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Daktronics Inc.

Application
For Certification
Transmitter Model HS-200 Wireless Mic

(FCC ID: P7EHS-200WM001)

February 11, 2002

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TABLE OF CONTENTS

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1.0 GENERAL DESCRIPTION

1.1 Related Submittals Grants

This is single application of the *HS-200 Wireless Mic* for Certification under Part 15 Subpart C. There are no other simultaneous applications.

1.2 Product Description

Purpose of the IT2611 RF Module

The *HS-200 Wireless Mic* is a part of the HS-200 Start System. The *HS-200 Wireless Mic* is a hand-held transmitter with an attached antenna. The intended use of the *HS-200 Wireless Mic* unit is to generate and transmit both voice and data signals upon command from an attached modified CB Microphone. When the side button on the microphone is pressed, a digital signal is sent to receiver, turning the audio circuits on, and any voice picked up by the microphone is transmitted to receiver. When the top button on the CB microphone is pressed, a digital is transmitted to receiver. The *HS-200 Wireless Mic* powered at 3VDC from two internal AA-size batteries.

The HS-200 Wireless Mic Transmitter

The *HS-200 Wireless Mic* Transmitter operates in frequency range:

From 903.37 to 921.37MHz (FM/FSK Modulation Method),
adjustable in eight channels from channel 0 to channel 7.

The HS-200 Wireless Mic Antenna

The antenna on the *HS-200 Wireless Mic* is a PCB mounted, internal to the chassis and is not easily accessible.

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1.3 Test Methodology

Emission measurements were performed according to the procedures in ANSI C63.4-1992. All field strength radiated emissions measurements were performed in the semi-anechoic chamber, and for each scan, the procedure for maximizing emissions in Appendices D and E were followed. All field strength radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The test site facility used to collect the radiated and conducted measurement data is located at 7250 Hudson Blvd., Suite 100, Oakdale, Minnesota. This test facility has been fully described in a report dated on January 2000 submitted to your office. Please reference the site registration number: 90706, dated May 19, 2000.

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2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was powered at 3VDC from two AA-size fresh batteries. The EUT was set up as tabletop equipment.

2.2 EUT Exercising Software

The *HS-200 Wireless Mic* was tested in the continuous transmission mode.

2.3 Special Accessories

There are no special accessories necessary for compliance of these products.

2.4 Equipment Modification

No modifications were installed during the testing.

2.5 Support Equipment List and Description

N/A

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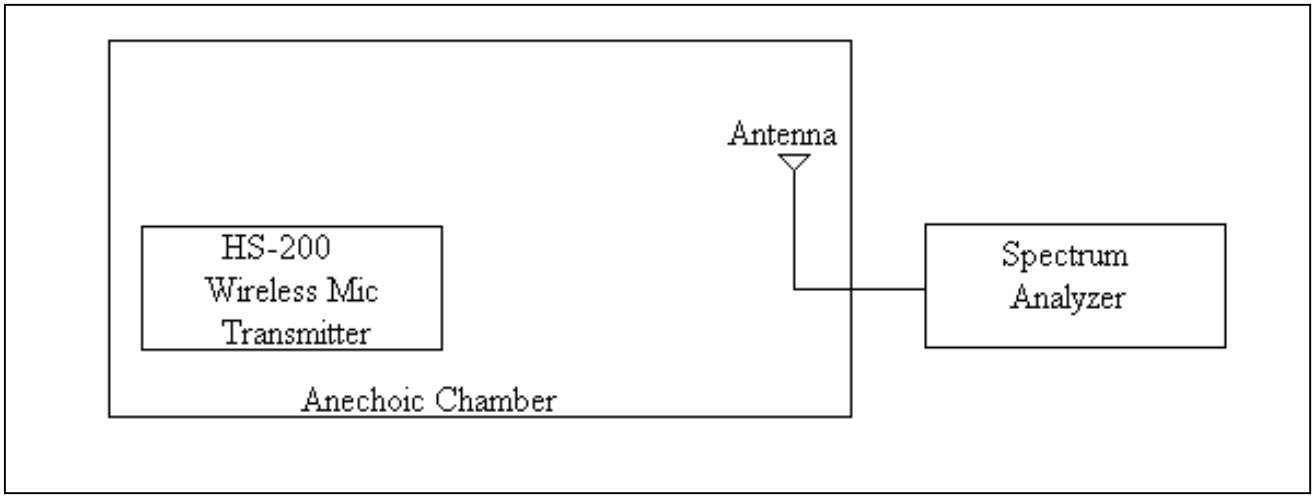
2.6 Test Configuration Block Diagrams

Field Strength Measurements



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3.0 TEST RESULTS

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs, data tables and graphical representations of the emissions are included.

The EUT is intended for operation under the requirements of Part 15 Subpart C. Specific test requirements include the following:

47 CFR 15.249(a)(b)	Field Strength of Fundamental
47 CFR 15.249(a)(b)	Field Strength of Harmonics
47 CFR 15.249(c), 15.209	Out of Band Spurious Emissions

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3.1 Field Strength of Fundamental and Harmonics Emissions, FCC 15.249(a)(b)

Field Strength of Fundamental and Harmonics Emissions measurements were made in the start, center, and end frequency of the frequency range (Channel 0, Channel 4, and Channel 7). The Harmonics emissions were tested up to 10^{th} harmonic. The follow Fundamental frequencies and their Harmonics emissions were tested:

903.37MHz
912.37MHz
921.37MHz

Test Procedure

The EUT was placed on a non-conductive table 0.8m above the ground plane inside the Anecoic Chamber. The table was centered on a motorized turntable, which allows 360-degree rotation. The measurement antenna was positioned at distance 3m. The radiated emissions were maximized by configuring the EUT, by rotating the EUT, by changing antenna polarization, and by changing antenna height from 1 to 4m. Field strength was measured and calculated (See Section 3.3).

The Tables and Graphs below show the Field Strength of Fundamental and Harmonics Radiation.

Note: Emission level shown in the Graphs does not include the Antenna, Cable and Pre-amplifier correction factors. These factors are shown in the tables as the Total Factor.

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Radiated Emissions **Date:** 02/06-08/2002
Company: Daktronics Inc.
Model: HS-200 Wireless Mic, Transmitter
Test Engineer: Norman Shpilsher
Special Config. Info: Channel 0. Frequency range 902 to 928MHz
Standard: FCC Part 15.249
Test Site: 3 m Anechoic Chamber
Note: Measurements were taking using a CISPR Quasi-Peak Detector for frequencies below 1GHz with 100kHz Resolution Bandwidth
For frequencies above 1GHz measurements were taking using a Peak Detector with 1MHz Resolution Bandwidth
No emissions were found above ambient at 7th and higher harmonics.

Table # 3-1-1

Frequency	Antenna			Total	Reading	Net at 3m.	Limit	Margin	Comments
MHz	Polarity	Hts(m)	Dir (°)	Factor(dB/m)	dBµV	dBµV/m	dBµV/m	dB	
903.35	V	171	16	25.03	59.80	84.83	93.98	-9.15	Fund.
903.35	H	100	305	25.03	67.03	92.06	93.98	-1.92	Fund.
1806.74	V	135	318	-2.90	51.76	48.86	53.98	-5.12	2nd harm.
1806.74	H	100	245	-2.90	51.88	48.98	53.98	-5.00	2nd harm.
2710.10	V	117	350	0.75	53.17	53.92	53.98	-0.06	3rd harm.
2710.10	H	256	306	0.75	50.55	51.30	53.98	-2.68	3rd harm.
3613.50	V	153	280	4.90	48.86	53.76	53.98	-0.22	4th harm.
3613.50	H	255	274	4.90	44.26	49.16	53.98	-4.82	4th harm.
4516.82	V	206	282	6.94	44.35	51.29	53.98	-2.69	5th harm.
4516.82	H	187	33	6.94	42.40	49.34	53.98	-4.64	5th harm.
5420.33	V	146	308	9.23	39.10	48.33	53.98	-5.65	6th harm.
5420.33	H	165	199	9.23	38.51	47.74	53.98	-6.24	6th harm.
6323.50	V	170	354	10.41	36.25	46.66	53.98	-7.32	7th harm.
6323.50	H	167	313	10.41	36.12	46.53	53.98	-7.45	7th harm.
7226.80	V	122	245	11.94	29.20	41.14	53.98	-12.84	8th harm.
7226.80	H	153	315	11.94	29.45	41.39	53.98	-12.59	8th harm.
8130.15	V	122	245	13.10	31.43	44.53	53.98	-9.45	9th harm.
8130.15	H	153	315	13.10	31.38	44.48	53.98	-9.50	9th harm.
9033.50	V	122	245	17.41	31.48	48.89	53.98	-5.09	10th harm.
9033.50	H	153	315	17.41	31.51	48.92	53.98	-5.06	10th harm.

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Radiated Emissions **Date:** 02/06-08/2002
Company: Daktronics Inc.
Model: HS-200 Wireless Mic, Transmitter
Test Engineer: Norman Shpilsher
Special Config. Info: Channel 4. Frequency range 902 to 928MHz
Standard: FCC Part 15.249
Test Site: 3 m Anechoic Chamber
Note: Measurements were taking using a CISPR Quasi-Peak Detector for frequencies below 1GHz with 100kHz Resolution Bandwidth
For frequencies above 1GHz measurements were taking using a Peak Detector with 1MHz Resolution Bandwidth
No emissions were found above ambient at 7th and higher harmonics.

Table # 3-1-2

Frequency	Antenna			Total	Reading	Net at 3m.	Limit	Margin	Comments
MHz	Polarity	Hts(m)	Dir (°)	Factor(dB/m)	dBµV	dBµV/m	dBµV/m	dB	
912.34	V	165	11	25.12	59.23	84.35	93.98	-9.63	Fund.
912.34	H	100	311	25.12	66.87	91.99	93.98	-1.99	Fund.
1824.75	V	131	327	-2.90	51.61	48.71	53.98	-5.27	2nd harm.
1824.75	H	100	238	-2.90	51.19	48.29	53.98	-5.69	2nd harm.
2737.08	V	116	351	0.80	53.00	53.80	53.98	-0.18	3rd harm.
2737.08	H	151	324	0.80	49.79	50.59	53.98	-3.39	3rd harm.
3649.49	V	151	275	4.96	48.20	53.16	53.98	-0.82	4th harm.
3649.49	H	250	273	4.96	44.59	49.55	53.98	-4.43	4th harm.
4561.84	V	203	281	7.01	45.67	52.68	53.98	-1.30	5th harm.
4561.84	H	185	25	7.01	44.36	51.37	53.98	-2.61	5th harm.
5474.27	V	208	309	9.29	40.93	50.22	53.98	-3.76	6th harm.
5474.27	H	144	317	9.29	39.32	48.61	53.98	-5.37	6th harm.
6386.52	V	171	338	10.48	35.28	45.76	53.98	-8.22	7th harm.
6386.52	H	170	307	10.48	36.08	46.56	53.98	-7.42	7th harm.
7296.72	V	122	245	12.02	29.20	41.22	53.98	-12.76	8th harm.
7296.72	H	153	315	12.02	29.45	41.47	53.98	-12.51	8th harm.
8211.06	V	122	245	13.17	31.43	44.60	53.98	-9.38	9th harm.
8211.06	H	153	315	13.17	31.38	44.55	53.98	-9.43	9th harm.
9123.40	V	122	245	17.43	31.48	48.91	53.98	-5.07	10th harm.
9123.40	H	153	315	17.43	31.51	48.94	53.98	-5.04	10th harm.

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Radiated Emissions **Date:** 02/06-08/2002
Company: Daktronics Inc.
Model: HS-200 Wireless Mic, Transmitter
Test Engineer: Norman Shpilsher
Special Config. Info: Channel 7. Frequency range 902 to 928MHz
Standard: FCC Part 15.249
Test Site: 3 m Anechoic Chamber
Note: Measurements were taking using a CISPR Quasi-Peak Detector for frequencies below 1GHz with 100kHz Resolution Bandwidth
For frequencies above 1GHz measurements were taking using a Peak Detector with 1MHz Resolution Bandwidth
No emissions were found above ambient at 7th and higher harmonics.

Table # 3-1-3

Frequency	Antenna			Total	Reading	Net at 3m.	Limit	Margin	Comments
MHz	Polarity	Hts(m)	Dir (°)	Factor(dB/m)	dBµV	dBµV/m	dBµV/m	dB	
921.35	V	163	172	25.21	59.06	84.27	93.98	-9.71	Fund.
921.35	H	100	317	25.21	66.16	91.37	93.98	-2.61	Fund.
1842.80	V	125	307	-2.90	47.11	44.21	53.98	-9.77	2nd harm.
1842.80	H	201	232	-2.90	49.83	46.93	53.98	-7.05	2nd harm.
2764.05	V	112	352	0.85	51.96	52.81	53.98	-1.17	3rd harm.
2764.05	H	224	297	0.85	50.01	50.86	53.98	-3.12	3rd harm.
3685.47	V	147	274	5.02	47.96	52.98	53.98	-1.00	4th harm.
3685.47	H	242	273	5.02	43.26	48.28	53.98	-5.70	4th harm.
4606.81	V	168	294	7.08	44.66	51.74	53.98	-2.24	5th harm.
4606.81	H	181	31	7.08	43.41	50.49	53.98	-3.49	5th harm.
5528.24	V	182	322	9.65	34.70	44.35	53.98	-9.63	6th harm.
5528.24	H	165	199	9.65	32.97	42.62	53.98	-11.36	6th harm.
6449.50	V	170	354	10.54	32.89	43.43	53.98	-10.55	7th harm.
6449.50	H	167	313	10.54	33.15	43.69	53.98	-10.29	7th harm.
7370.80	V	122	245	12.10	29.20	41.30	53.98	-12.68	8th harm.
7370.80	H	153	315	12.10	29.45	41.55	53.98	-12.43	8th harm.
8292.15	V	122	245	13.23	31.43	44.66	53.98	-9.32	9th harm.
8292.15	H	153	315	13.23	31.38	44.61	53.98	-9.37	9th harm.
9213.50	V	122	245	17.45	31.48	48.93	53.98	-5.05	10th harm.
9213.50	H	153	315	17.45	31.51	48.96	53.98	-5.02	10th harm.

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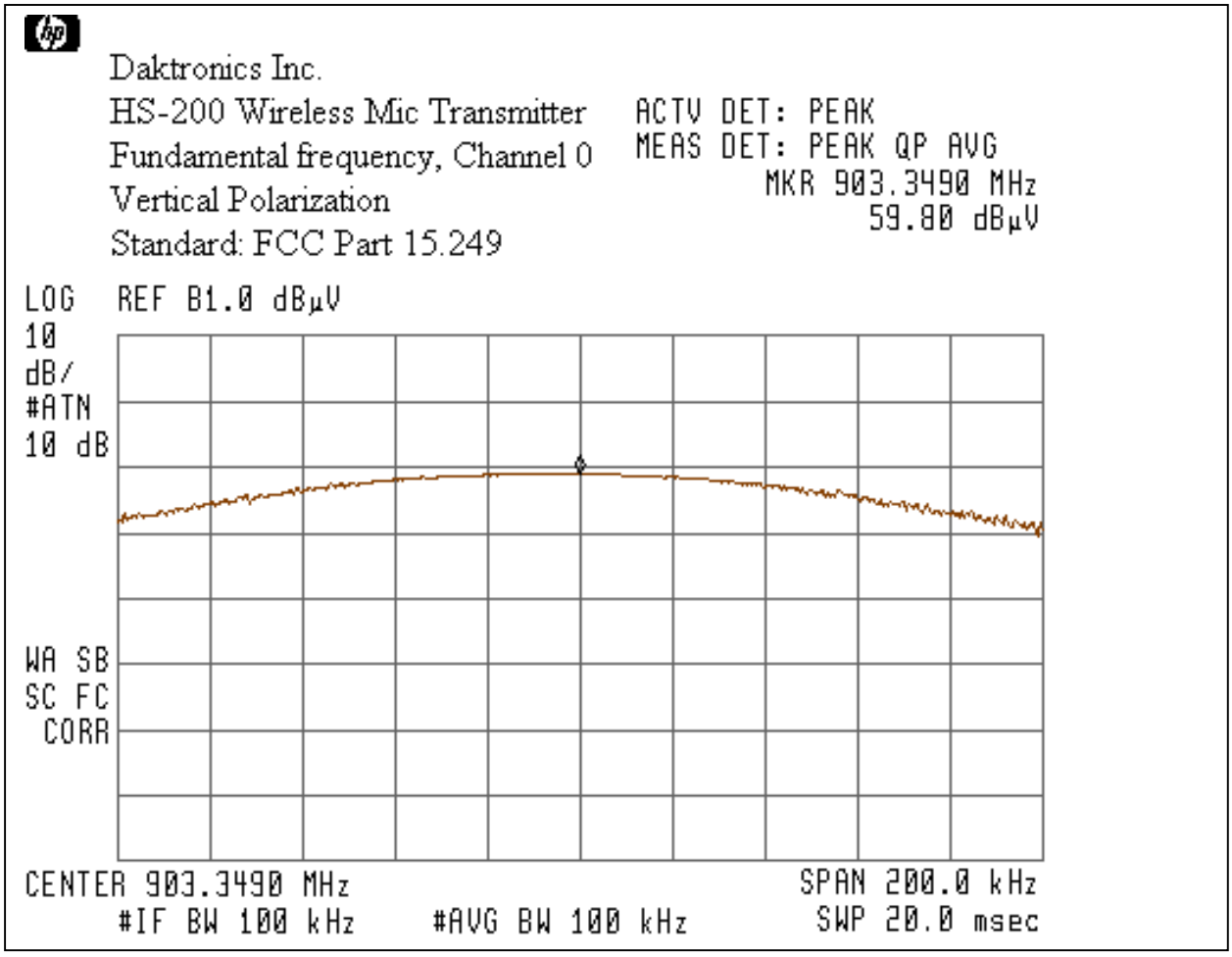
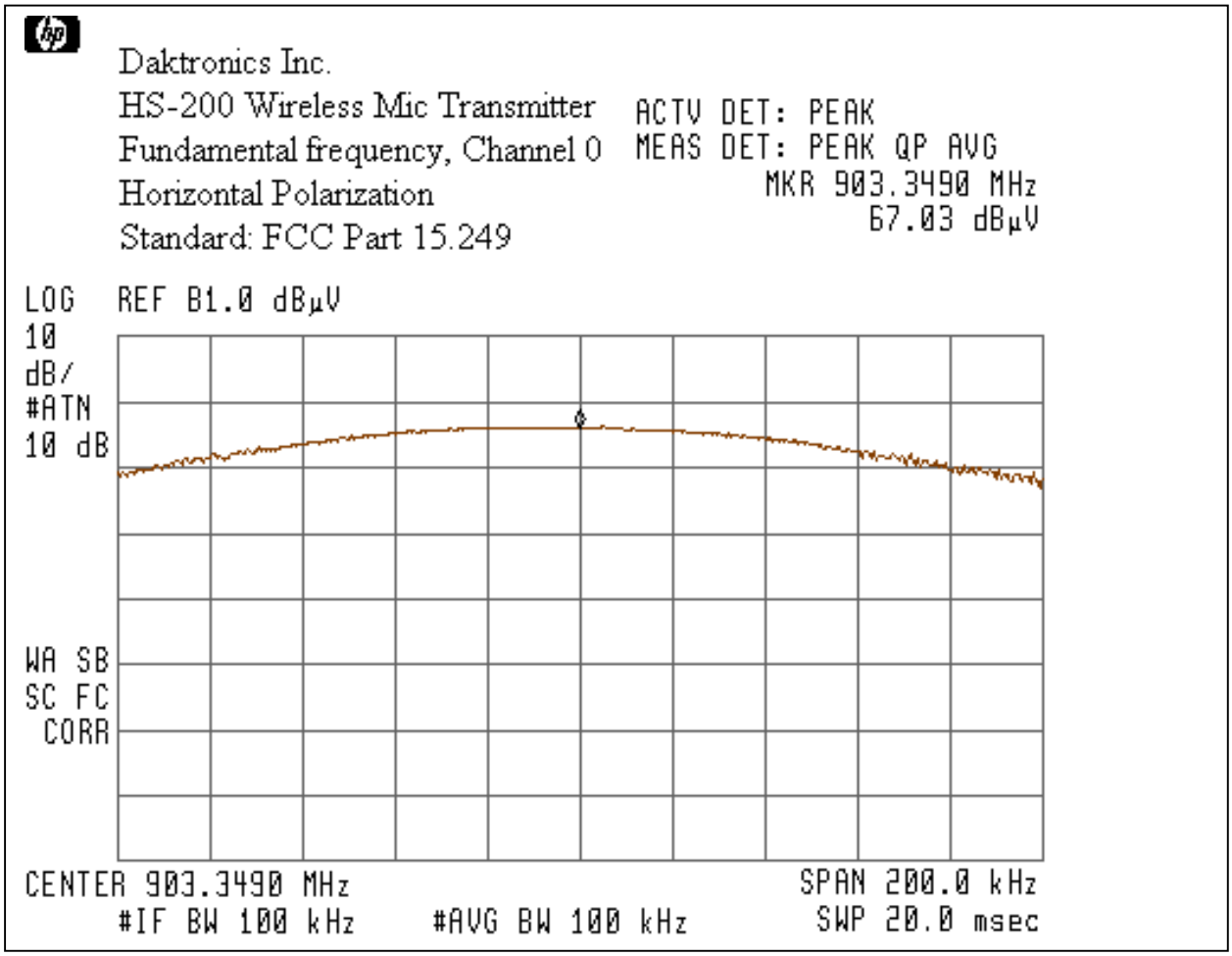
Graph # 3-1-1


