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CERTIFICATION TEST REPORT

Report Number:	2009 05123926 FCC
Project Number:	23904-1
Nex Number:	123926
Applicant:	SMK MANUFACTURING, INC. 1055 TIERRA DEL REY CHULA VISTA, CA 91910
Equipment Under Test (EUT):	SET-TOP BOX REMOTE
Model:	165541
FCC ID:	QVETC4U2
IC:	3683B-TC4U2
In Accordance With:	FCC Part 15 Subpart C, 15.247 IC RSS-210 Issue 7 June 2007 IC RSS-Gen Issue 2 June 2007
Tested By:	Nemko USA Inc. 11696 Sorrento Valley Road, Suite F San Diego, CA 92121
Authorized By:	 Alan Laudani, EMC/RF Test Engineer
Date:	May 9, 2009
Total Number of Pages:	39

Section1: Summary of Test Results

General

All measurements are traceable to national standards

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15; Subpart C and IC RSS-210. Radiated tests were conducted is accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC and IC.

The assessment summary is as follows:

Apparatus Assessed:	Set-Top Box Remote
Model:	165541
Specification:	FCC Part 15 Subpart C, 15.247 IC RSS-210 Issue 7 June 2007
Date Received in Laboratory:	April 13, 2009
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None

1.1 Report Release History

REVISION	DATE	COMMENTS
-	May 9, 2009	Prepared By: Ferdinand Custodio
-	May 9, 2009	Initial Release: Alan Laudani

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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TESTED BY: _____ Date: May 9, 2009
Ferdinand Custodio, EMC Test Engineer

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Section 2: Equipment Under Test

2.1 Product Identification

The Equipment Under Test was indentified as follows:

SMK Manufacturing, Inc. Model # 165541 Set-top box remote

Production sample, serial number not available during assessment:

2.2 Samples Submitted for Assessment

The following sample of the apparatus has been submitted for type assessment:

Sample No.	Description	Serial No.
123926-1	Set-top box (STB) remote	N/A

2.3 Theory of Operation

The 165541 is a Set-Top Box Remote. Its function is to control a set-top box (STB). The EUT was exercised in a test mode providing continuous transmitting of low, mid and high frequencies at full strength continuously with worst-case duty cycle. Four AAA batteries power the remote. Each test was begun with a fresh set of battery.

2.4 Technical Specifications of the EUT

Manufacturer:	SMK Manufacturing, Inc.
Operating Frequency:	2425, 2450 and 2475 MHz in the 2400-2483.5 MHz Band
Number of Operating Frequencies:	3
Rated Power:	95.9 dBµV/m @ 3 m
Modulation:	QPSK
Antenna Connector:	Internal/Integral
Power Source:	6VDC (4 AAA Batteries)

Section 3: Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.247
Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz and 24.0-24.25 GHz bands.

IC RSS-210 Issue 7 June 2007
Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment. Annex 8 - Frequency Hopping and Digital Modulation Systems Operating in the Bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

IC RSS-Gen Issue 2 June 2007
General Requirements and Information for the Certification of Radiocommunication Equipment

3.2 Deviations from Laboratory Test Procedures

No deviations from Laboratory Test Procedure

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	18.9 - 22 ^{o}C
Humidity range	:	36 - 48 %
Pressure range	:	100.9 - 101.2 kPa
Power supply range	:	6VDC (Batteries)

3.4 Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
128	Antenna, Bicon	EMCO	3104	2882	09-Feb-09	09-Feb-11
529	Antenna, DRWG	EMCO	3115	2505	30-Sep-08	30-Sep-10
919	Preamplifier	Spacek Labs MM-Wave Technology	100MHz to 40GHz	3M12 (SLK-35-3) and 3M13 (SLKa-35-4)	10-Nov-08	11-Nov-09
111	Antenna, LPA	EMCO	3146	1382	20-Oct-08	20-Oct-10
911	Spectrum Analyzer	Agilent	E4440A	US41421266	06-Nov-08	06-Nov-09

2040B-1 OATS

Section 4: Observations

4.1 Modifications Performed During Assessment

No modifications were performed during assessment.

