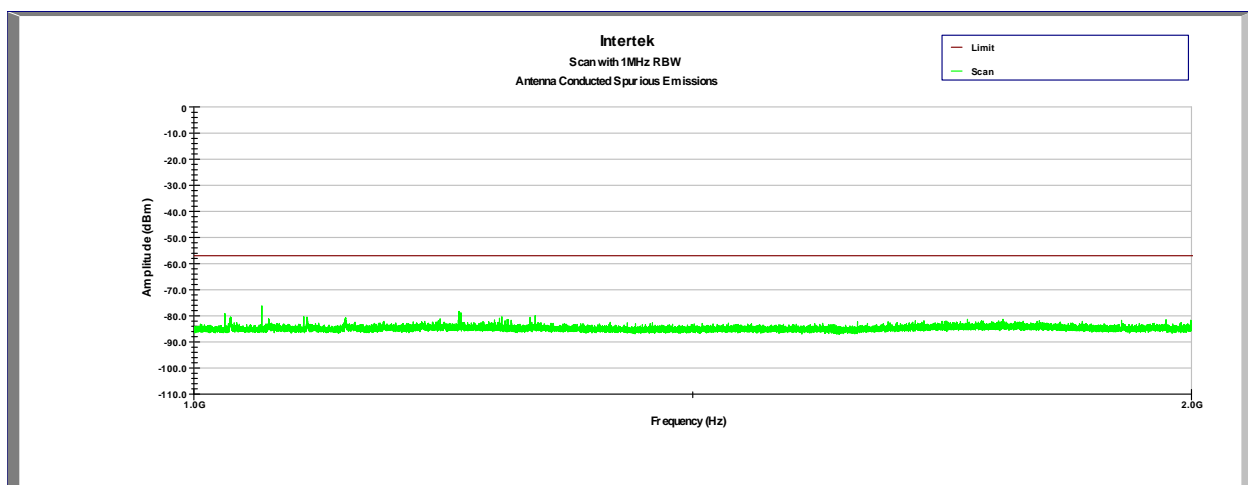
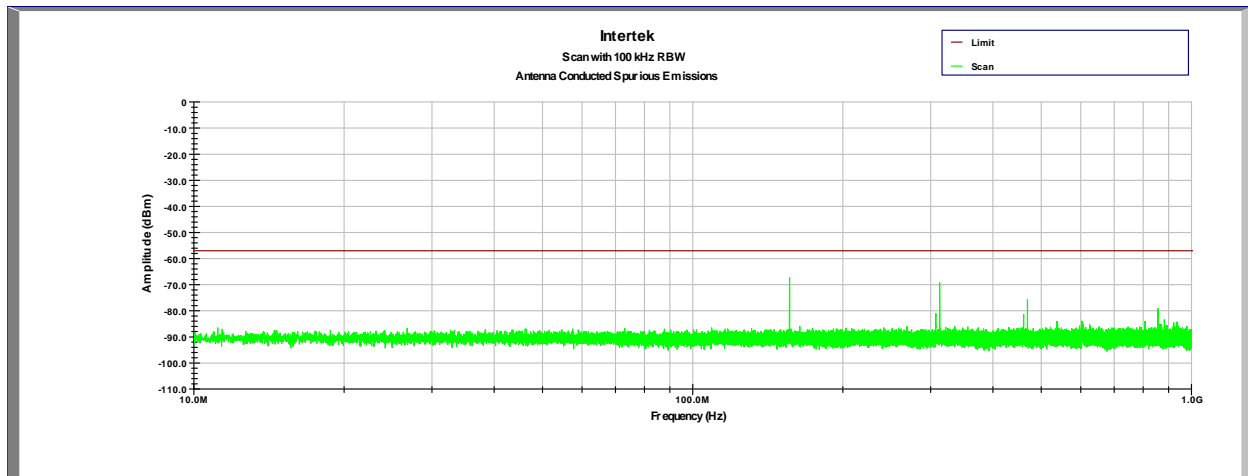
11.1 Test Procedure

The spectrum analyzer was connected to the RF output of the EUT. The EUT was setup in receiving mode.

Test was performed at tuned frequencies of Low, Middle and High Channels. The worst case data is reported.

11.2 Test Results

Complies. Refer to the attached data.





12.0 List of Test Equipment

Measurement equipment used for compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
RF Filter Section	Hewlett Packard	85460A	3448A00267	12	07/01/10
EMI Receiver	Hewlett Packard	8546A	3710A00373	12	07/01/10
BI-Log Antenna	Antenna Research	LPB-2513/A	1154	12	06/23/10
Pre-Amplifier	Sonoma	310N	185634	12	11/19/10
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	07/28/10
Modulation Analyzer	Hewlett Packard	8901B	2441A00392	12	01/26/10
Spectrum Analyzer	Rohde&Schwarz	FSU	200482	12	04/27/10
Double-ridged Horn Antenna	EMCO	3115	31626	12	04/23/10
Oscilloscope	Tektronix	TDS 380	BI05549	12	09/24/10
Signal Generator	Leader	LFG-1310	1090196	12	03/11/10



13.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 / 3196492	BG	January 25, 2010	Original document