Daktronics Inc.
HS-200 Wireless Mic Transmitter
Fundamental frequency, Channel 0
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 903.3490 MHz
59.80 dBµV
LOG
10
dB/
#ATN
10 dB
REF 81.0 dBµV
WA SB
SC FC
CORR
CENTER 903.3490 MHz
#IF BW 100 kHz
#AVG BW 100 kHz
SPAN 200.0 kHz
SWP 20.0 msec

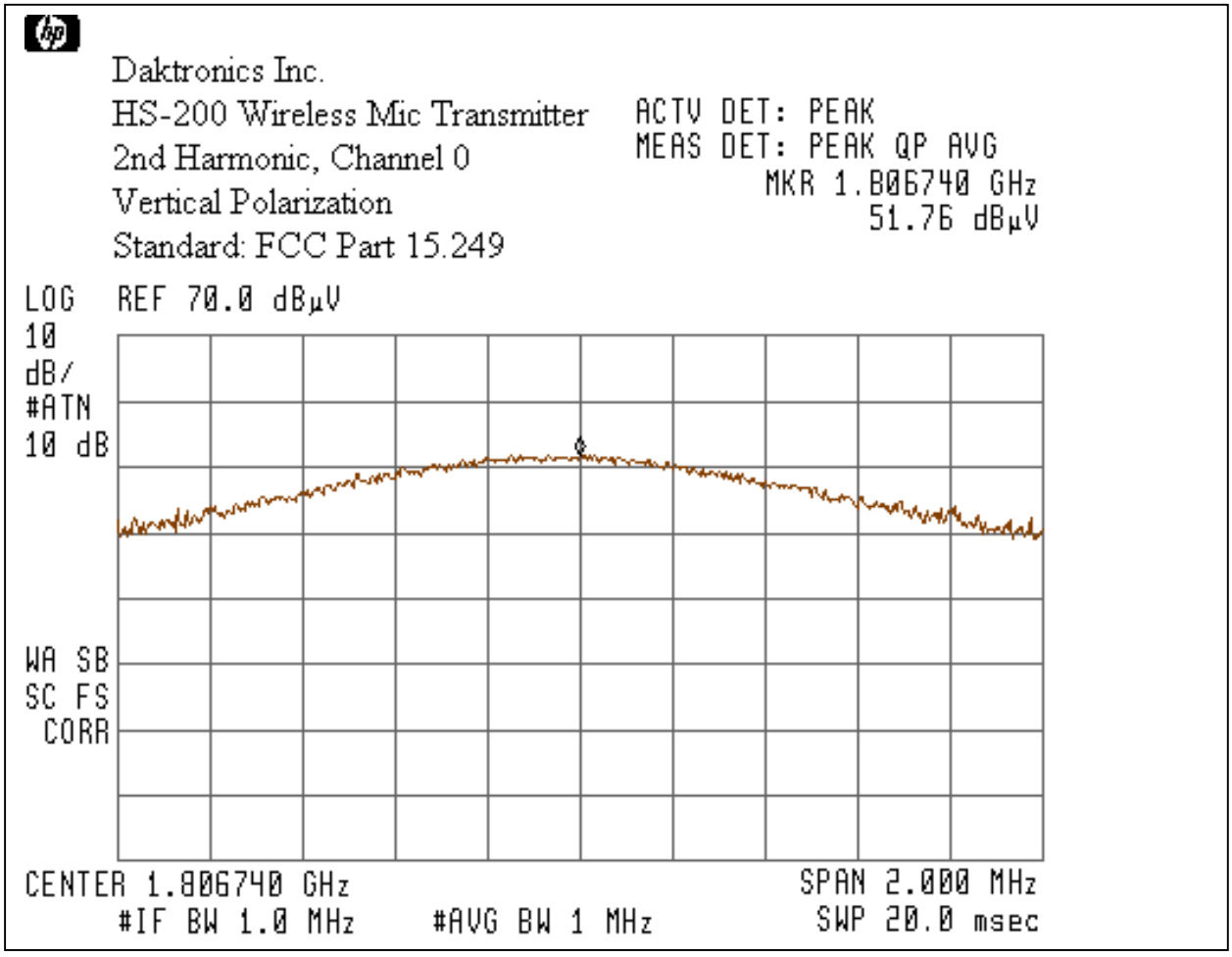
A

Graph # 3-1-2


Daktronics Inc.
HS-200 Wireless Mic Transmitter
Fundamental frequency, Channel 0
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 903.3490 MHz
67.03 dBµV
LOG
10
dB/
#ATN
10 dB
REF 81.0 dBµV
WA SB
SC FC
CORR
CENTER 903.3490 MHz
#IF BW 100 kHz
#AVG BW 100 kHz
SPAN 200.0 kHz
SWP 20.0 msec

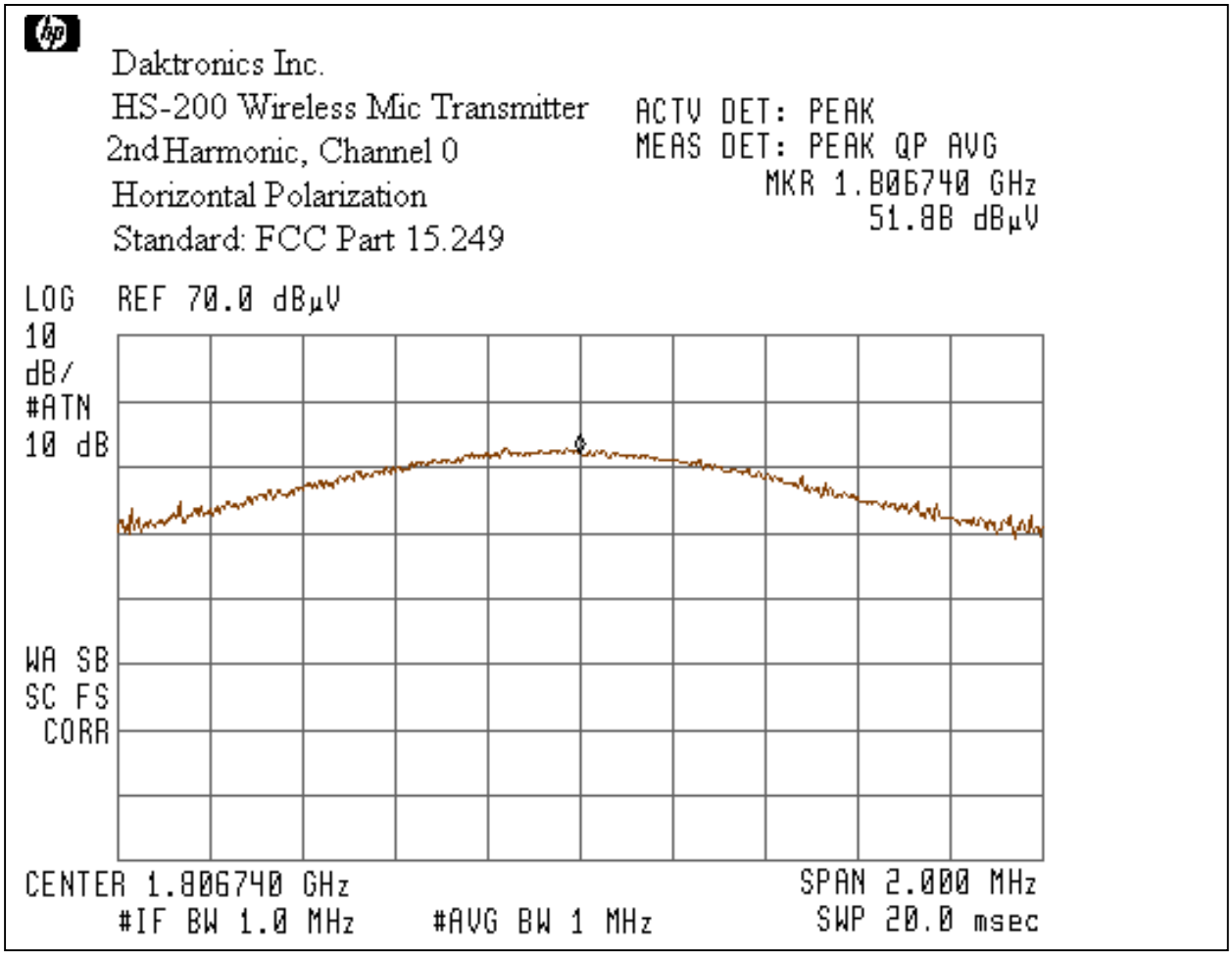
A

Graph # 3-1-3


Daktronics Inc.
HS-200 Wireless Mic Transmitter
2nd Harmonic, Channel 0
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.806740 GHz
51.76 dBµV
LOG
10
dB/
#ATN
10 dB
REF 70.0 dBµV
WA SB
SC FS
CORR
CENTER 1.806740 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
SWP 20.0 msec

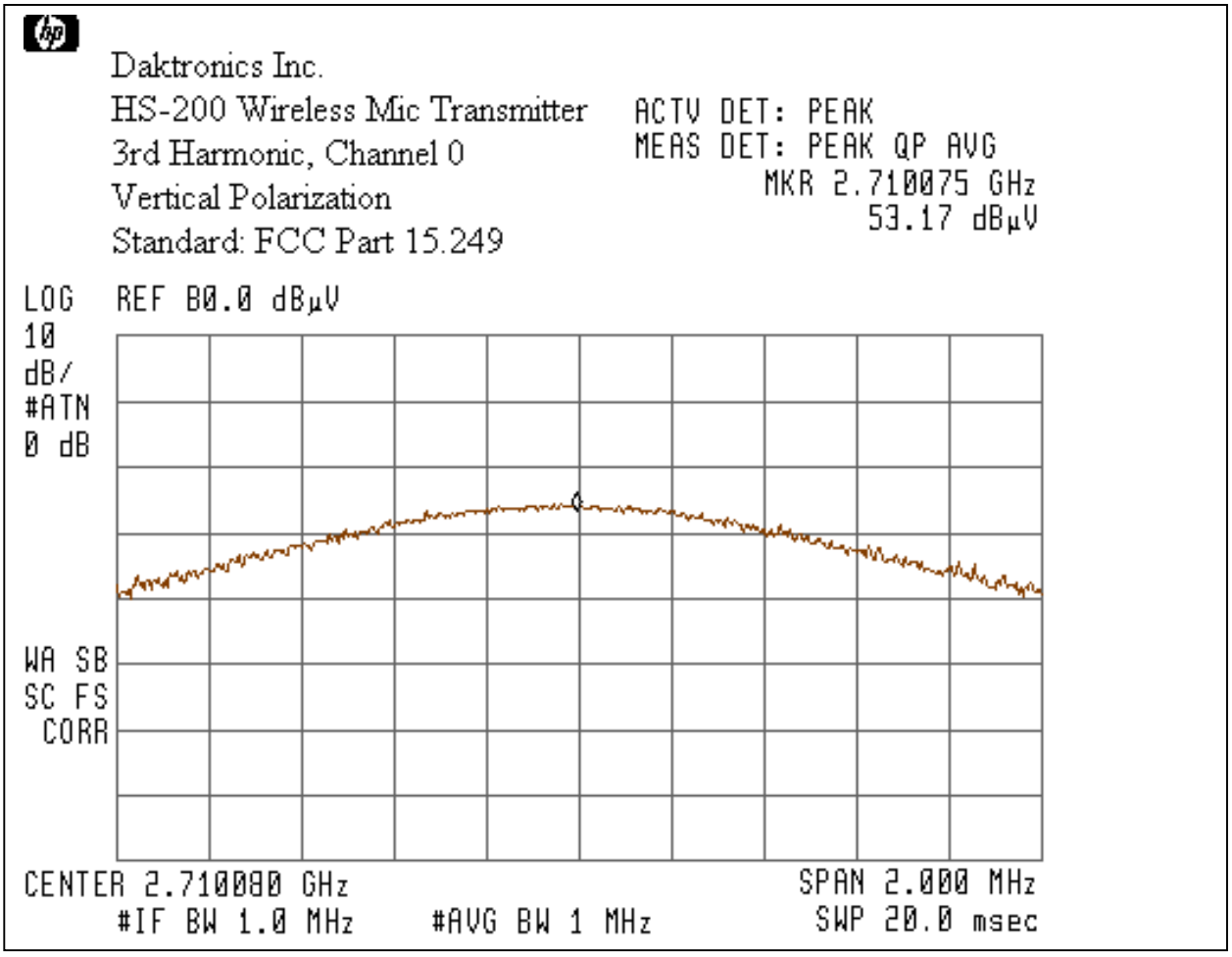
A

Graph # 3-1-4


Daktronics Inc.
HS-200 Wireless Mic Transmitter
2nd Harmonic, Channel 0
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.806740 GHz
51.88 dBµV
LOG
10
dB/
#ATN
10 dB
REF 70.0 dBµV
WA SB
SC FS
CORR
CENTER 1.806740 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
SWP 20.0 msec

A

Graph # 3-1-5


Daktronics Inc.
HS-200 Wireless Mic Transmitter
3rd Harmonic, Channel 0
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.710075 GHz
53.17 dBµV
LOG
10
dB/
#ATN
0 dB
REF 80.0 dBµV
WA SB
SC FS
CORR
CENTER 2.710080 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
SWP 20.0 msec

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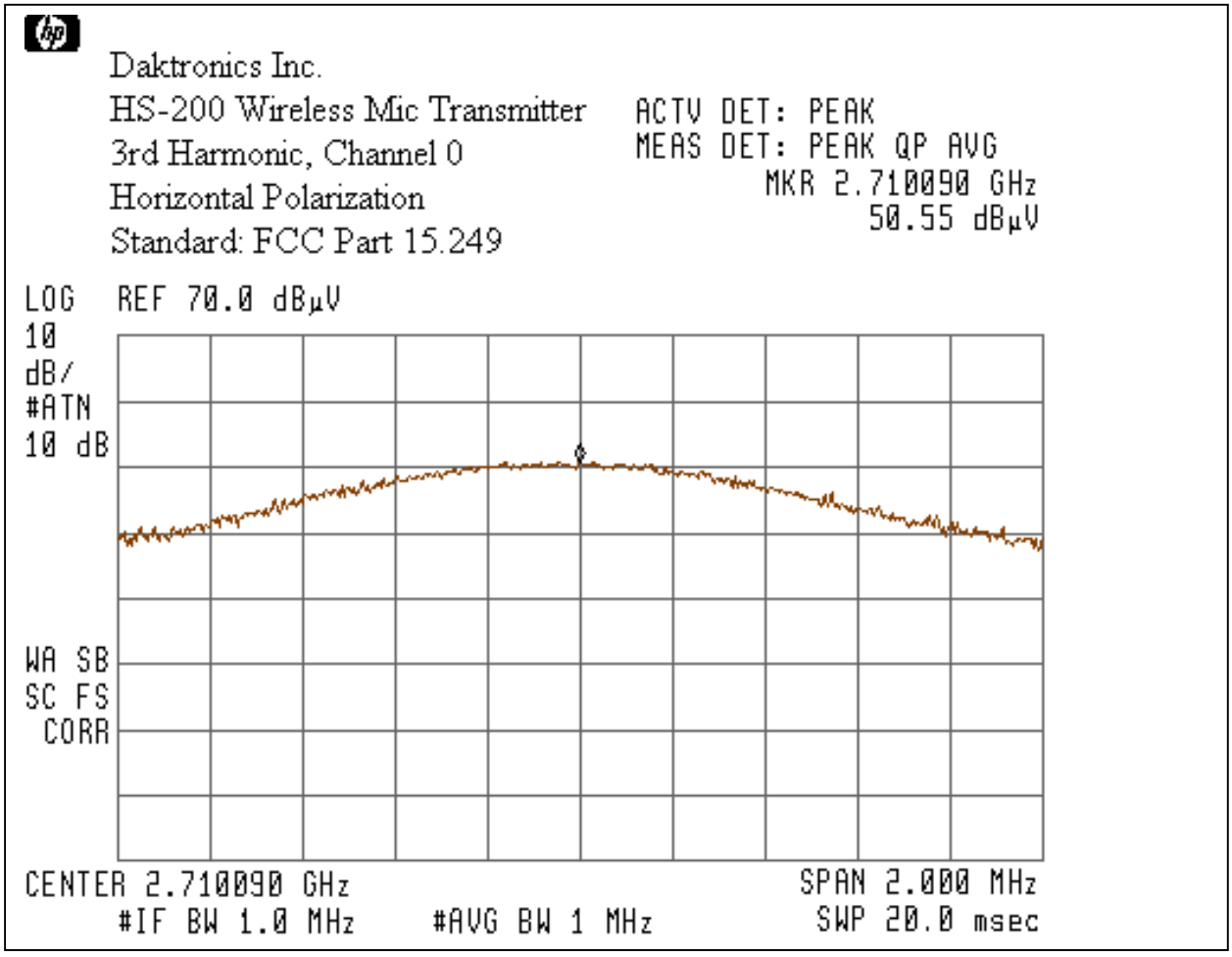
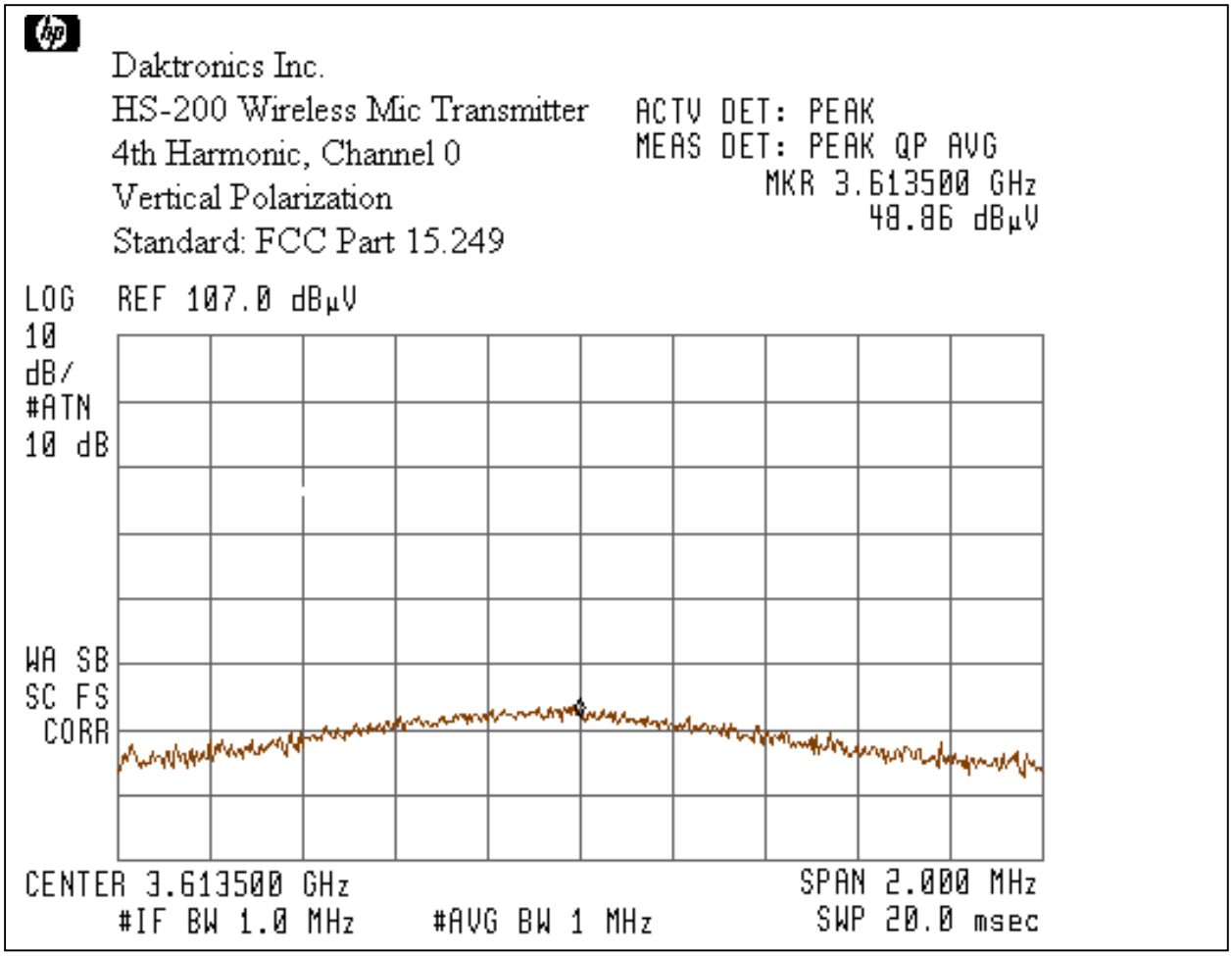
Graph # 3-1-6


Daktronics Inc.
HS-200 Wireless Mic Transmitter
3rd Harmonic, Channel 0
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.710090 GHz
50.55 dBµV
LOG REF 70.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FS
CORR
CENTER 2.710090 GHz
SPAN 2.000 MHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SWP 20.0 msec

A

Graph # 3-1-7


Daktronics Inc.
HS-200 Wireless Mic Transmitter
4th Harmonic, Channel 0
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 3.613500 GHz
48.86 dBµV
LOG
10
dB/
#ATN
10 dB
REF 107.0 dBµV
WA SB
SC FS
CORR
CENTER 3.613500 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
SWP 20.0 msec