4.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

4.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

4.4 Test Deleted

No Tests were deleted from this assessment.

4.5 Additional Observations

There were no additional observations made during this assessment.

Section 5: Results Summary

This section contains the following:

FCC Part 15 Subpart C: Test Results
§ 15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

The column headed “Required” indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No: not applicable / not relevant
Y Yes: Mandatory i.e. the apparatus shall conform to these test.
N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

5.1 Test Results

Part 15C	Test Description	Required	Result
15.207	Transmitter and Receiver AC Power Lines Conducted Emission Limit	N	-
15.247 (d)	Spurious Emissions (Radiated Emission Test)	Y	Pass
RSS Gen 4.6.1	Occupied Bandwidth	Y	Pass
15.247(a)(2)	Minimum 6dB RF Bandwidth	Y	Pass
15.247 (d)	Spurious Emissions (Radiated Emission Test)	Y	Pass
15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands	Y	Pass
15.247(e)	Power Spectral Density for Digitally Modulated Devices	Y	Pass

Appendix A: Test Results

Section 15.247 (d) – Spurious Emissions

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

Test Conditions:

Sample Number:	165541	Temperature:	18.9°C
Date:	April 13, 2009	Humidity:	48%
Modification State:	Low, Mid and High Channel	Tester:	FSCustodio
		Laboratory:	SOATS

Test Results:

See attached plots.

Additional Observations:

- Emissions were searched over a range of 30 MHz to 25000 MHz while in transmit mode on each of the three channels. No other emissions found within 20 dB of the limit.
- Investigations were made at 3 meters. Each channel investigated was maximized in the OATS.
- A correction factor was added to compensate for antenna factor and cable loss at the fundamental frequencies, example below.
- Measurements were made after fresh batteries were installed.
- Sample Computation:

Correction factor @ 2400MHz = 0.2
= Antenna factor + Cable loss – Preamp gain
= 28.3 + 5.9 – 34

Corrected reading = Max. reading + Correction factor
= 62.48 + 0.2
= 62.6 dBµV/m

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Radiated Emissions Data

Job # :	23904-1	Date :	04/13/2009	Page	1 of 1
NEX #:	123926	Time :	10AM		
		Staff :	FSC		

Client Name :	SMK Electronics Inc.	EUT Voltage :	Battery
EUT Name :	Set top box remote	EUT Frequency :	
EUT Model # :	165541	Phase:	
EUT Serial # :	N/A	NOATS	
EUT Config. :	Transmit-- test configuation	SOATS	X
		Distance < 1000 MHz:	3 m
		Distance > 1000 MHz:	3 m

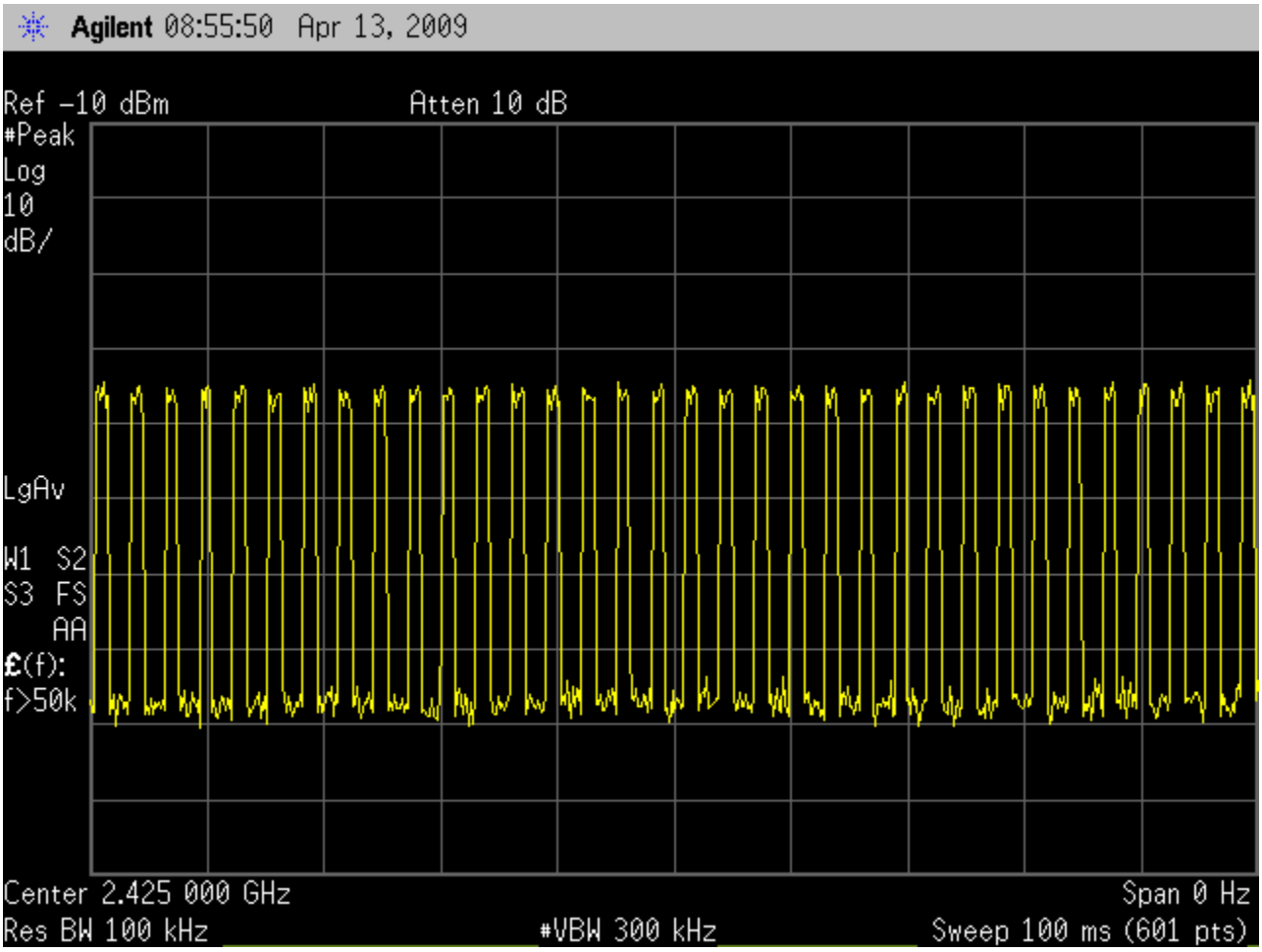
Specification :	CFR47 Part 15C 15.249 15.209		
Loop Ant. #:	NA		
Bicon Ant.#:	128_10m	Temp. (°C) :	18.9
Log Ant.#:	111_10m	Humidity (%) :	48
DRG Ant. #	529	Spec An.#:	911
Cable LF#:	SOATS	Spec An. Display #:	911
Cable HF#:	40ft	QP #:	911
Preamp LF#:	NA	PreSelect#:	NA
Preamp HF#	919	DC CF	-9.81

Quasi-Peak	RBW: 120 kHz
	Video Bandwidth 300 kHz
Peak (Fundamental)	RBW: 3 MHz
	Video Bandwidth 3 MHz
Peak	RBW: 1 MHz
	Video Bandwidth 3 MHz