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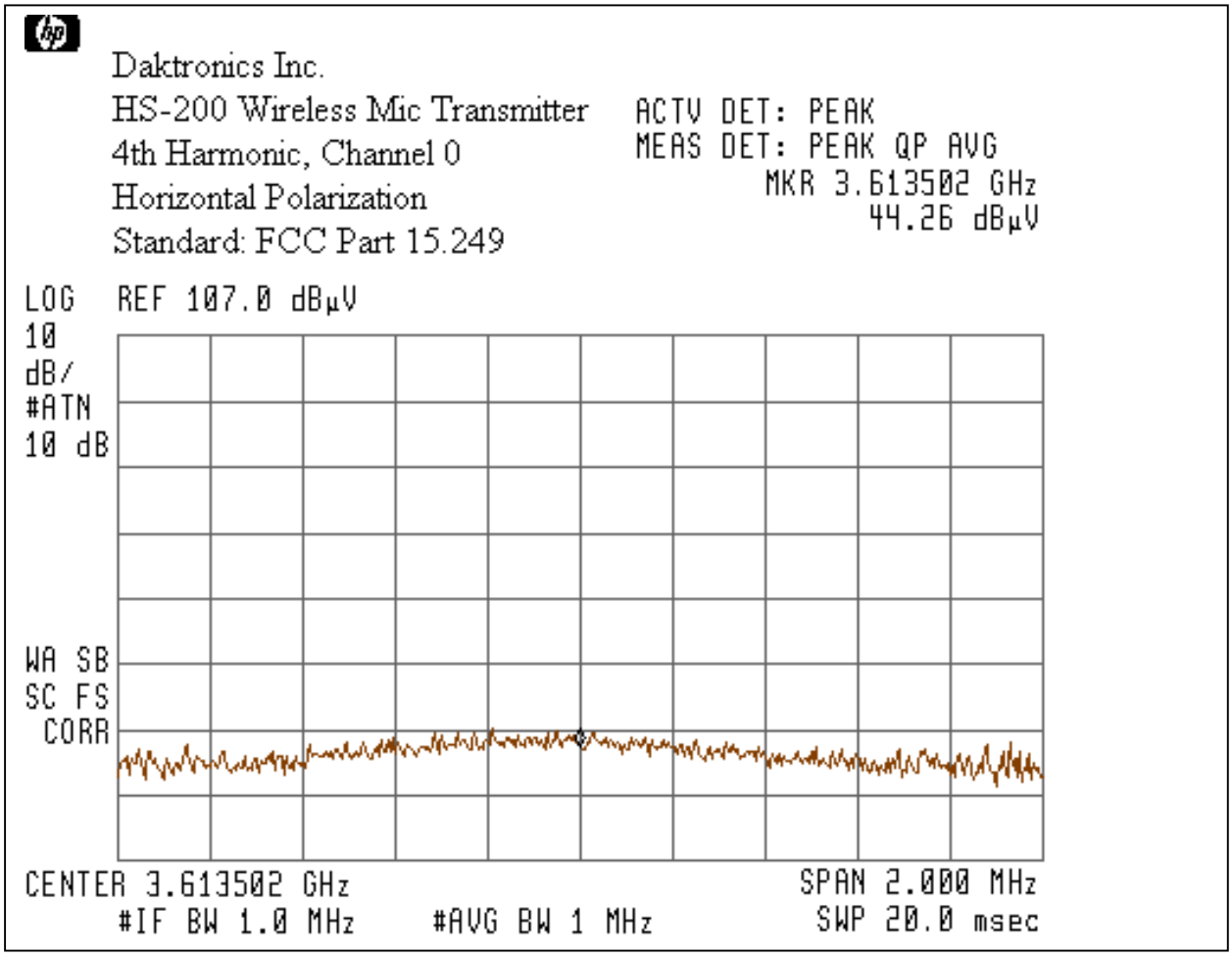
Graph # 3-1-8


Daktronics Inc.
HS-200 Wireless Mic Transmitter
4th Harmonic, Channel 0
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 3.613502 GHz
44.26 dBµV
LOG
10
dB/
#ATN
10 dB
REF 107.0 dBµV
WA SB
SC FS
CORR
CENTER 3.613502 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
SWP 20.0 msec

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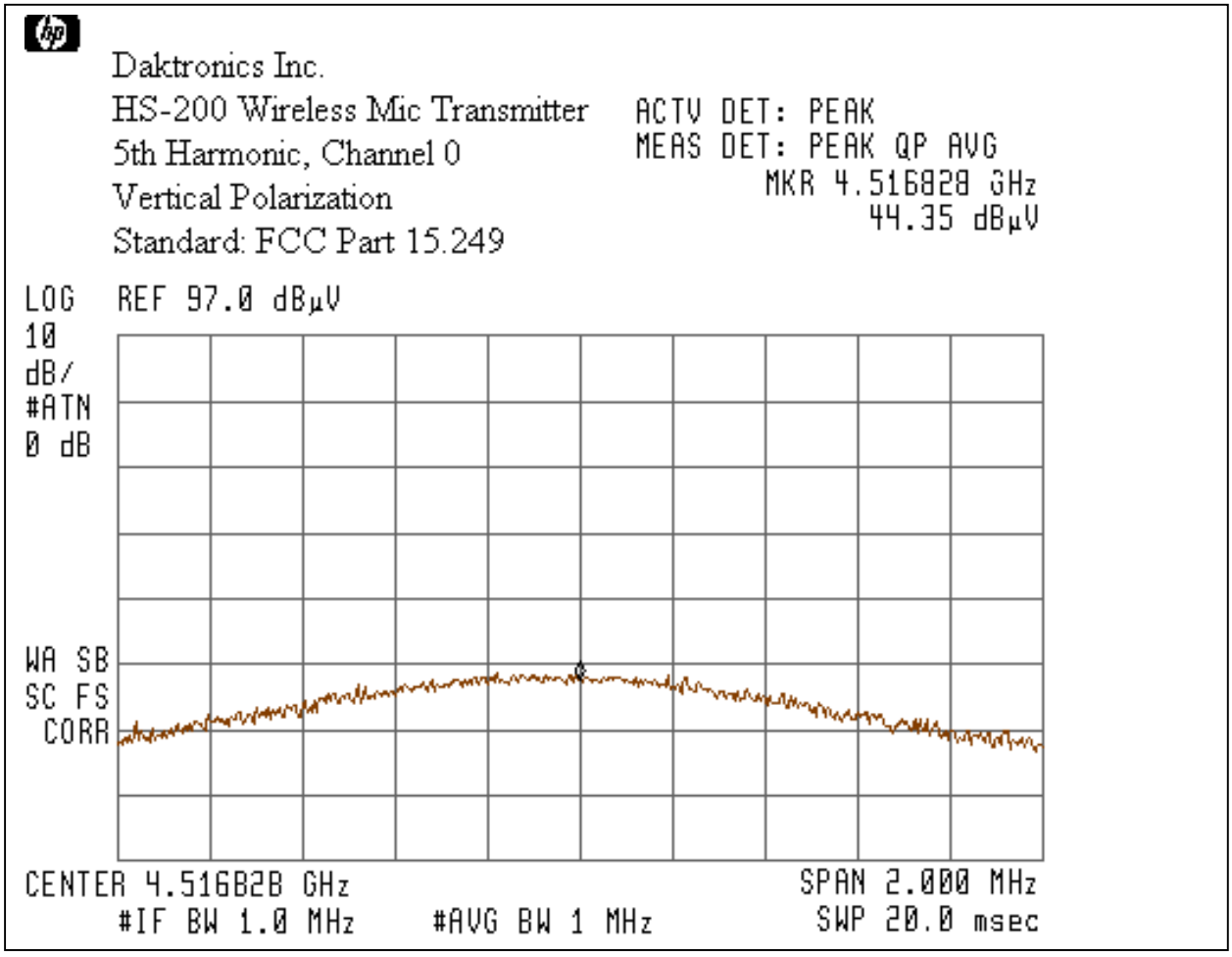
Graph # 3-1-9


Daktronics Inc.
HS-200 Wireless Mic Transmitter
5th Harmonic, Channel 0
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.516828 GHz
44.35 dBµV
LOG
10
dB/
#ATN
0 dB
REF 97.0 dBµV
WA SB
SC FS
CORR
CENTER 4.516828 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
SWP 20.0 msec

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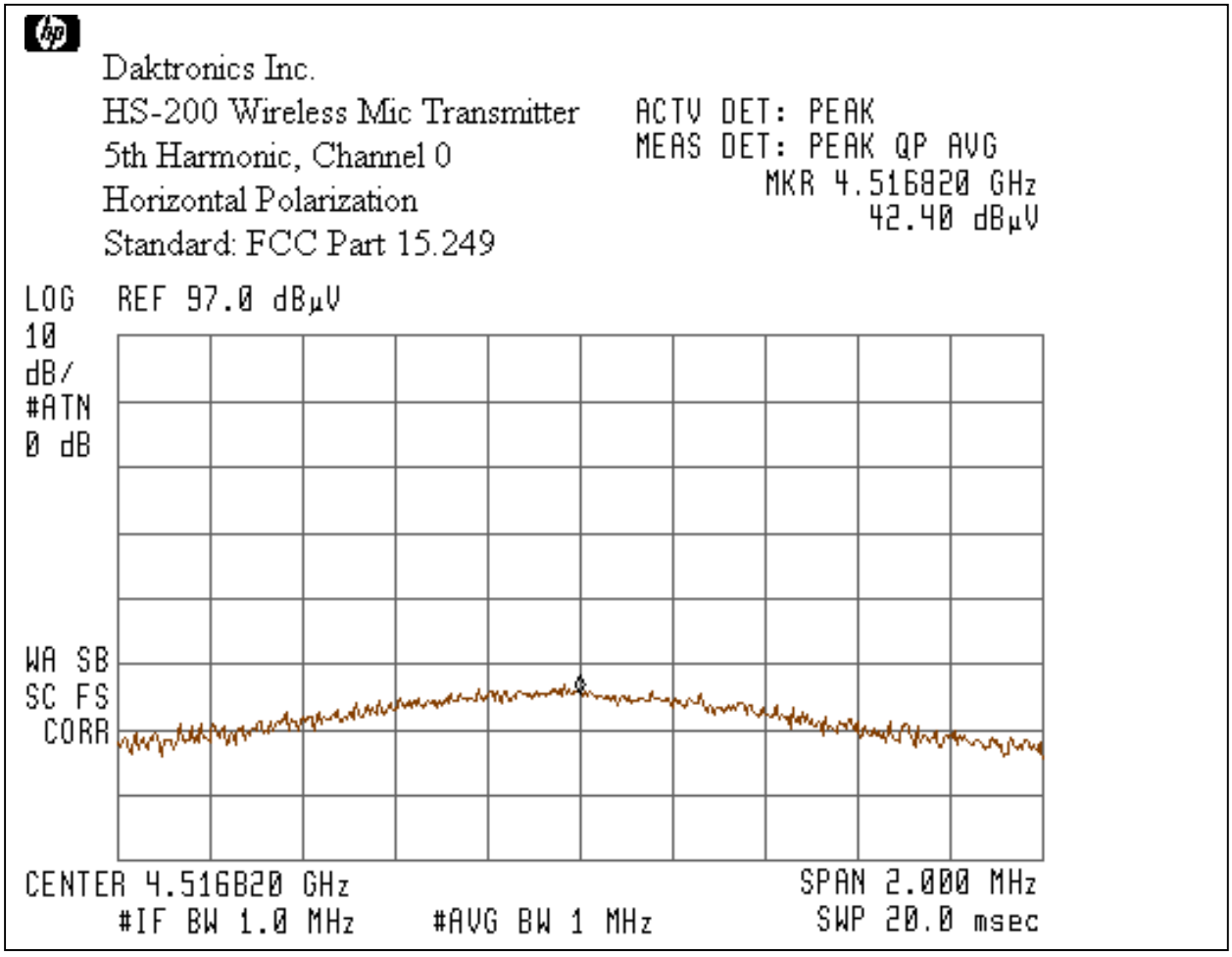
Graph # 3-1-10


Daktronics Inc.
HS-200 Wireless Mic Transmitter
5th Harmonic, Channel 0
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.516820 GHz
42.40 dBµV
LOG
10
dB/
#ATN
0 dB
REF 97.0 dBµV
WA SB
SC FS
CORR
CENTER 4.516820 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
SWP 20.0 msec

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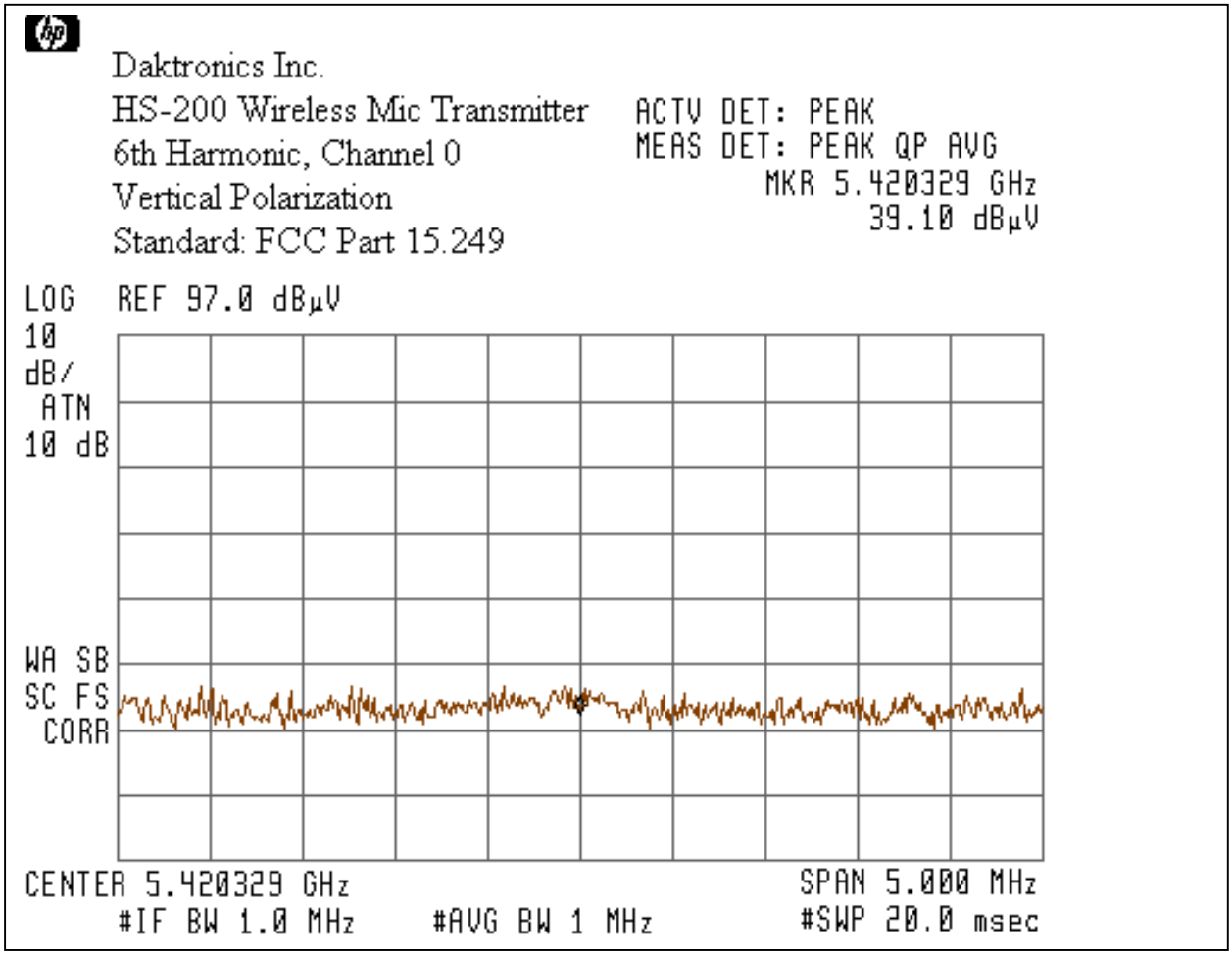
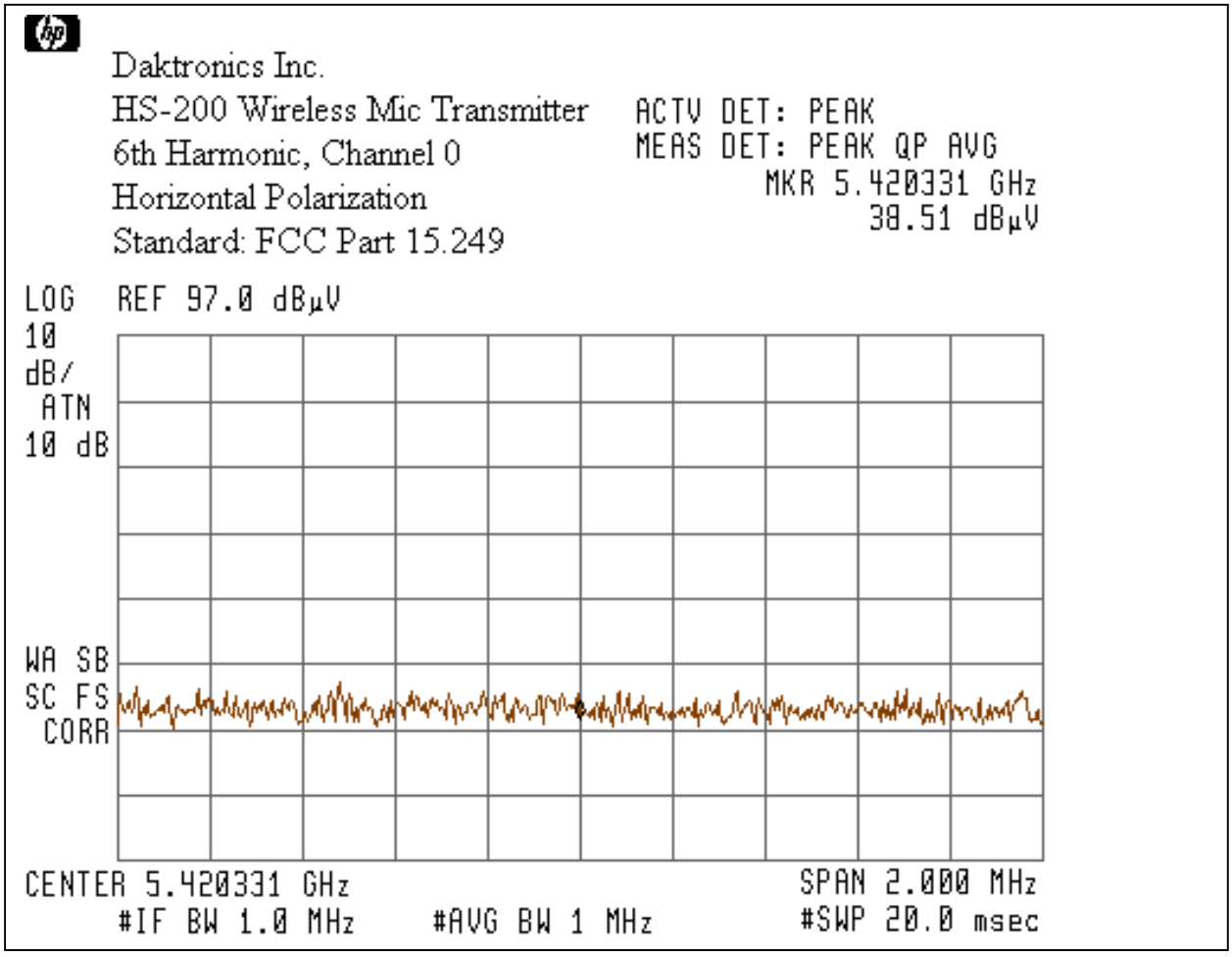
Graph # 3-1-11


Daktronics Inc.
HS-200 Wireless Mic Transmitter
6th Harmonic, Channel 0
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 5.420329 GHz
39.10 dBµV
LOG
10
dB/
ATN
10 dB
REF 97.0 dBµV
WA SB
SC FS
CORR
CENTER 5.420329 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 5.000 MHz
#SWP 20.0 msec

A

Graph # 3-1-12


Daktronics Inc.
HS-200 Wireless Mic Transmitter
6th Harmonic, Channel 0
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 5.420331 GHz
38.51 dBµV
LOG REF 97.0 dBµV
10
dB/
ATN
10 dB
WA SB
SC FS
CORR
CENTER 5.420331 GHz
SPAN 2.000 MHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
#SWP 20.0 msec

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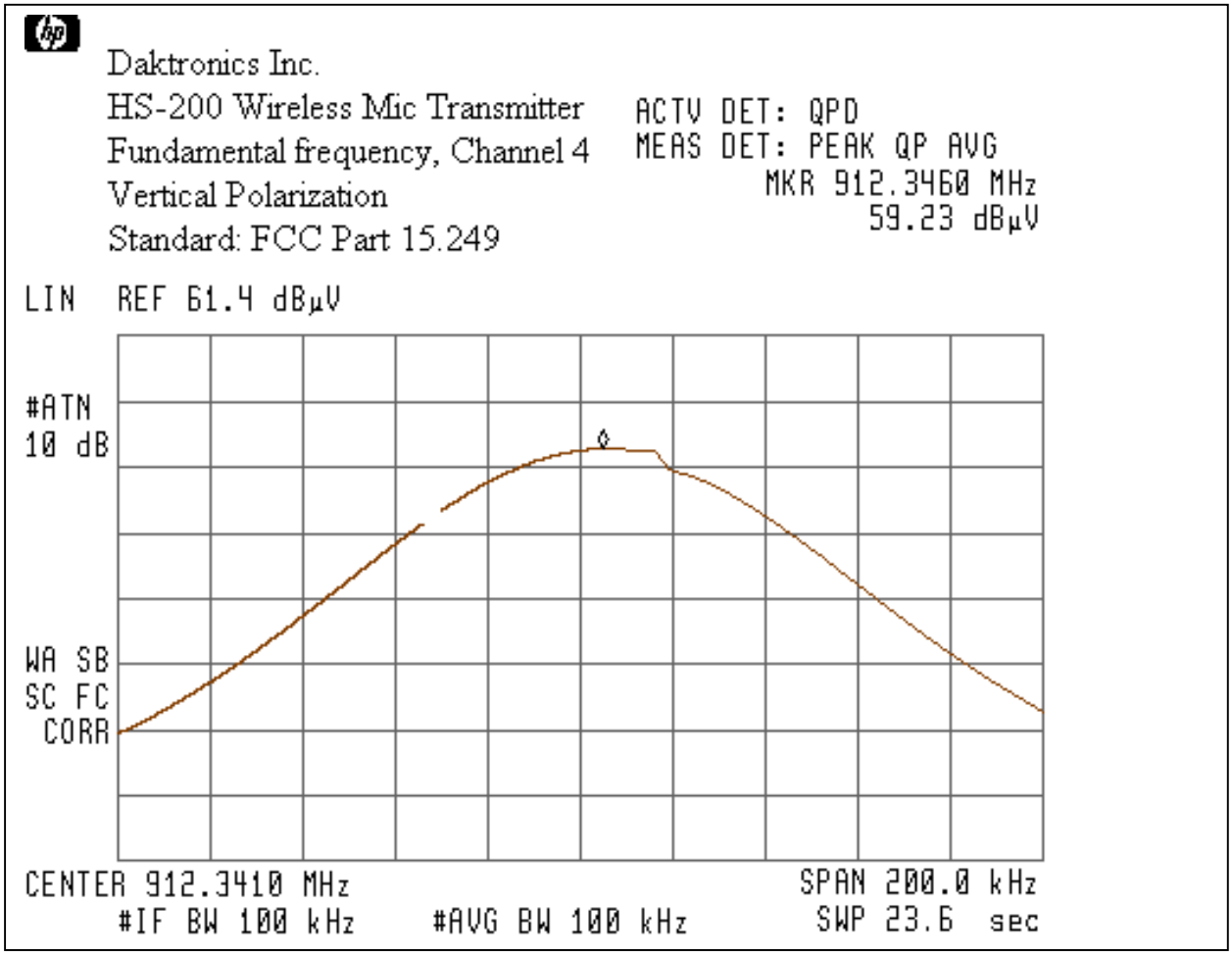
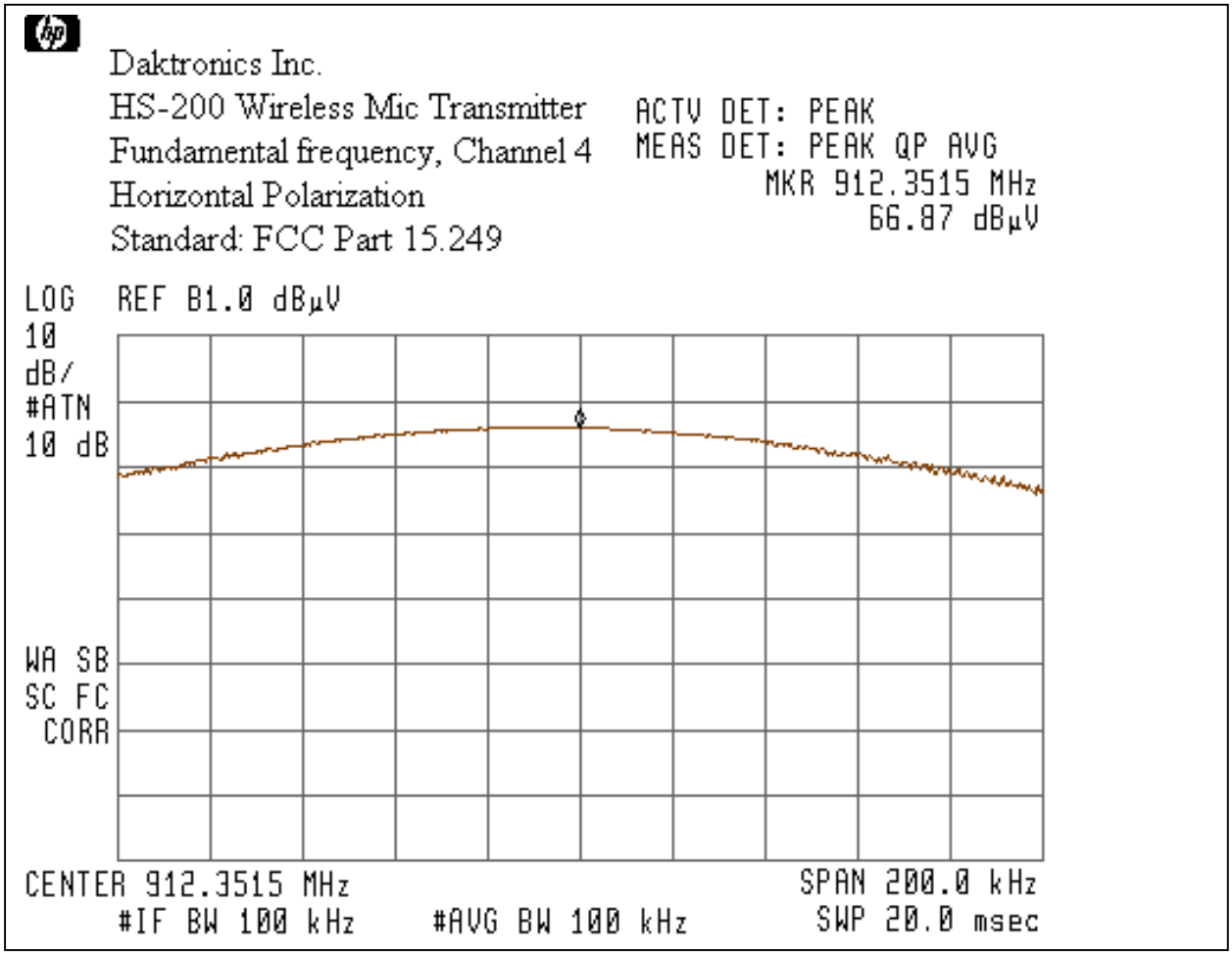
Graph # 3-1-13


Daktronics Inc.
HS-200 Wireless Mic Transmitter
Fundamental frequency, Channel 4
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: QPD
MEAS DET: PEAK QP AVG
MKR 912.3460 MHz
59.23 dBµV
LIN REF 61.4 dBµV
#ATN
10 dB
WA SB
SC FC
CORR
CENTER 912.3410 MHz
SPAN 200.0 kHz
#IF BW 100 kHz
#AVG BW 100 kHz
SWP 23.6 sec

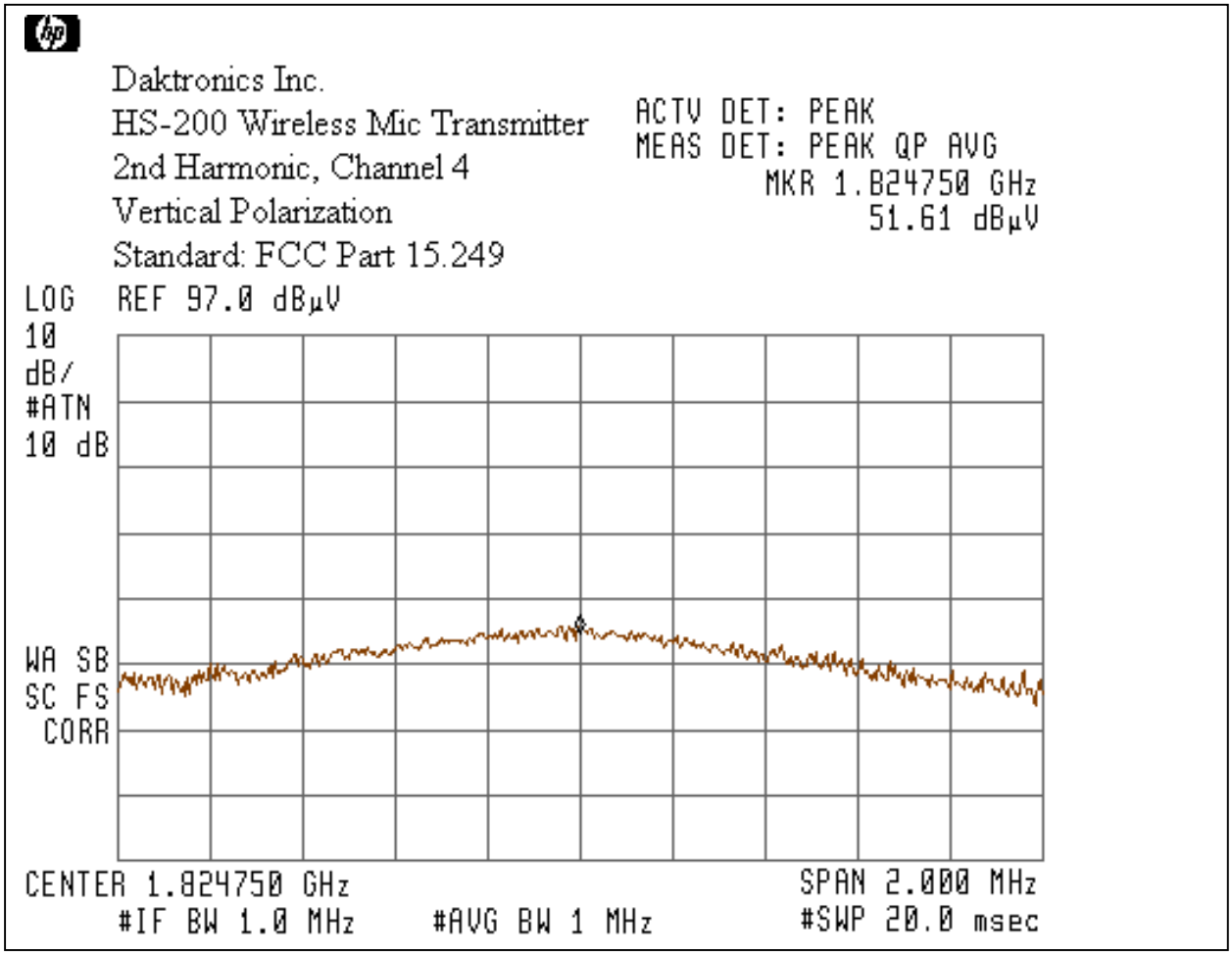
A

Graph # 3-1-14


Daktronics Inc.
HS-200 Wireless Mic Transmitter
Fundamental frequency, Channel 4
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 912.3515 MHz
66.87 dBµV
LOG REF 81.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FC
CORR
CENTER 912.3515 MHz
SPAN 200.0 kHz
#IF BW 100 kHz
#AVG BW 100 kHz
SWP 20.0 msec

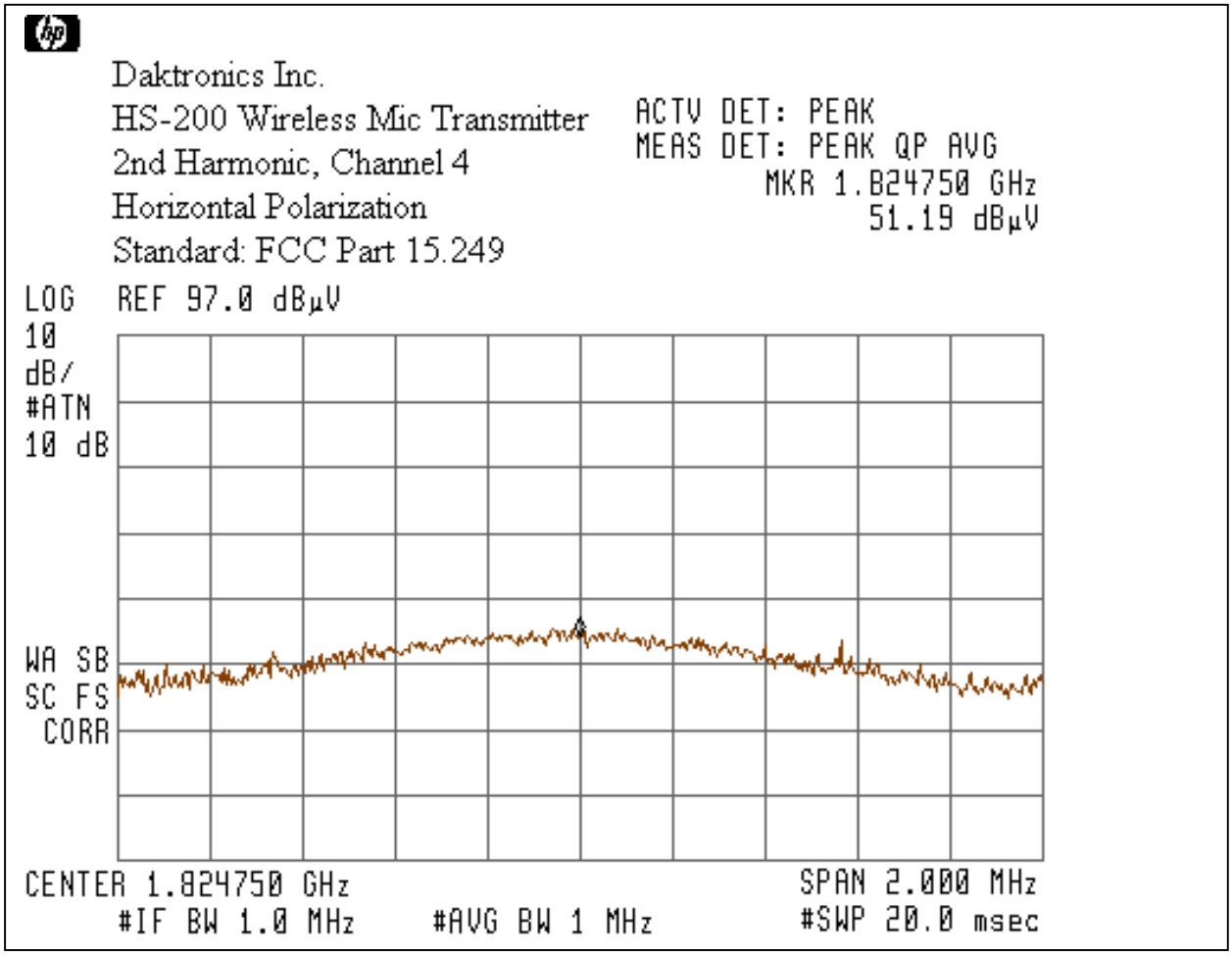
A

Graph # 3-1-15


Daktronics Inc.
HS-200 Wireless Mic Transmitter
2nd Harmonic, Channel 4
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.824750 GHz
51.61 dBµV
LOG REF 97.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FS
CORR
CENTER 1.824750 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

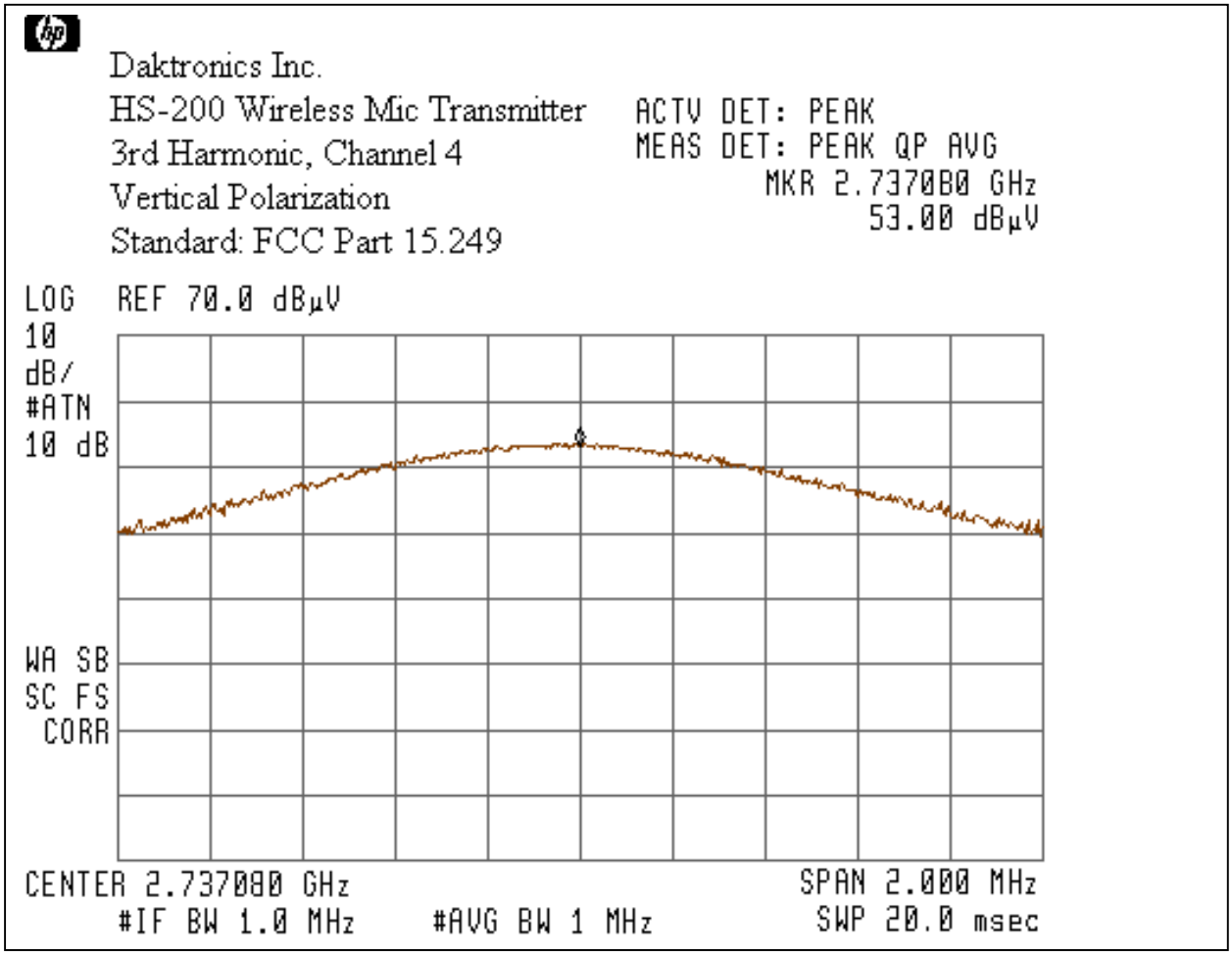
A

Graph # 3-1-16


Daktronics Inc.
HS-200 Wireless Mic Transmitter
2nd Harmonic, Channel 4
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.824750 GHz
51.19 dBµV
LOG REF 97.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FS
CORR
CENTER 1.824750 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

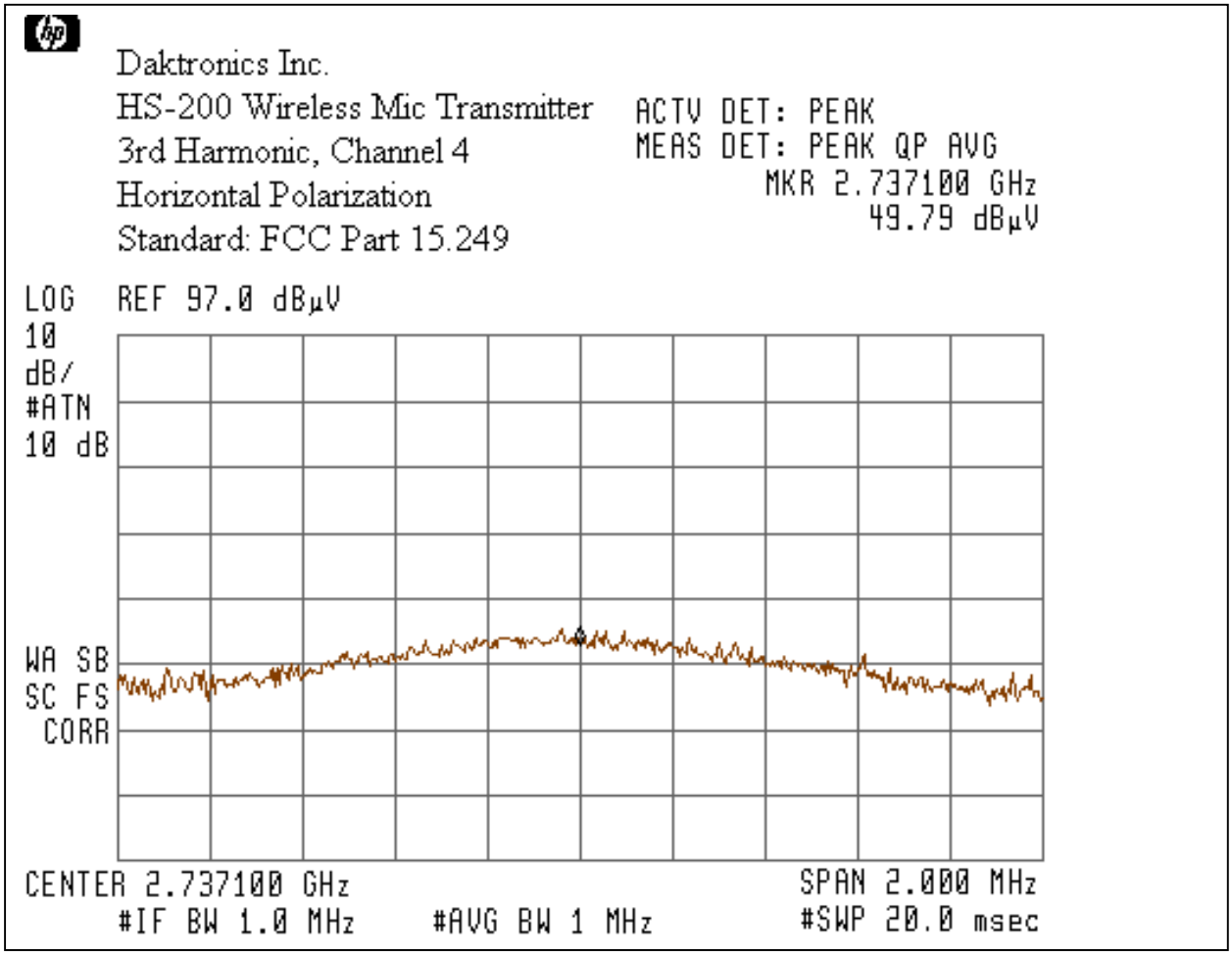
A

Graph # 3-1-17


Daktronics Inc.
HS-200 Wireless Mic Transmitter
3rd Harmonic, Channel 4
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.737080 GHz
53.00 dBµV
LOG REF 70.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FS
CORR
CENTER 2.737080 GHz
SPAN 2.000 MHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SWP 20.0 msec