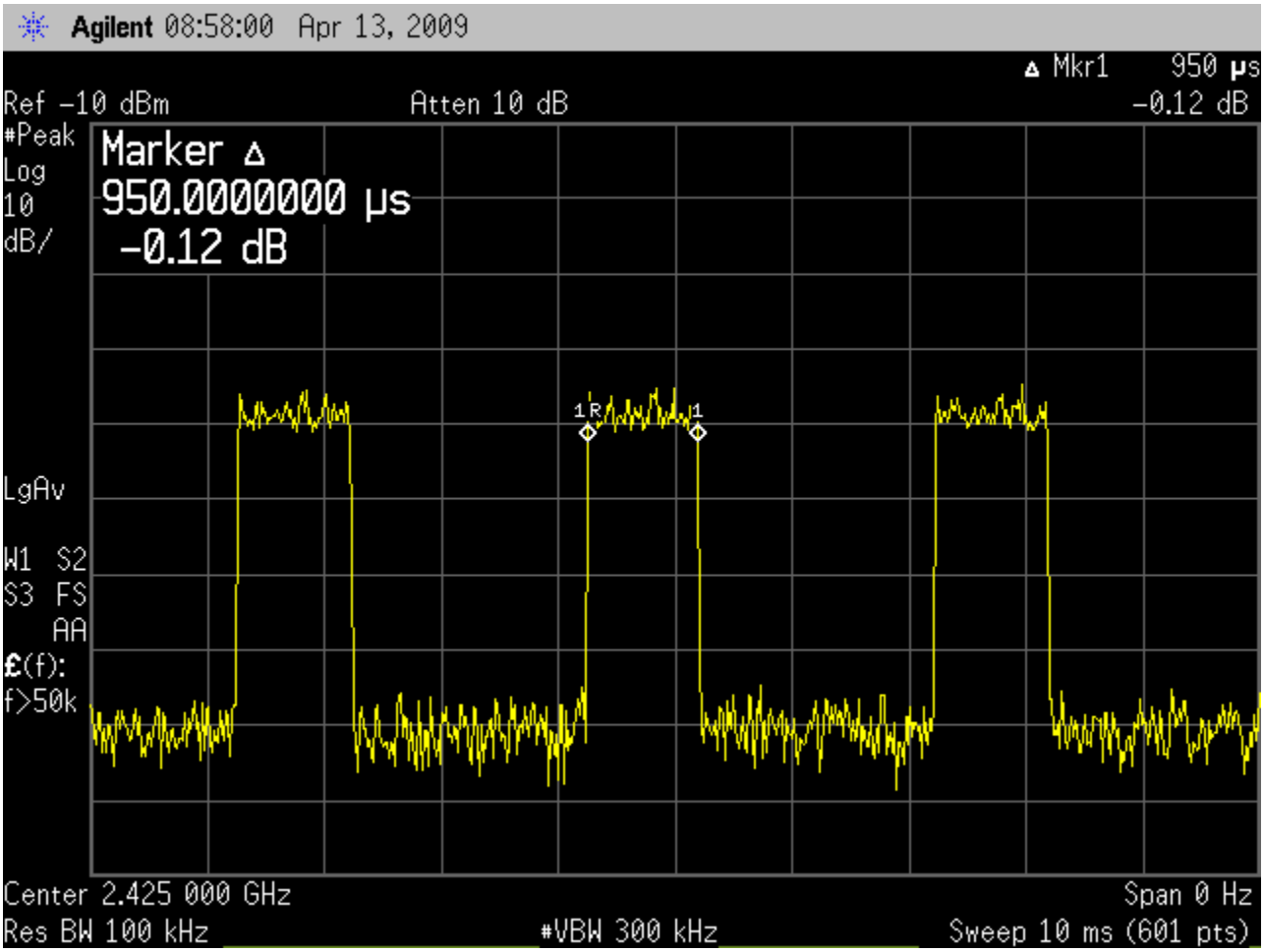
Average = Peak + Duty Cycle Factor

Meas. Freq. (MHz)	Meter Reading **Vertical**	Meter Reading **Horizontal**	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dBµV)	Corrected Reading (dBµV/m)	Spec. limit (dBµV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
2400.0	53.2	62.5	P	BL	1.0	62.48	62.6	74.0	-11.4	Pass	
2400.0	43.4	52.7	A	BL	1.0	52.67	52.8	54.0	-1.2	Pass	
2425.0	59.0	61.8	P	BL	1.0	61.79	95.9	125.2	-29.3	Pass	X
2425.0	60.2	55.0	P	F	1.0	60.2	94.4	125.2	-30.9	Pass	Y
2425.0	60.1	60.6	P	L	1.0	60.63	94.8	125.2	-30.4	Pass	Z
4850.0	52.6	51.5	P	BR	1.0	52.63	58.8	74.0	-15.1	Pass	X
4850.0	42.8	41.7	A	BR	1.0	42.82	49.0	54.0	-4.9	Pass	X
4850.0	54.6	54.1	P	F	1.0	54.59	60.8	74.0	-13.2	Pass	Y
4850.0	44.8	44.3	A	F	1.0	44.78	51.0	54.0	-3.0	Pass	Y
4850.0	54.5	52.0	P	L	1.0	54.48	60.7	74.0	-13.3	Pass	Z
4850.0	44.7	42.2	A	L	1.0	44.67	50.9	54.0	-3.1	Pass	Z
2450.0	58.9	60.6	P	BR	1.8	60.56	94.7	125.2	-30.5	Pass	X
2450.0	59.1	54.3	P	F	1.0	59.08	93.2	125.2	-32.0	Pass	Y
2450.0	57.6	59.7	P	F	1.0	59.68	93.8	125.2	-31.4	Pass	Z
4900.0	51.3	51.9	P	BR	1.8	51.85	58.3	74.0	-15.7	Pass	X
4900.0	41.5	42.0	A	BR	1.8	42.04	48.5	54.0	-5.5	Pass	X
4900.0	51.6	52.6	P	F	1.0	52.64	59.1	74.0	-14.9	Pass	Y