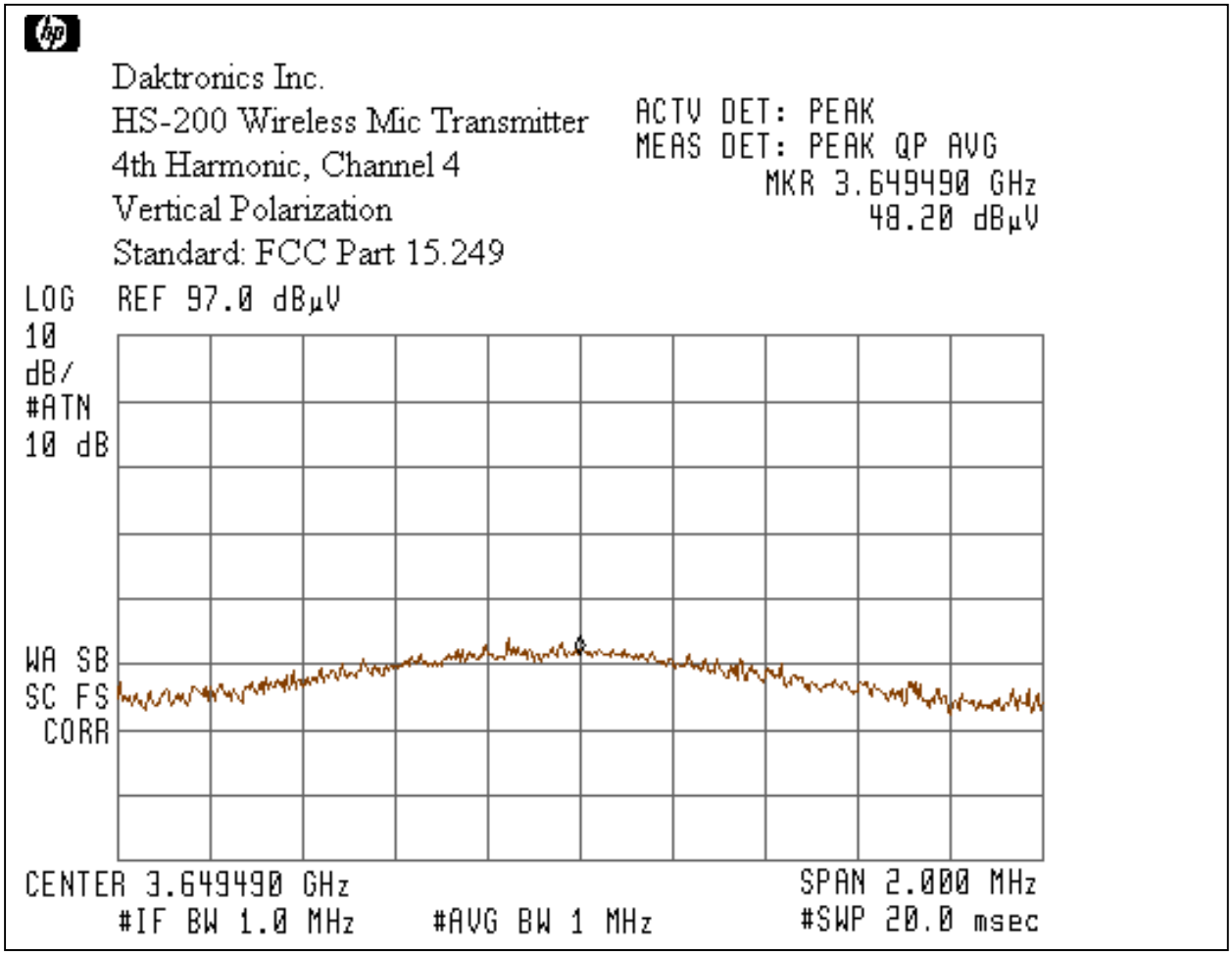
A

Graph # 3-1-18


Daktronics Inc.
HS-200 Wireless Mic Transmitter
3rd Harmonic, Channel 4
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.737100 GHz
49.79 dBµV
LOG
10
dB/
#ATN
10 dB
REF 97.0 dBµV
WA SB
SC FS
CORR
CENTER 2.737100 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

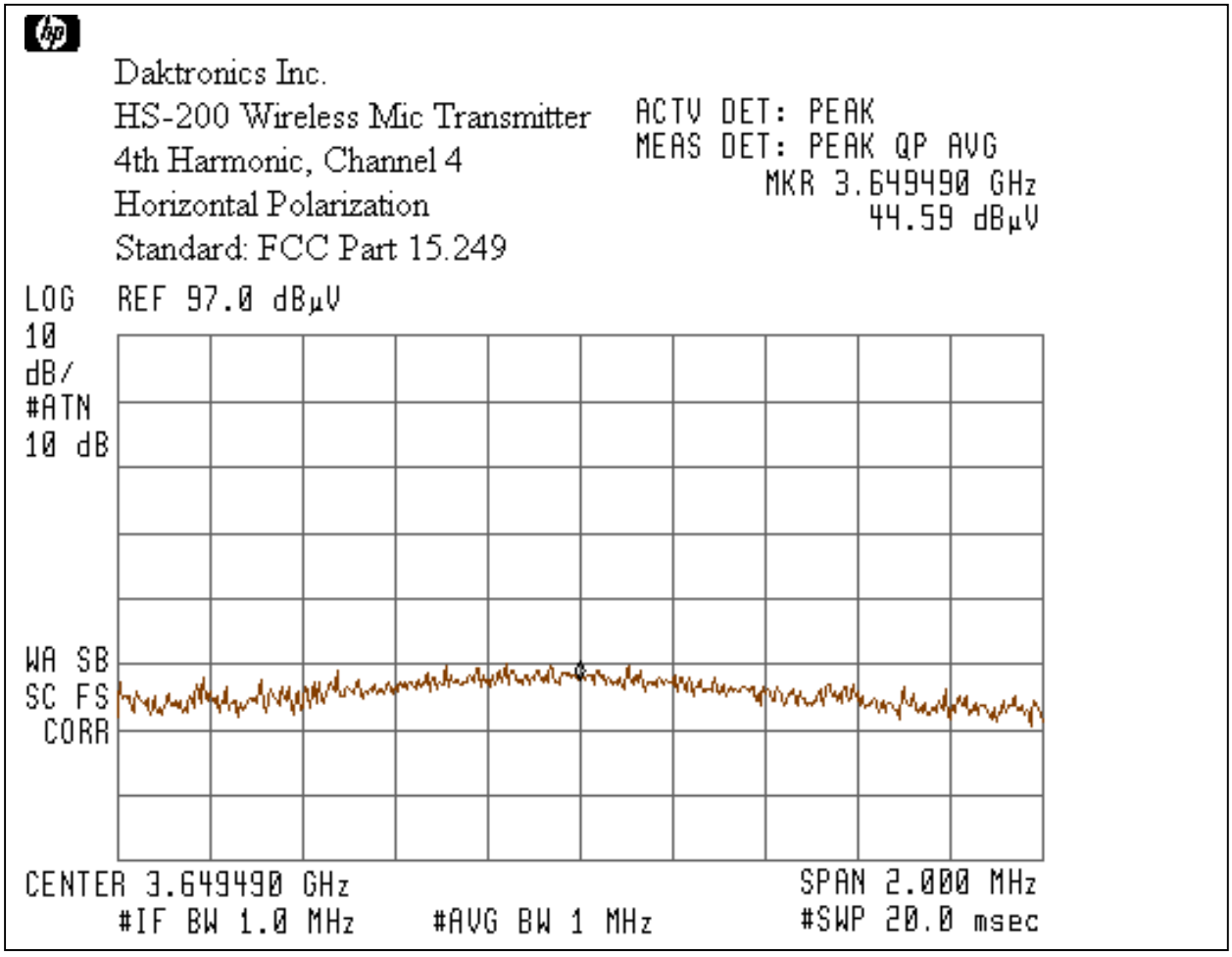
A

Graph # 3-1-19


Daktronics Inc.
HS-200 Wireless Mic Transmitter
4th Harmonic, Channel 4
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 3.649490 GHz
48.20 dBµV
LOG REF 97.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FS
CORR
CENTER 3.649490 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

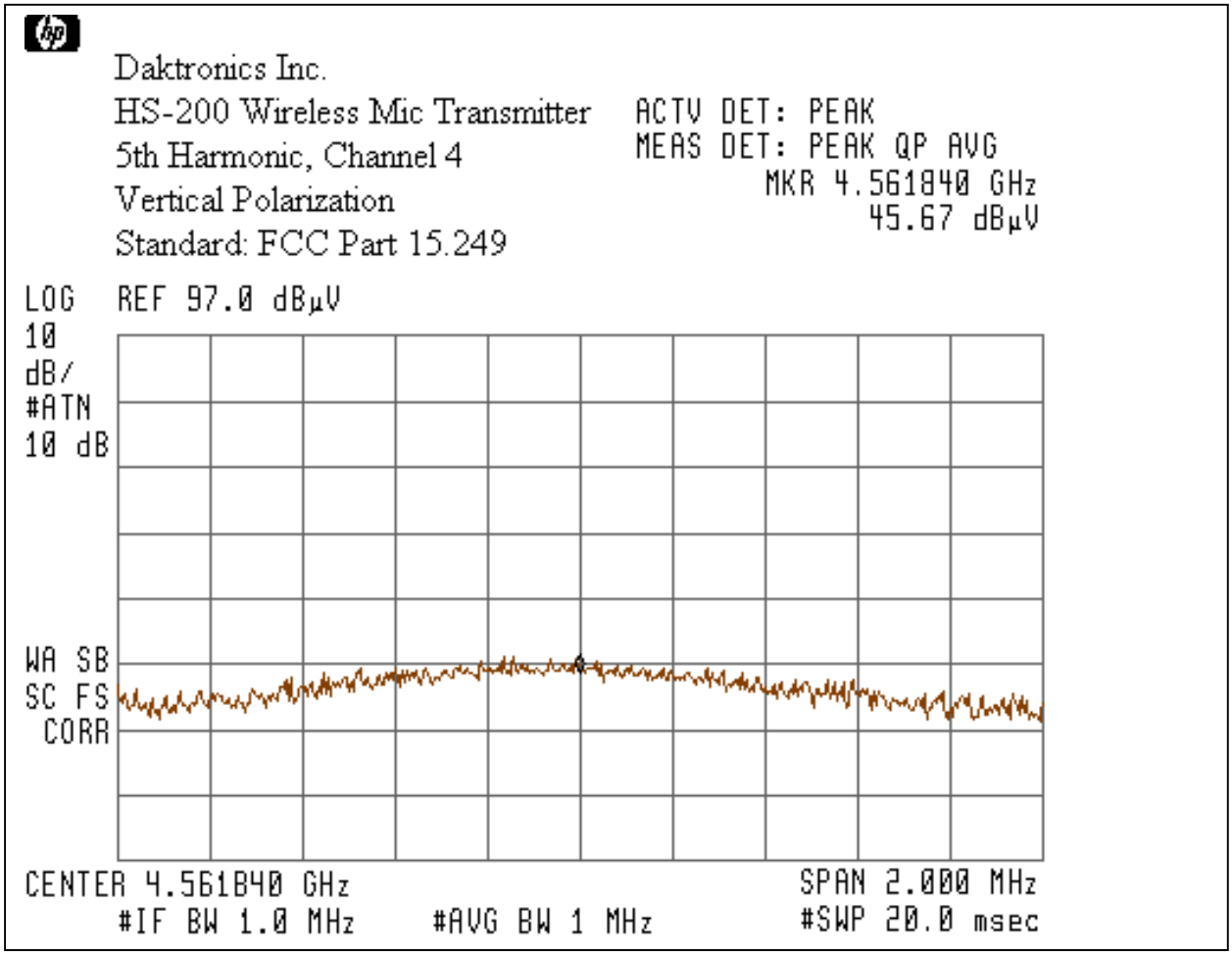
A

Graph # 3-1-20


Daktronics Inc.
HS-200 Wireless Mic Transmitter
4th Harmonic, Channel 4
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 3.649490 GHz
44.59 dBµV
LOG
10
dB/
#ATN
10 dB
REF 97.0 dBµV
WA SB
SC FS
CORR
CENTER 3.649490 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

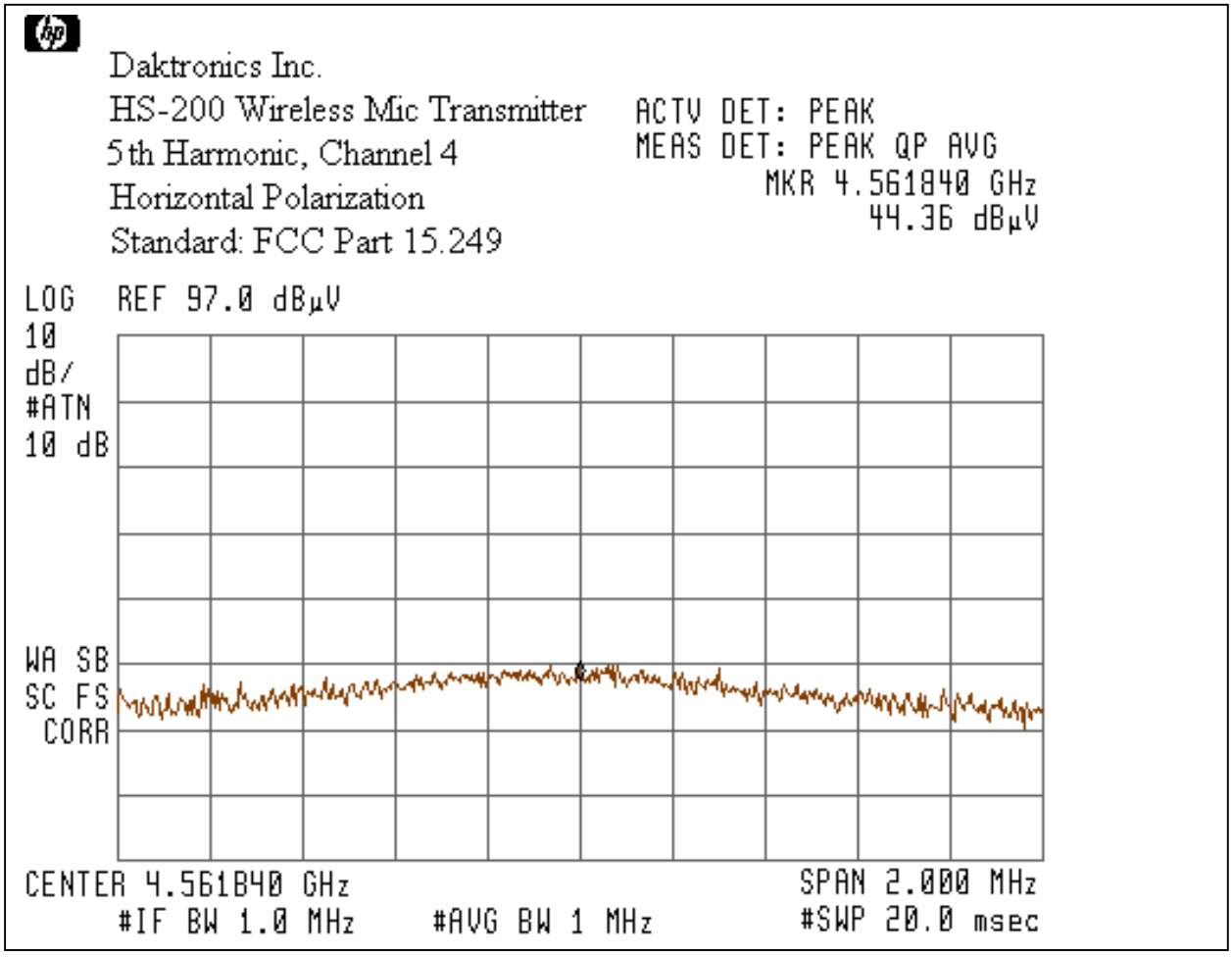
A

Graph # 3-1-21


Daktronics Inc.
HS-200 Wireless Mic Transmitter
5th Harmonic, Channel 4
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.561840 GHz
45.67 dBµV
LOG
10
dB/
#ATN
10 dB
REF 97.0 dBµV
WA SB
SC FS
CORR
CENTER 4.561840 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

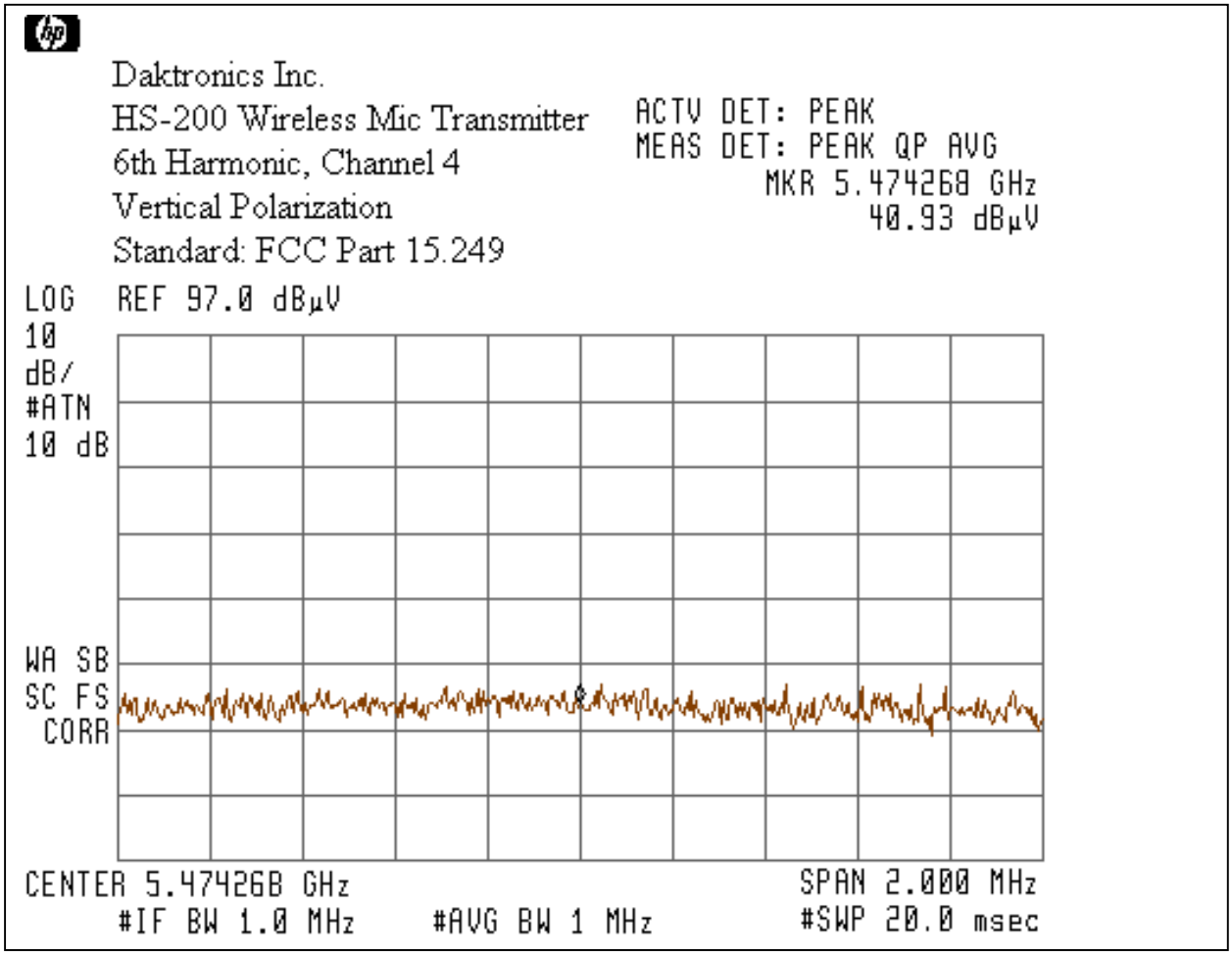
A

Graph # 3-1-22


Daktronics Inc.
HS-200 Wireless Mic Transmitter
5th Harmonic, Channel 4
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.561840 GHz
44.36 dBµV
LOG REF 97.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FS
CORR
CENTER 4.561840 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

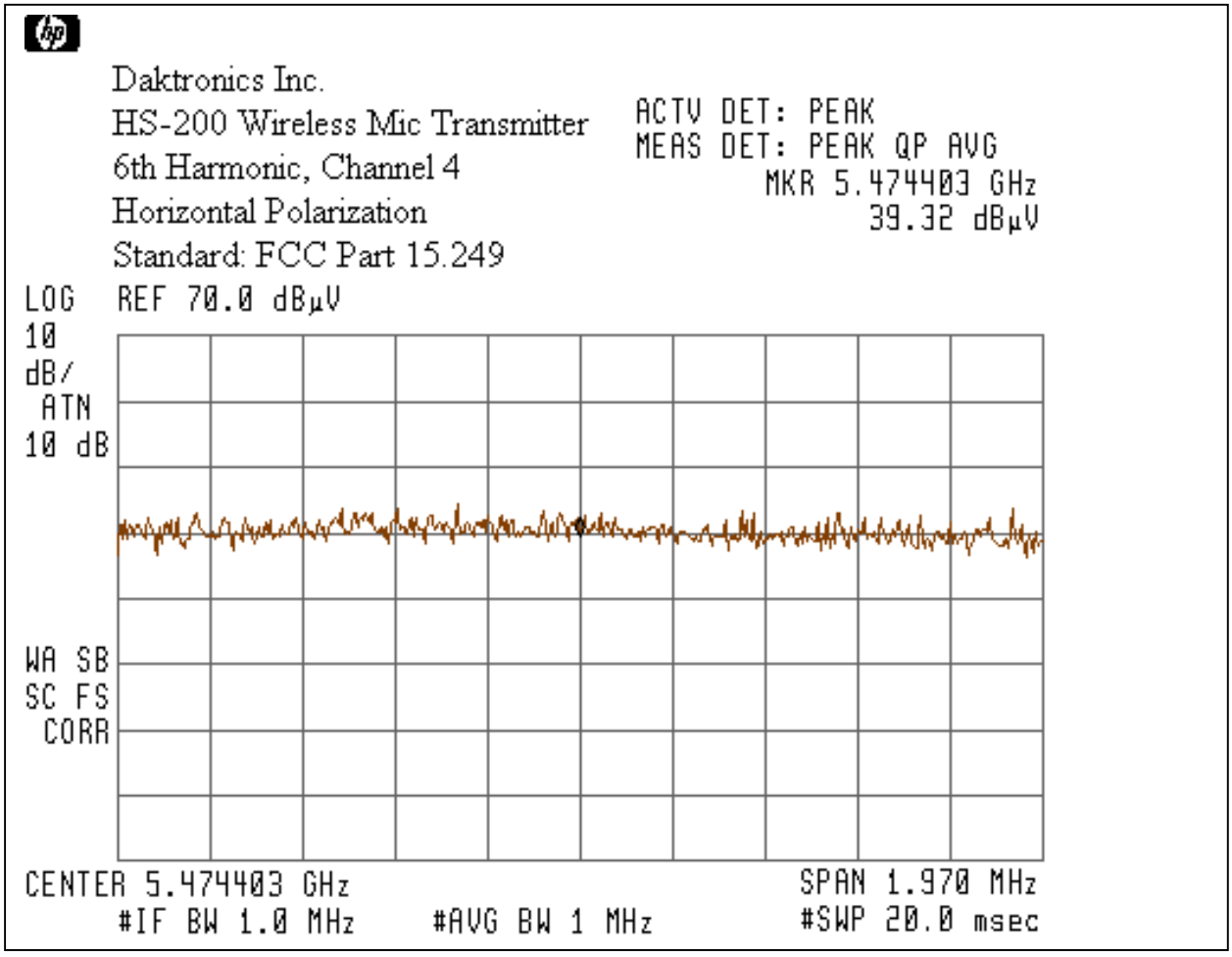
A

Graph # 3-1-23


Daktronics Inc.
HS-200 Wireless Mic Transmitter
6th Harmonic, Channel 4
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 5.474268 GHz
40.93 dBµV
LOG REF 97.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FS
CORR
CENTER 5.474268 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

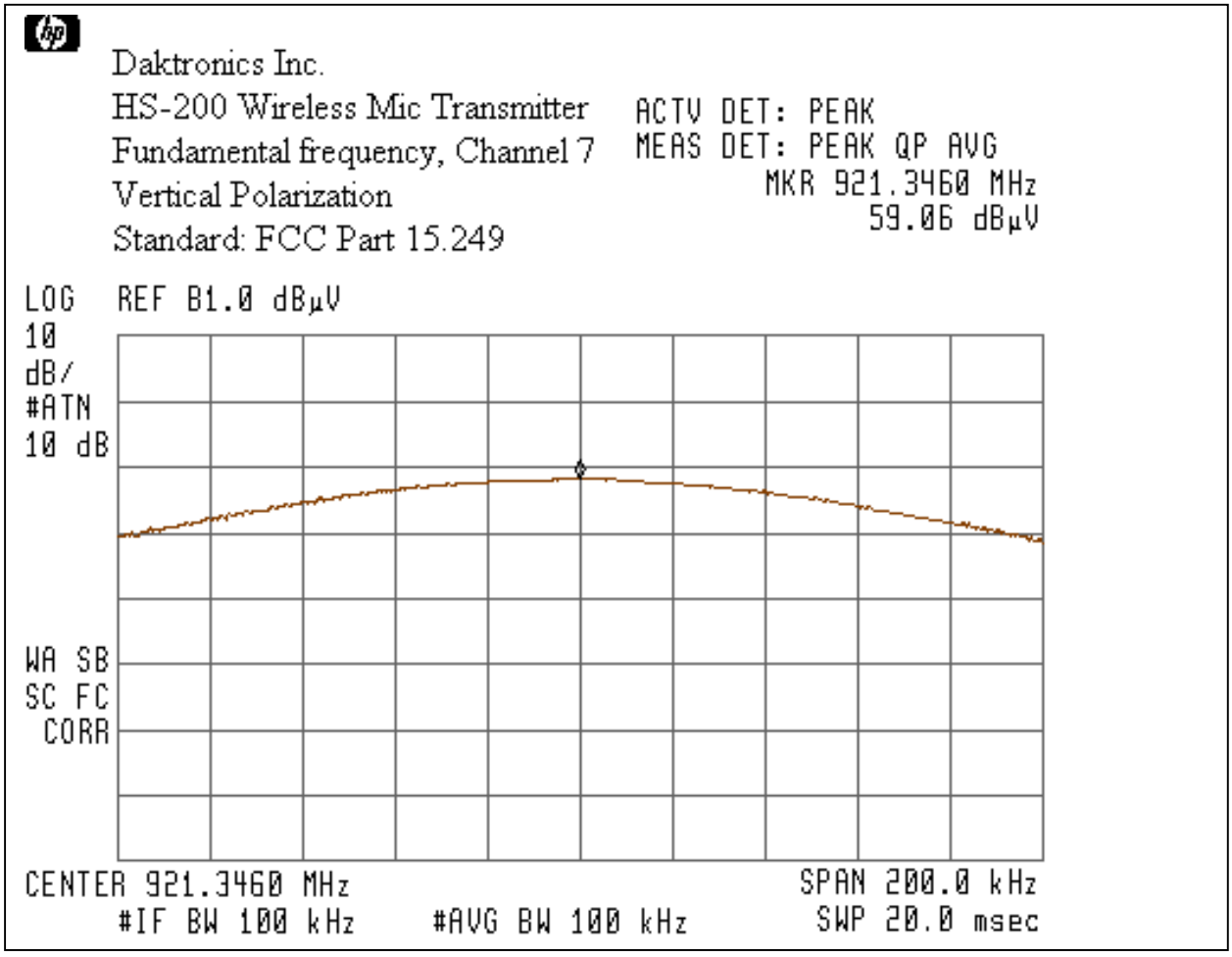
A

Graph # 3-1-24


Daktronics Inc.
HS-200 Wireless Mic Transmitter
6th Harmonic, Channel 4
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 5.474403 GHz
39.32 dBµV
LOG REF 70.0 dBµV
10 dB/
ATN 10 dB
WA SB
SC FS
CORR
CENTER 5.474403 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 1.970 MHz
#SWP 20.0 msec

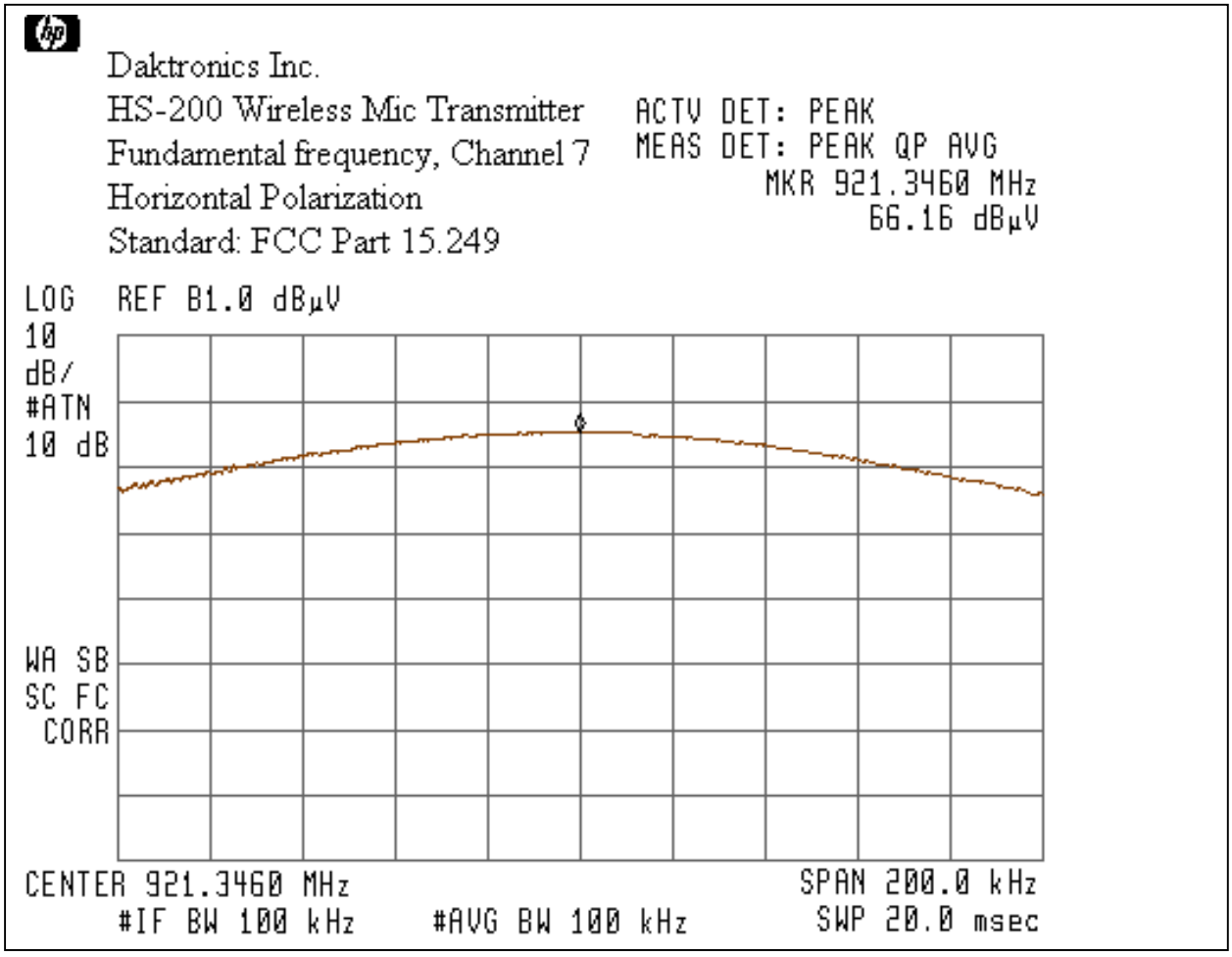
A

Graph # 3-1-25


Daktronics Inc.
HS-200 Wireless Mic Transmitter
Fundamental frequency, Channel 7
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 921.3460 MHz
59.06 dBµV
LOG REF 81.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FC
CORR
CENTER 921.3460 MHz
SPAN 200.0 kHz
#IF BW 100 kHz
#AVG BW 100 kHz
SWP 20.0 msec

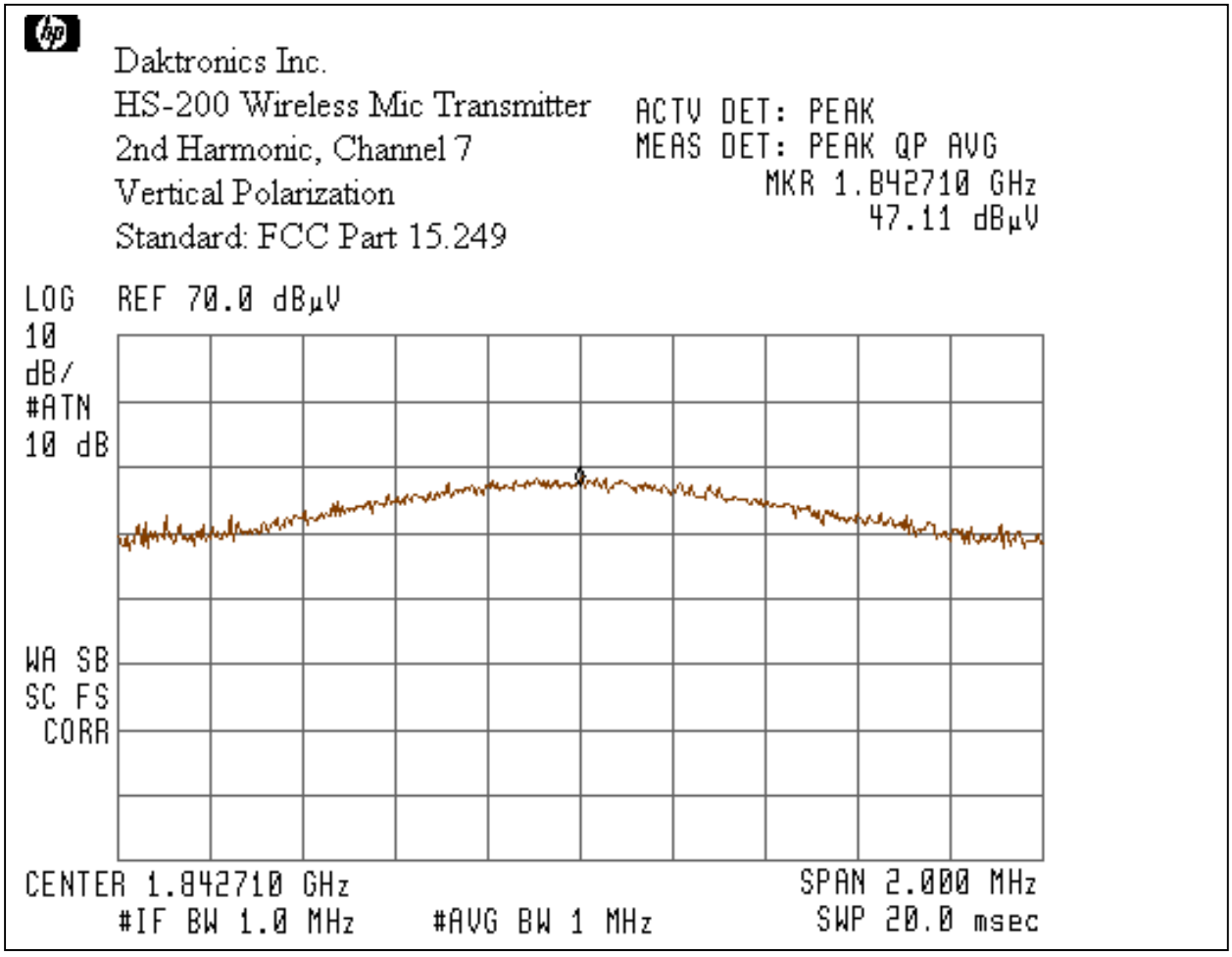
A

Graph # 3-1-26


Daktronics Inc.
HS-200 Wireless Mic Transmitter
Fundamental frequency, Channel 7
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 921.3460 MHz
66.16 dBµV
LOG REF 81.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FC
CORR
CENTER 921.3460 MHz
SPAN 200.0 kHz
#IF BW 100 kHz
#AVG BW 100 kHz
SWP 20.0 msec

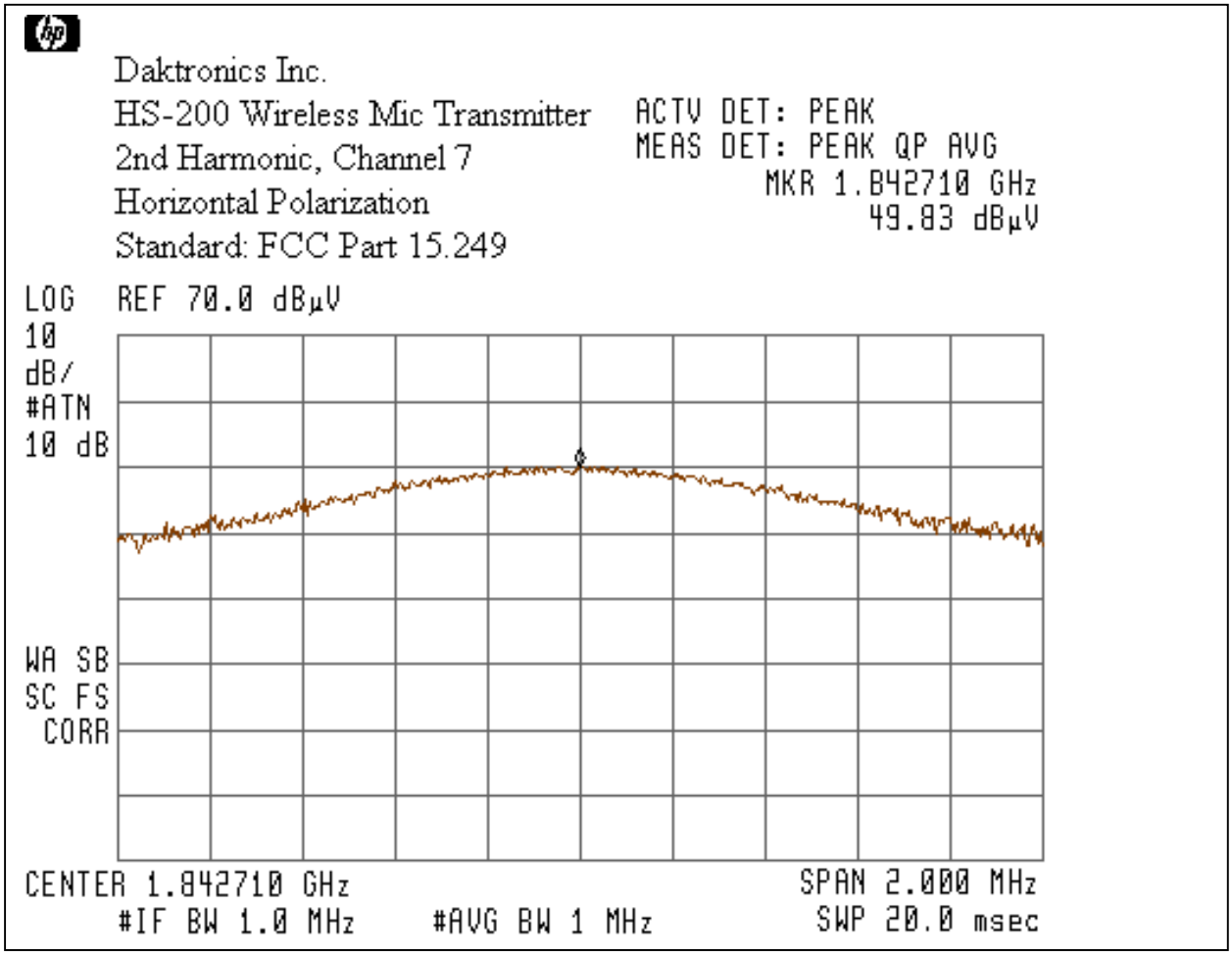
A

Graph # 3-1-27


Daktronics Inc.
HS-200 Wireless Mic Transmitter
2nd Harmonic, Channel 7
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.842710 GHz
47.11 dBµV
LOG
10
dB/
#ATN
10 dB
REF 70.0 dBµV
WA SB
SC FS
CORR
CENTER 1.842710 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
SWP 20.0 msec

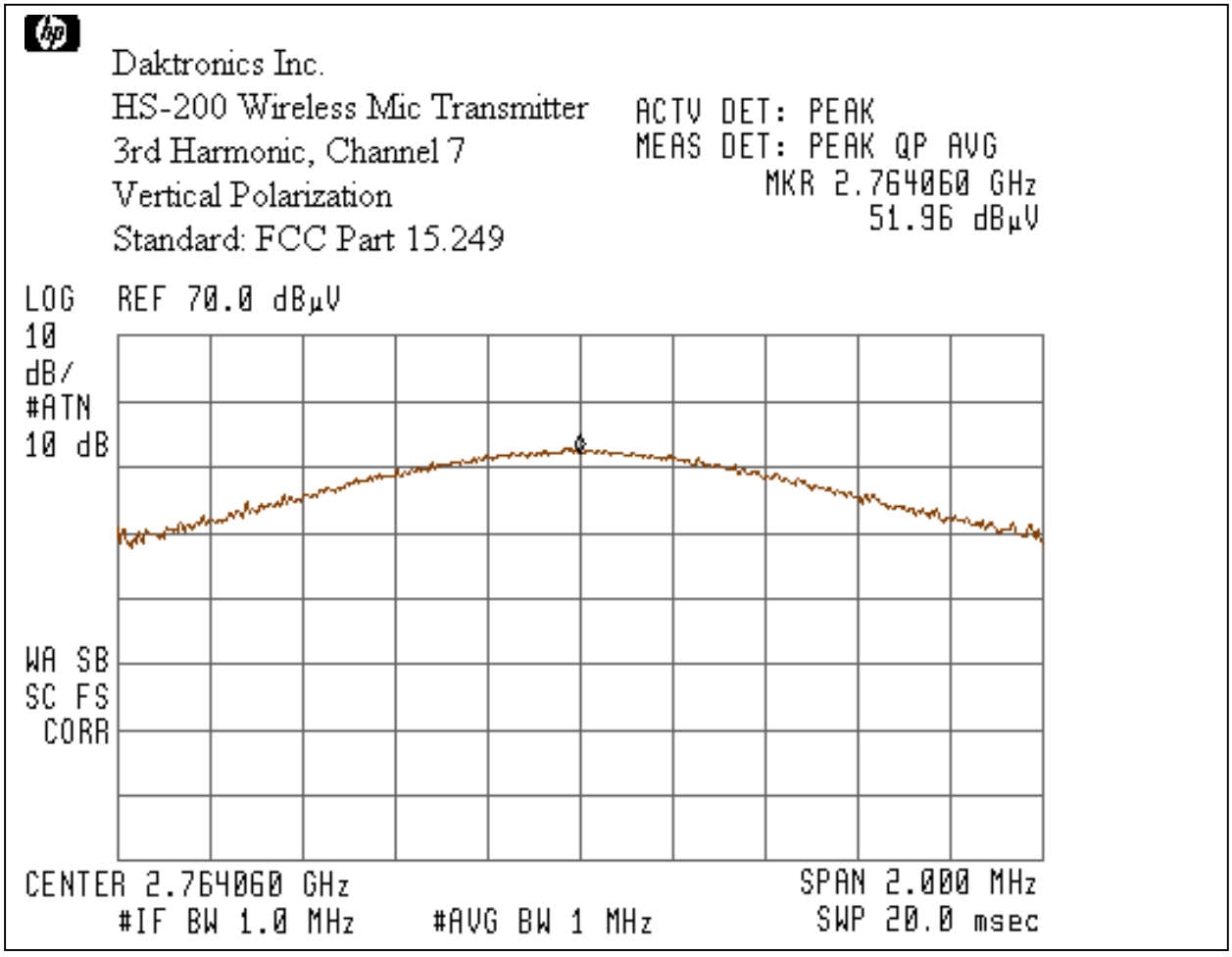
A

Graph # 3-1-28


Daktronics Inc.
HS-200 Wireless Mic Transmitter
2nd Harmonic, Channel 7
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.842710 GHz
49.83 dBµV
LOG REF 70.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FS
CORR
CENTER 1.842710 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
SWP 20.0 msec