4900.0	41.7	42.8	A	F	1.0	42.83	49.3	54.0	-4.7	Pass	Y
4900.0	52.6	51.4	P	F	1.0	52.59	59.0	74.0	-15.0	Pass	Z
4900.0	42.8	41.6	A	F	1.0	42.78	49.2	54.0	-4.8	Pass	Z
2475.0	57.1	57.7	P	BL	2.2	57.69	91.8	125.2	-33.4	Pass	X
2475.0	58.7	52.4	P	F	1.0	58.69	92.8	125.2	-32.4	Pass	Y
2475.0	54.3	57.2	P	L	1.2	57.19	91.3	125.2	-33.9	Pass	Z
2483.5	63.3	50.1	P	F	1.0	63.29	63.4	74.0	-10.6	Pass	
2483.5	53.5	40.3	A	F	1.0	53.48	53.6	54.0	-0.4	Pass	
4950.0	50.2	49.6	P	BL	2.2	50.2	56.6	74.0	-17.4	Pass	X
4950.0	40.4	39.8	A	BL	2.2	40.39	46.8	54.0	-7.2	Pass	X
4950.0	50.4	51.1	P	F	1.0	51.14	57.6	74.0	-16.4	Pass	Y
4950.0	40.6	41.3	A	F	1.0	41.33	47.8	54.0	-6.2	Pass	Y
4950.0	50.0	49.9	P	L	1.2	50	56.4	74.0	-17.6	Pass	Z
4950.0	40.2	40.0	A	L	1.2	40.19	46.6	54.0	-7.4	Pass	Z

Duty Cycle Factor



34 emissions in 100ms



0.950 ms per emission

Duty Cycle Correction Factor computation:

= 0.950 x 34
= 32.3 ms or 32.3%
= 20log(0.323)
= **-9.81**

RSS-Gen 4.6.1 – Occupied Bandwidth

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

Test Conditions:

Sample Number:	165541	**Temperature:**	22°C
Date:	April 13, 2009	**Humidity:**	36%
Modification State:	Low, Mid and High Channel	**Tester:**	FSCustodio
		Laboratory:	Shield Room #1

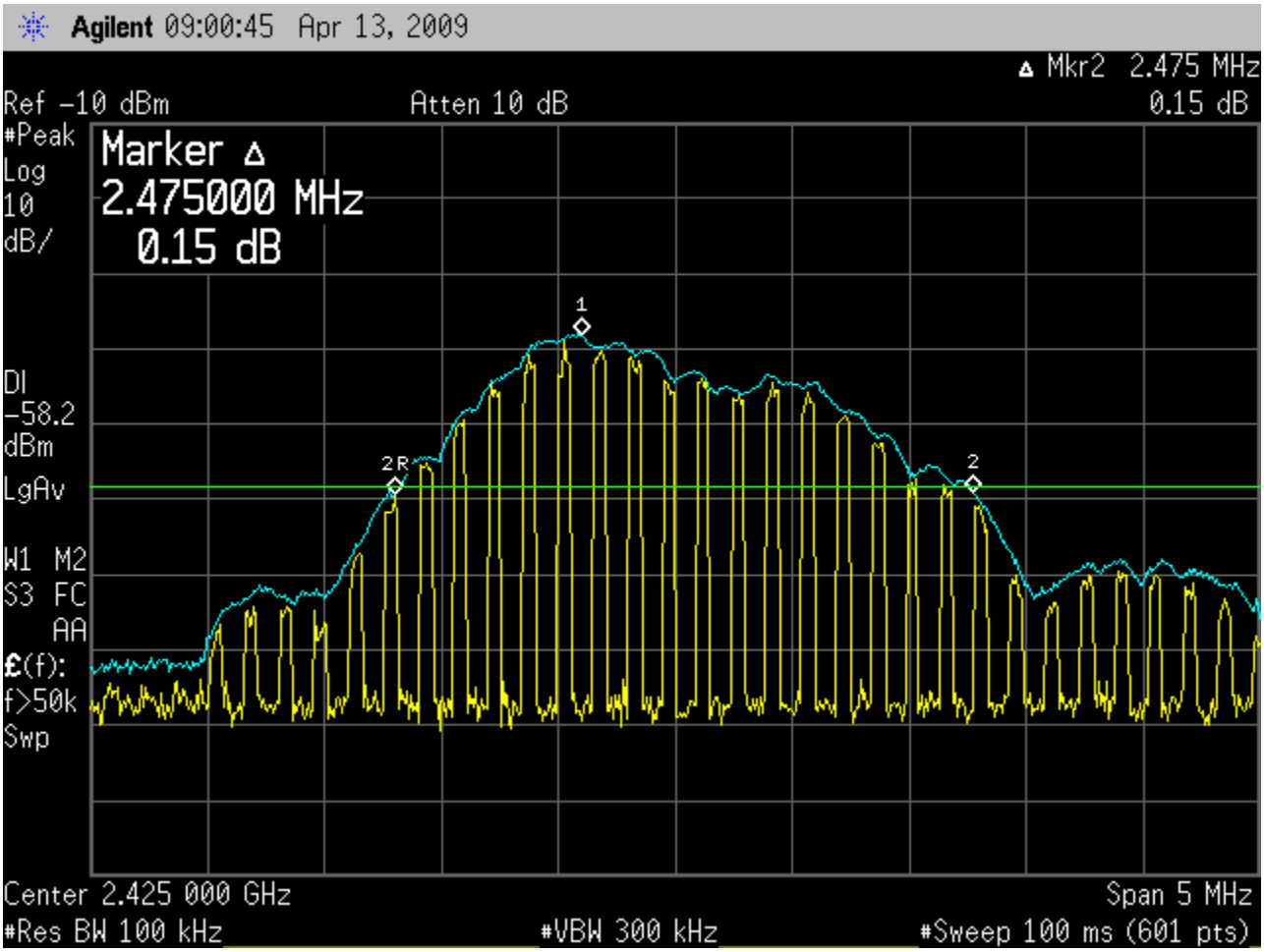
Test Results:

See attached plots.