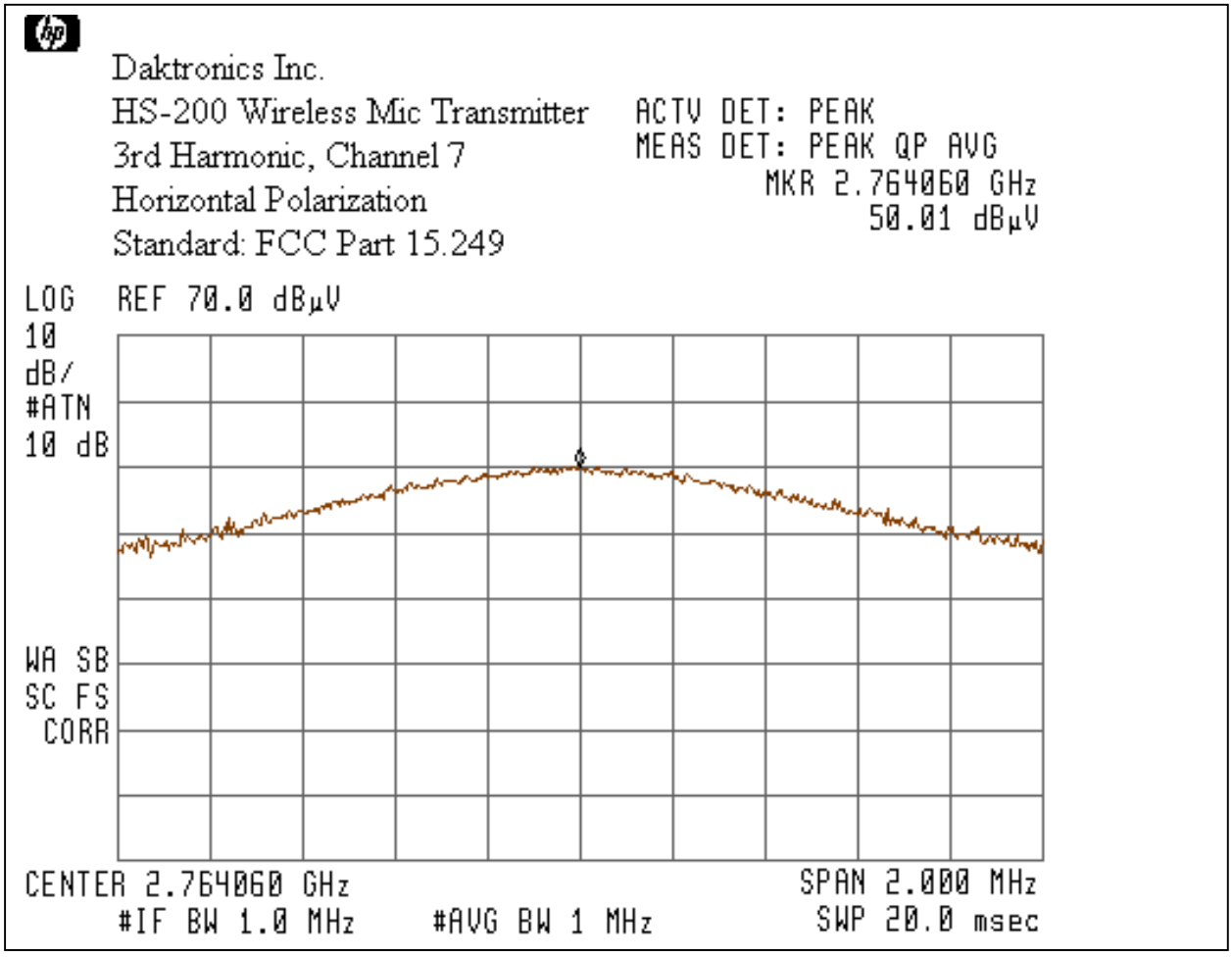
A

Graph # 3-1-29


Daktronics Inc.
HS-200 Wireless Mic Transmitter
3rd Harmonic, Channel 7
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.764060 GHz
51.96 dBµV
LOG REF 70.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FS
CORR
CENTER 2.764060 GHz
SPAN 2.000 MHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SWP 20.0 msec

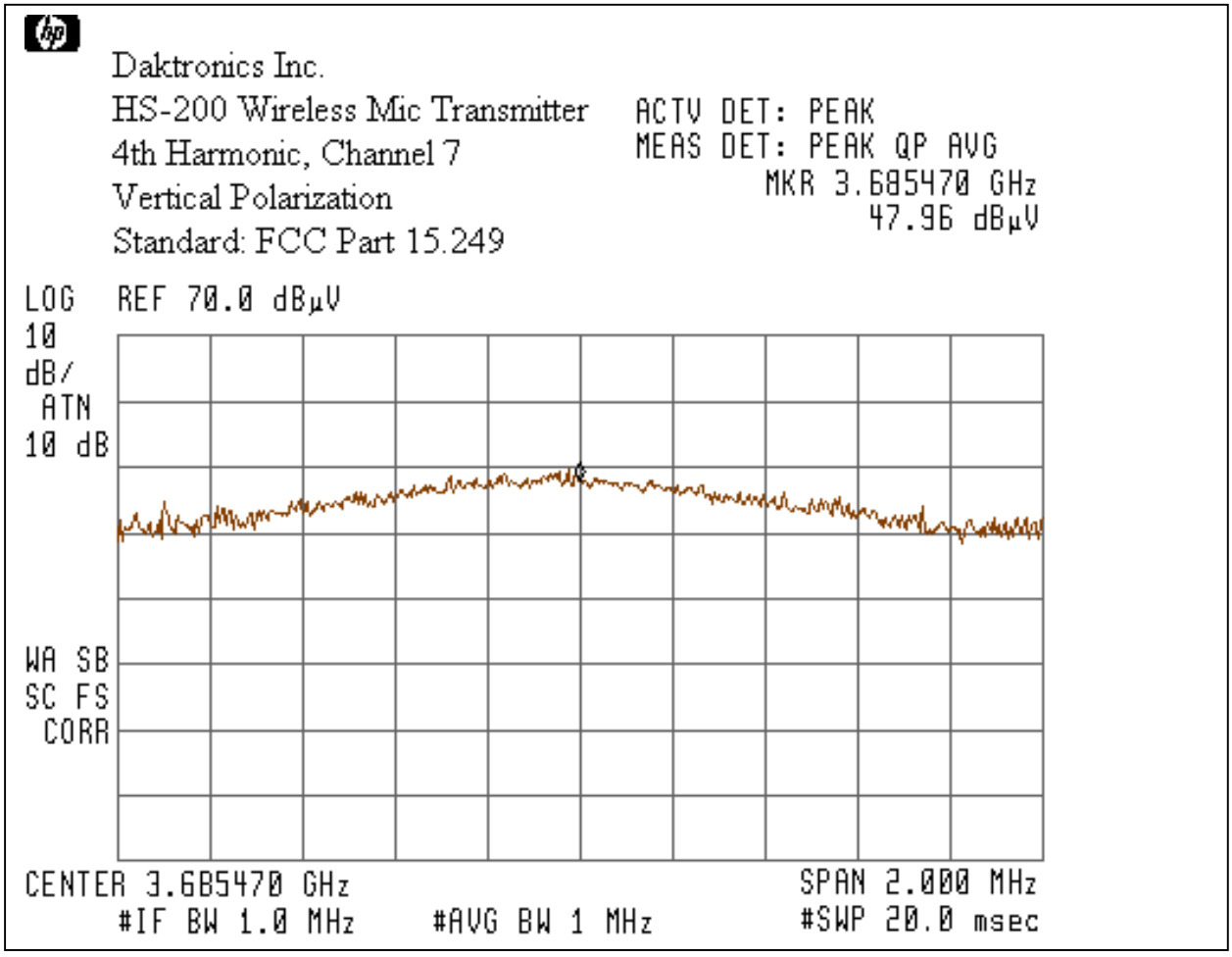
A

Graph # 3-1-30


Daktronics Inc.
HS-200 Wireless Mic Transmitter
3rd Harmonic, Channel 7
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.764060 GHz
50.01 dBµV
LOG REF 70.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FS
CORR
CENTER 2.764060 GHz
SPAN 2.000 MHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SWP 20.0 msec

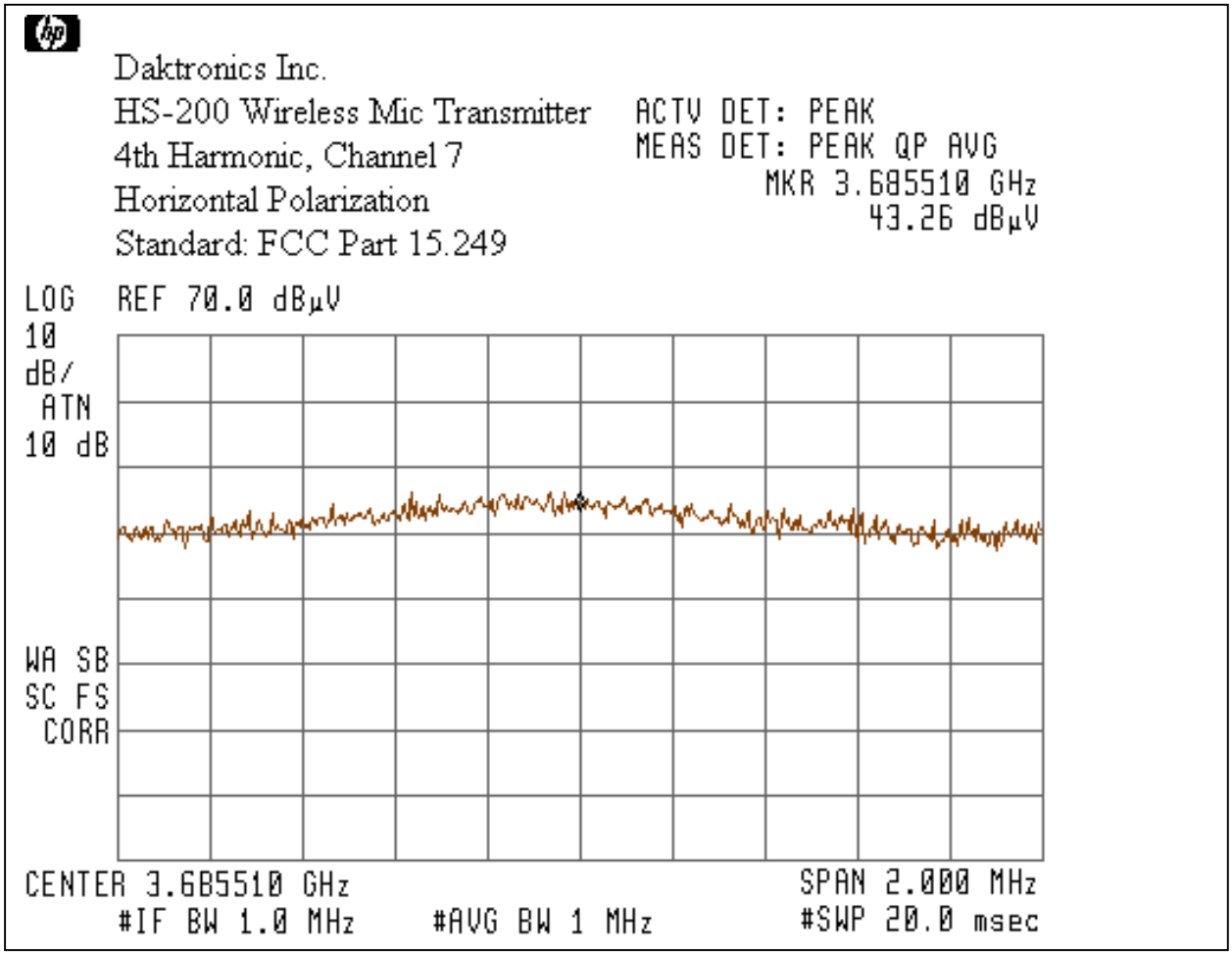
A

Graph # 3-1-31


Daktronics Inc.
HS-200 Wireless Mic Transmitter
4th Harmonic, Channel 7
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 3.685470 GHz
47.96 dBµV
LOG
10
dB/
ATN
10 dB
REF 70.0 dBµV
WA SB
SC FS
CORR
CENTER 3.685470 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

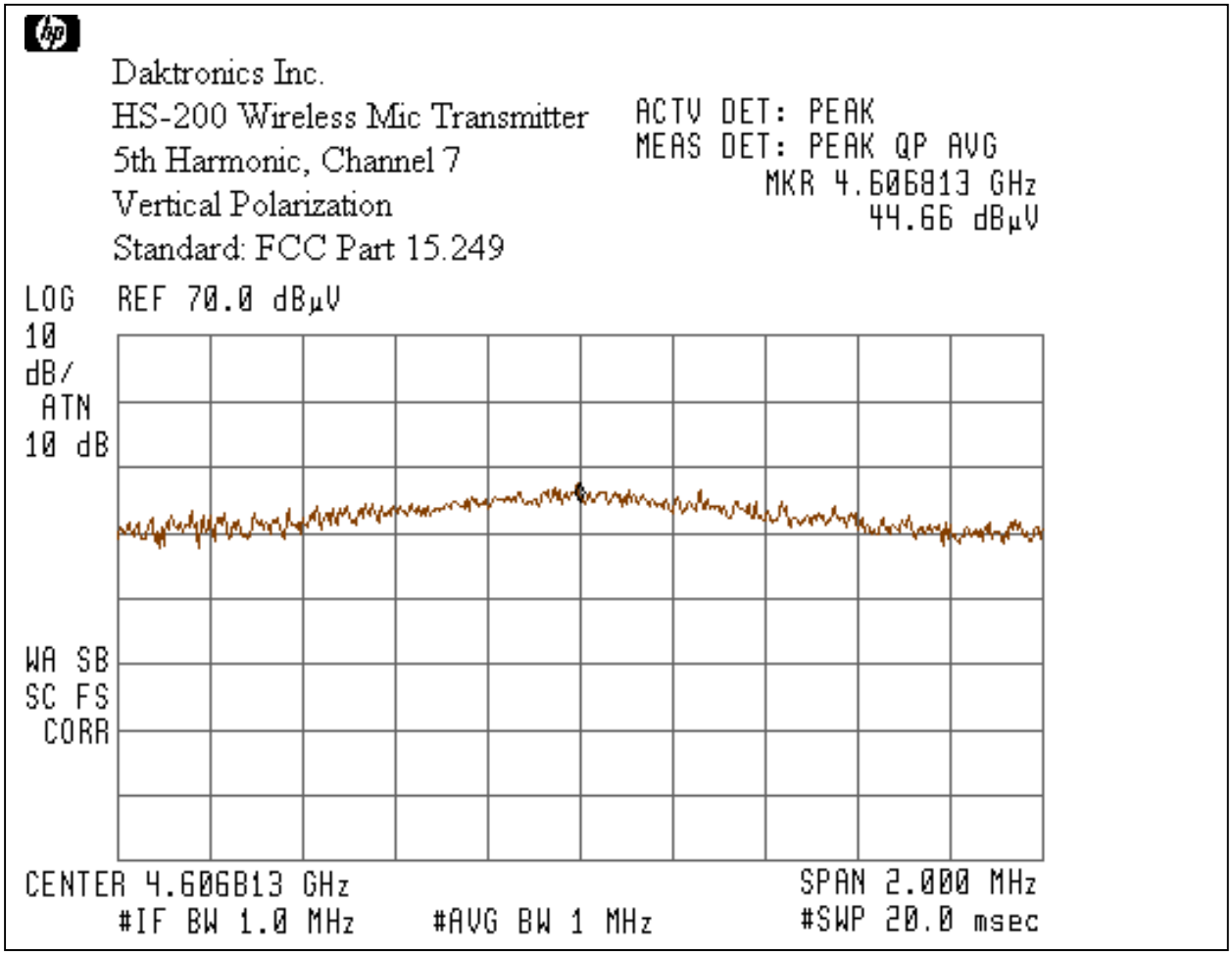
A

Graph # 3-1-32


Daktronics Inc.
HS-200 Wireless Mic Transmitter
4th Harmonic, Channel 7
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 3.685510 GHz
43.26 dBµV
LOG
10
dB/
ATN
10 dB
REF 70.0 dBµV
WA SB
SC FS
CORR
CENTER 3.685510 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

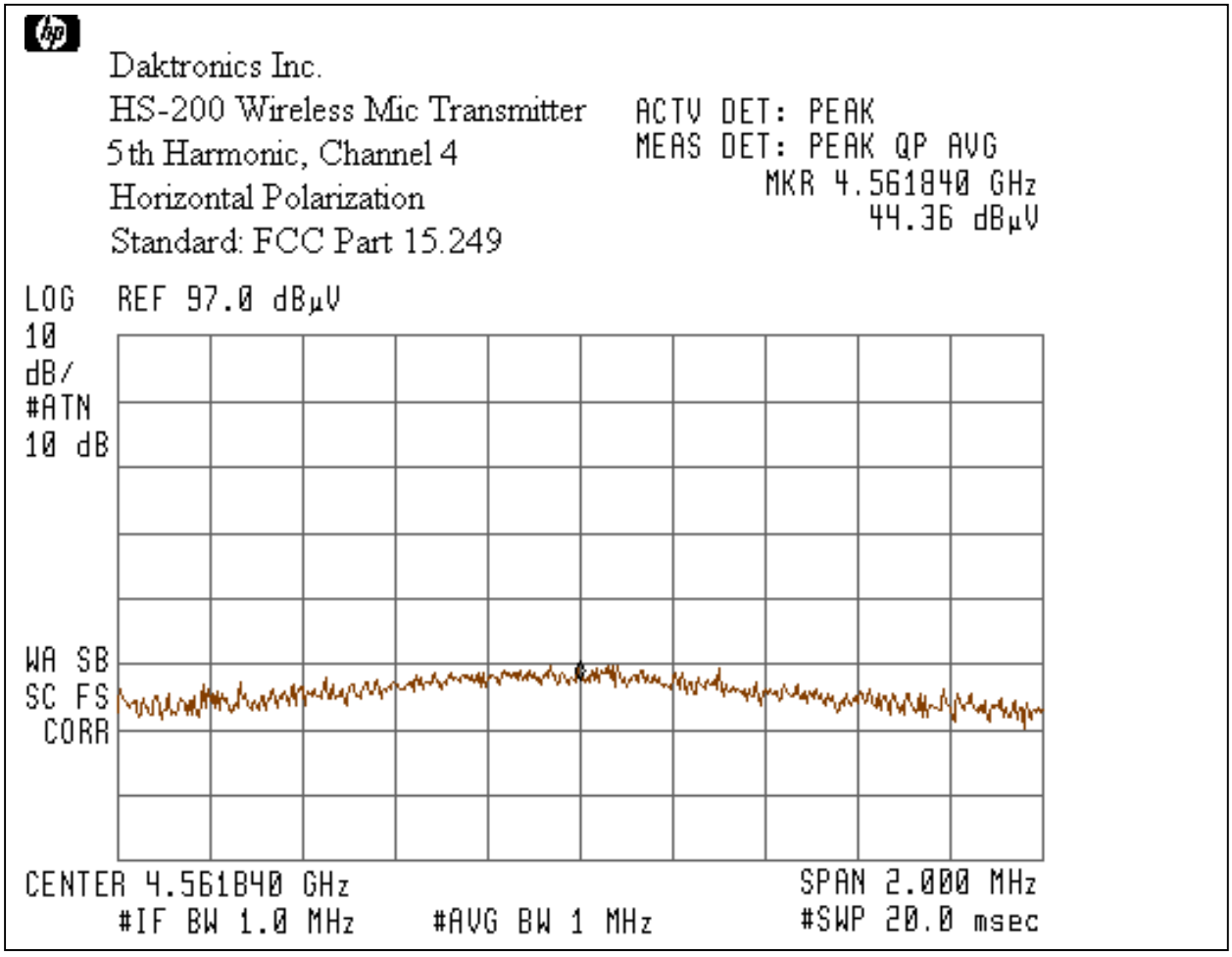
A

Graph # 3-1-33


Daktronics Inc.
HS-200 Wireless Mic Transmitter
5th Harmonic, Channel 7
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.606813 GHz
44.66 dBµV
LOG REF 70.0 dBµV
10 dB/
ATN 10 dB
WA SB
SC FS
CORR
CENTER 4.606813 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

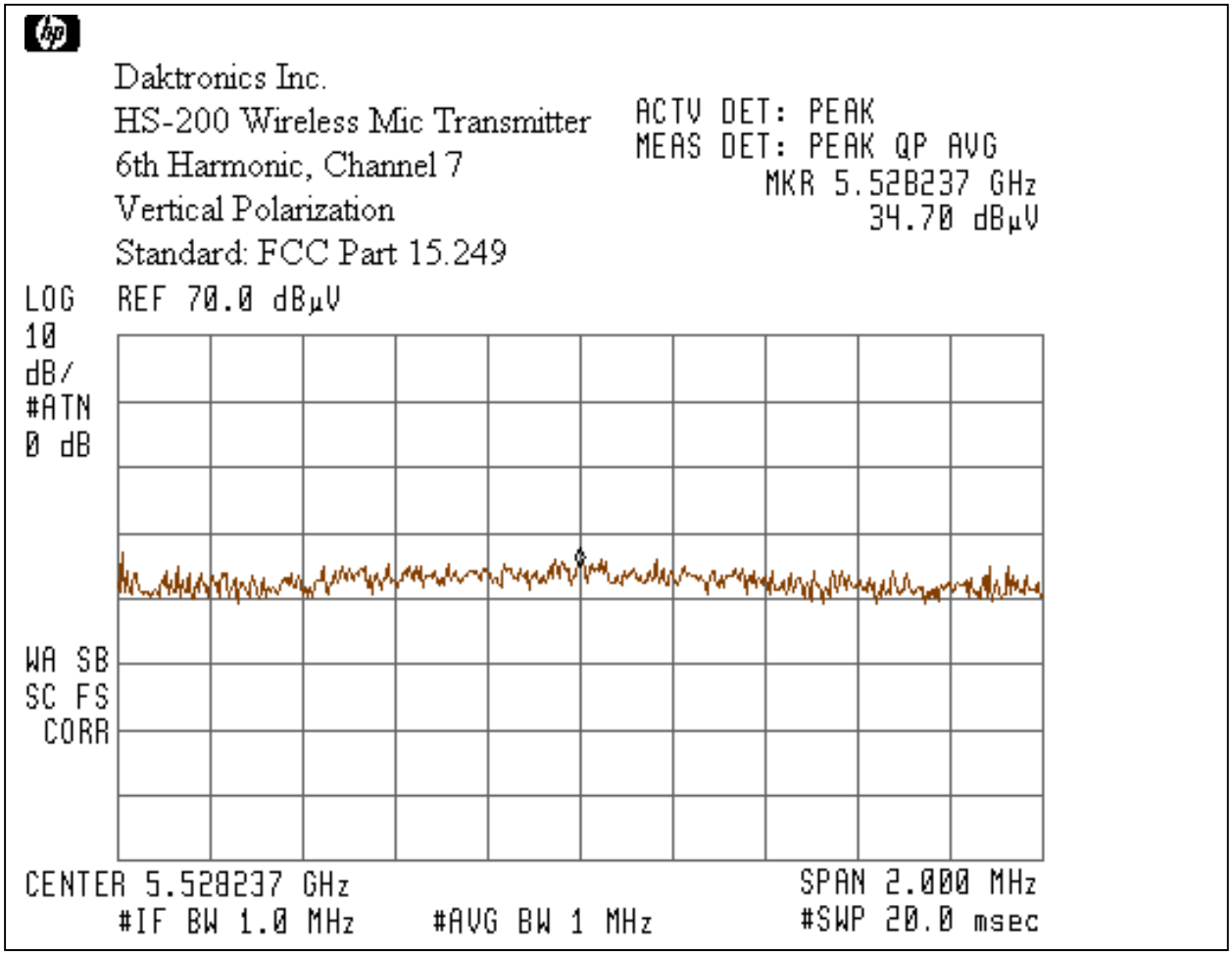
A

Graph # 3-1-34


Daktronics Inc.
HS-200 Wireless Mic Transmitter
5th Harmonic, Channel 4
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.561840 GHz
44.36 dBµV
LOG REF 97.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FS
CORR
CENTER 4.561840 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

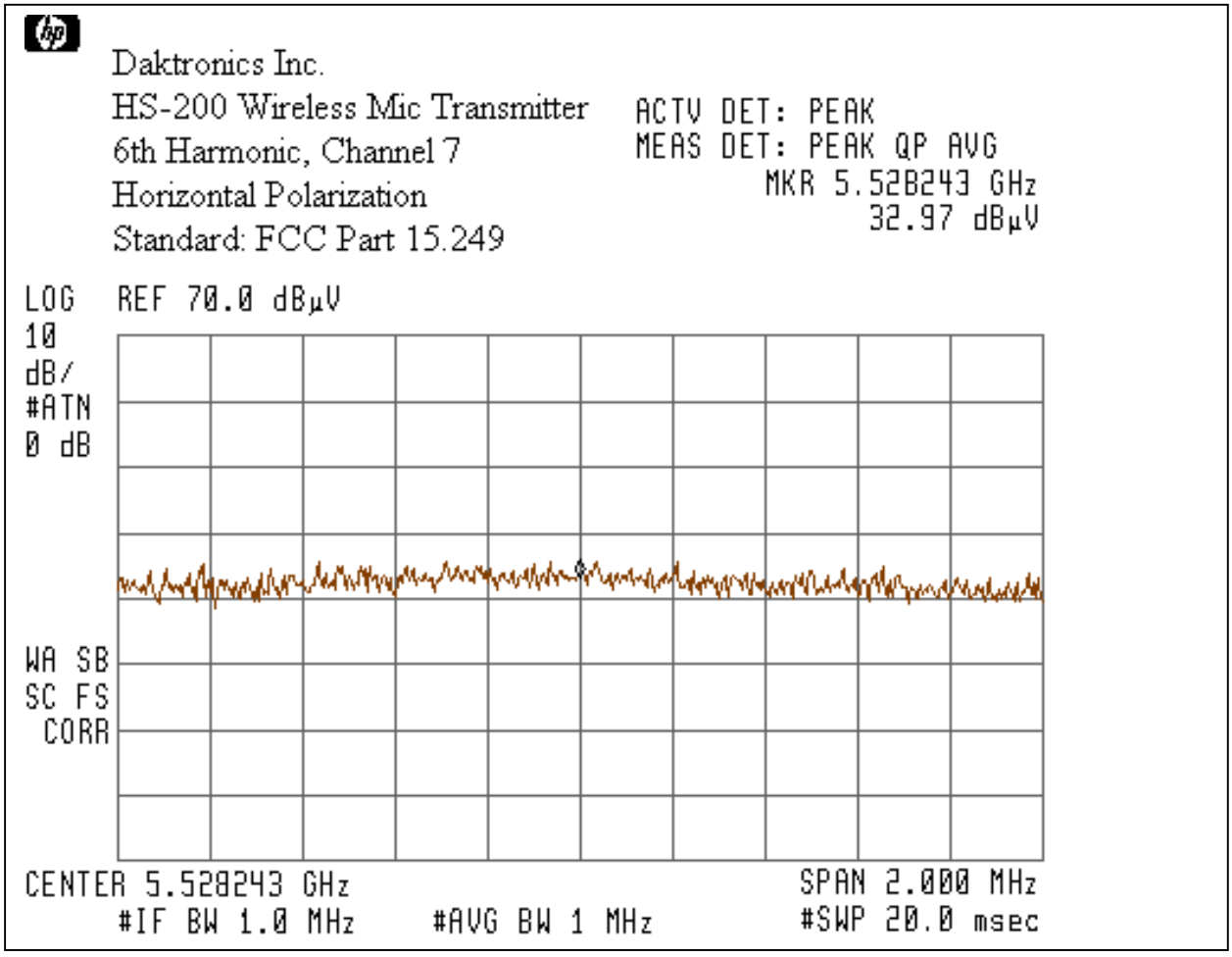
A

Graph # 3-1-35


Daktronics Inc.
HS-200 Wireless Mic Transmitter
6th Harmonic, Channel 7
Vertical Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 5.528237 GHz
34.70 dBµV
LOG
10
dB/
#ATN
0 dB
REF 70.0 dBµV
WA SB
SC FS
CORR
CENTER 5.528237 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

A

Graph # 3-1-36


Daktronics Inc.
HS-200 Wireless Mic Transmitter
6th Harmonic, Channel 7
Horizontal Polarization
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 5.528243 GHz
32.97 dBµV
LOG
10
dB/
#ATN
0 dB
REF 70.0 dBµV
WA SB
SC FS
CORR
CENTER 5.528243 GHz
#IF BW 1.0 MHz
#AVG BW 1 MHz
SPAN 2.000 MHz
#SWP 20.0 msec

A

3.2 Out of Band Spurious Emissions, FCC 15.249(c), 15.209

Out-of-band measurements were made for frequencies:
- 902MHz
- 928MHz.

Output frequencies of the EUT was set to:
- 903.37MHz (Channel 0)
- 921.37MHz (Channel 7)

Test Procedure
The Spurious Emissions was measured at the maximum power transmission condition. The EUT was placed on a non-conductive table 0.8m above the ground plane inside the Anechoic Chamber. The table was centered on a motorized turntable, which allows 360-degree rotation. The measurement antenna was positioned at distance 3m. The radiated emissions were maximized by configuring the EUT, by rotating the EUT, by changing antenna polarization, and by changing antenna height from 1 to 4m. Field strength was measured and calculated (See Section 3.3).

The Out of band spurious emissions were measured to comply with FCC 15.249(c) requirements of 50dB minimum attenuation of spurious emissions below the level of the fundamental. Also compliance to FCC 15.209 were verified.

The Table and Graphs below show the Out of Band Spurious Emissions.

Note: Emission level shown in the Graphs does not include the Antenna, Cable and Pre-amplifier correction factors. These factors are shown in the table as the Total Factor.

A

Radiated Emissions: Out of Band Emissions **Date:** 02-06-2002

Company: Daktronics Inc.
Model: HS-200 Wireless Mic, Transmitter
Test Engineer: Norman Shpilsher
Special Config. Info: Frequency range 902 to 928MHz
Standard: FCC Part 15.249
Test Site: 3 m Anechoic Chamber
Note: The table shows the worst case radiated emissions
All measurements were taken using a CISPR Quasi-peak detector

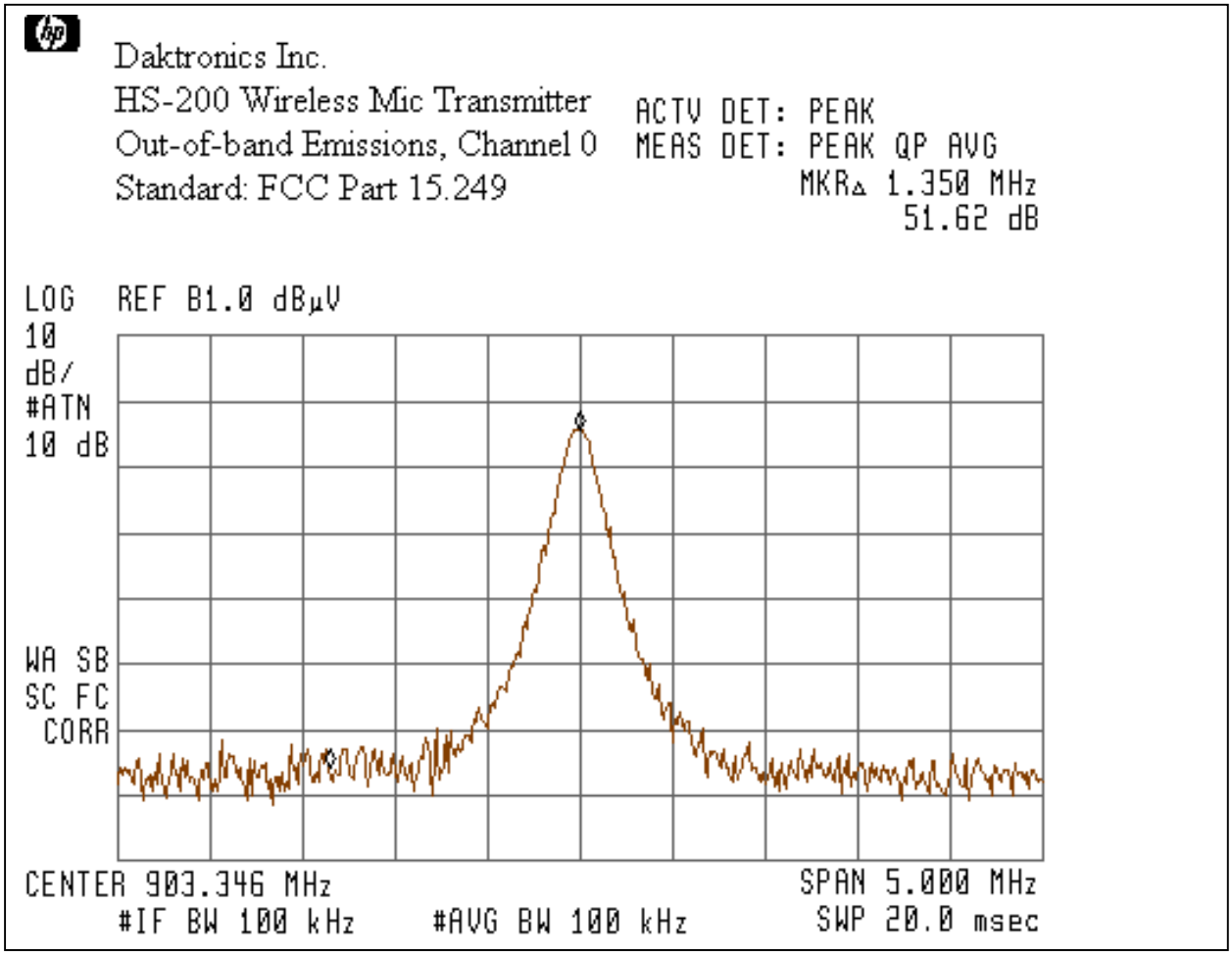
Table # 3-2-1

Frequency MHz	Reading dBµV	Total Factor dB/m	Net at 3m. dBµV/m	15.249 Attenuation dB	15.249 Limit dBµV/m	15.249 Margin dB	15.209 Limit dBµV/m	15.209 Margin dB
Channel 0								
903.35	67.0	25.0	92.0					
902.00	15.0	25.0	40.0	52.0	50.0	-2.0	46	-6.0
Channel 7								
921.34	66.2	25.2	91.4					
928.00	14.3	25.3	39.6	51.9	50.0	-1.9	46	-6.4

Comments:

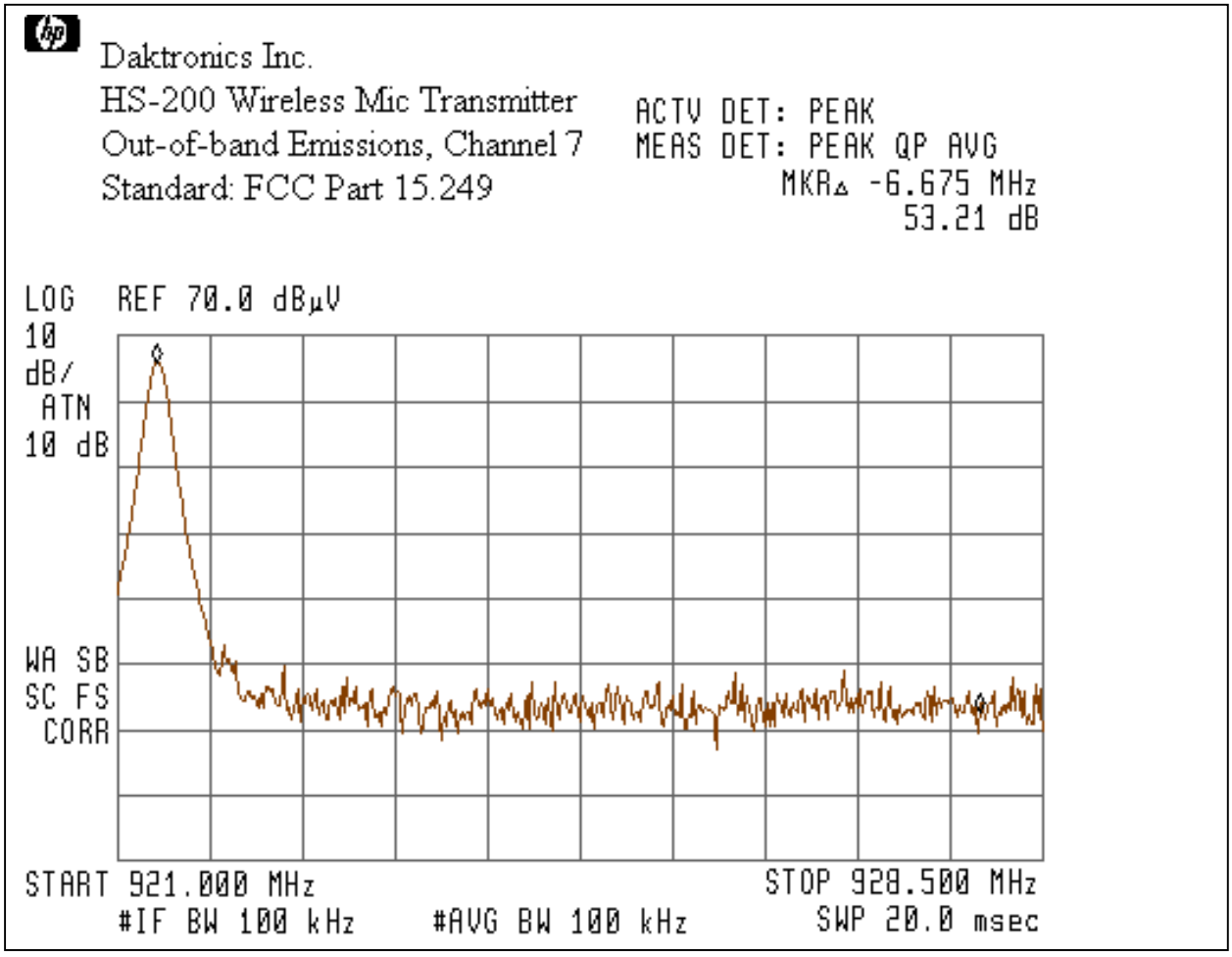
A

Graph # 3-2-1


Daktronics Inc.
HS-200 Wireless Mic Transmitter
Out-of-band Emissions, Channel 0
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 1.350 MHz
51.62 dB
LOG REF 81.0 dBµV
10
dB/
#ATN
10 dB
WA SB
SC FC
CORR
CENTER 903.346 MHz
SPAN 5.000 MHz
#IF BW 100 kHz
#AVG BW 100 kHz
SWP 20.0 msec

A

Graph # 3-2-2


Daktronics Inc.
HS-200 Wireless Mic Transmitter
Out-of-band Emissions, Channel 7
Standard: FCC Part 15.249
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ -6.675 MHz
53.21 dB
LOG REF 70.0 dBµV
10
dB/
ATN
10 dB
WA SB
SC FS
CORR
START 921.000 MHz
STOP 928.500 MHz
#IF BW 100 kHz
#AVG BW 100 kHz
SWP 20.0 msec

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3.3 Field Strength Calculation

The field strength is calculated by adding the emissions reading on the EMI Receiver to the factors associated with preamplifiers (if any), antennas and cables. A sample calculation is included below.

FS = RA – AG + AF + CF

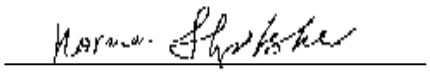
Where: FS = Field Strength in dB V/m
RA = Reading of the Receiver Amplitude (including receiver preamplifier) in dB V
AG = Pre-Amplifier Gain in dBi
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB/m

Assume a receiver reading of 47.3 dB V is obtained. The amplifier gain of 28.1 dBi is subtracted. The antenna factor of 27.5 dB/m and cable factor of 3.5 dB is added. The amplifier gain, antenna factor and cable factor combined to the Total Factor, and the Total Factor is 2.9dB. The net field strength for comparison to the appropriate limit is 50.2 dB V/m.

Tested by:

Norman Shpilsher
EMC Project Engineer
Intertek Testing Services NA, Inc.

Agent for Daktronics Inc.
Signature



Signature

Date: February 11, 2002

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4.0 TEST EQUIPMENT

Receivers/Spectrum Analyzers

DESCRIPTION	SERIAL NO.	LAST CAL DATE	CAL DUE	TICK IF USED
HP85462A Receiver RF Section	3325A00106	07/01	07/02	X
HP85460A RF Filter Section	3330A00109	07/01	07/02	X
Advantest Spectrum Analyzer R3271A	55050084	05/01	05/02	X
HP 83017A Microwave Amplifier	3123A00475	09/01	09/02	X

Antennas

DESCRIPTION	SERIAL NO.	LAST CAL DATE	CAL DUE	TICK IF USED
Schaffner-Chase Bicono-Log Antenna	2468	11/01	11/02	X
EMCO Horn antenna 3115	9507-4513	09/01	09/02	X
EMCO Horn antenna 3115	6579	12/01	12/02	

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EXHIBIT I

TEST SET UP PHOTOS

(See Test Setup Photos Exhibit)

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EXHIBIT II

FCC ID LABEL LOCATION

(See ID Label/Location Info. Attachments)

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EXHIBIT III

EXTERNAL PHOTOS

(See External Photos Exhibit)

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EXHIBIT IV

INTERNAL PHOTOS

(See Internal Photos Exhibit)

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EXHIBIT V

ELECTRICAL SCHEMATICS AND BLOCK DIAGRAM

(See Block Diagram and Schematic Attachments)

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EXHIBIT VI

USER MANUAL AND OPERATIONAL DESCRIPTION

(See User Manual and Operational Description Attachments)