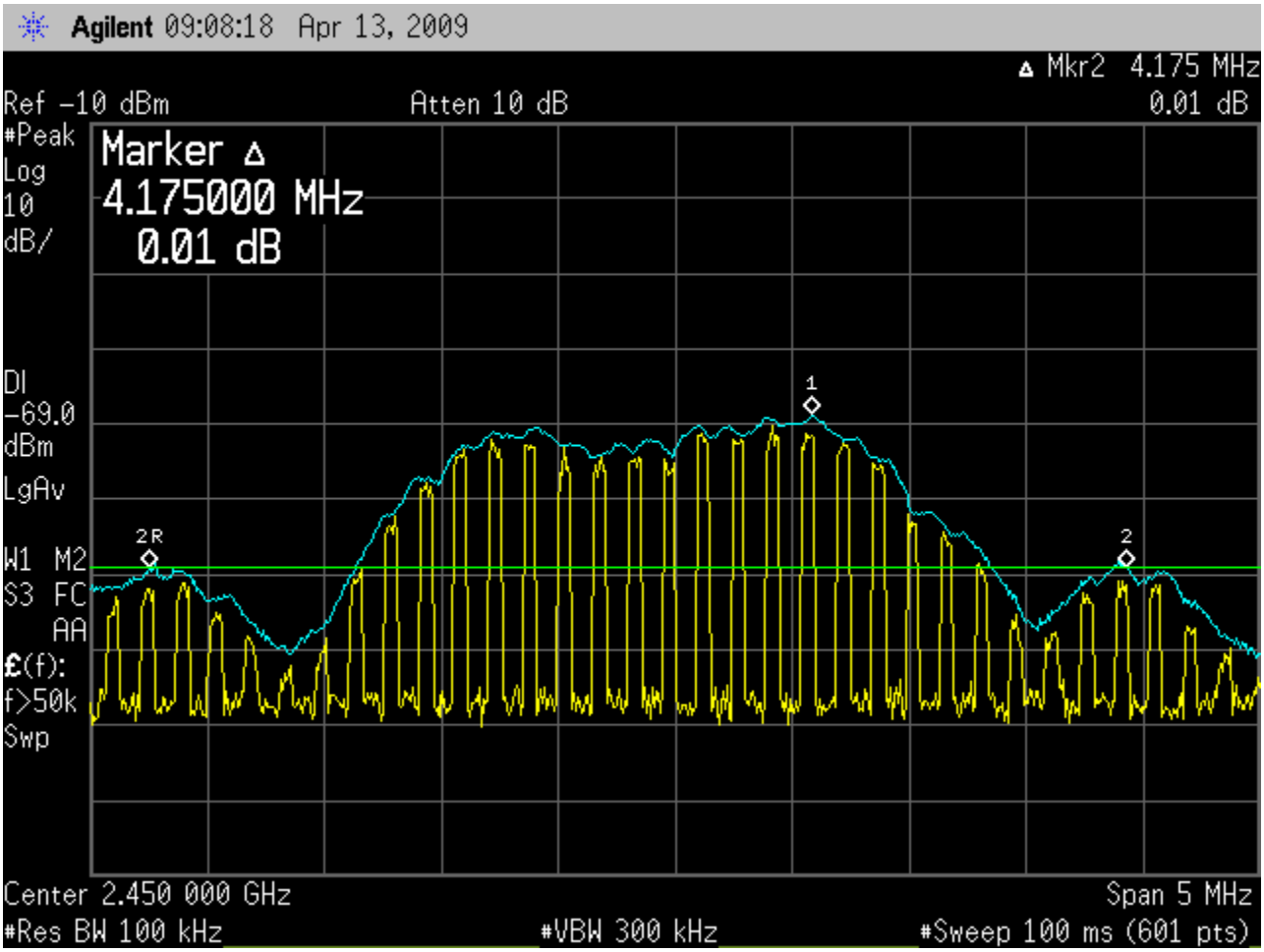
Additional Observations:

- Measurements were made at 1 meter. The spectrum analyzer center frequency was set to the channel carrier. After a PEAK output reading was taken, a line was drawn 20 dB lower than PEAK level. The bandwidth was determined from where the channel output spectrum intersected the display line.
- Analyzer RES BW was set not to be below 1% of the span for each RF output channel investigated. VBW is set at 3 times the RBW.
- No other emission skirts observed other than what is presented.

Channel Range	20 dB Bandwidth
Low (2425 MHz)	2.475 MHz
Mid (2450 MHz)	4.175 MHz
High (2475 MHz)	2.658 MHz



LOW Channel (2425 MHz)



MID Channel (2450 MHz)

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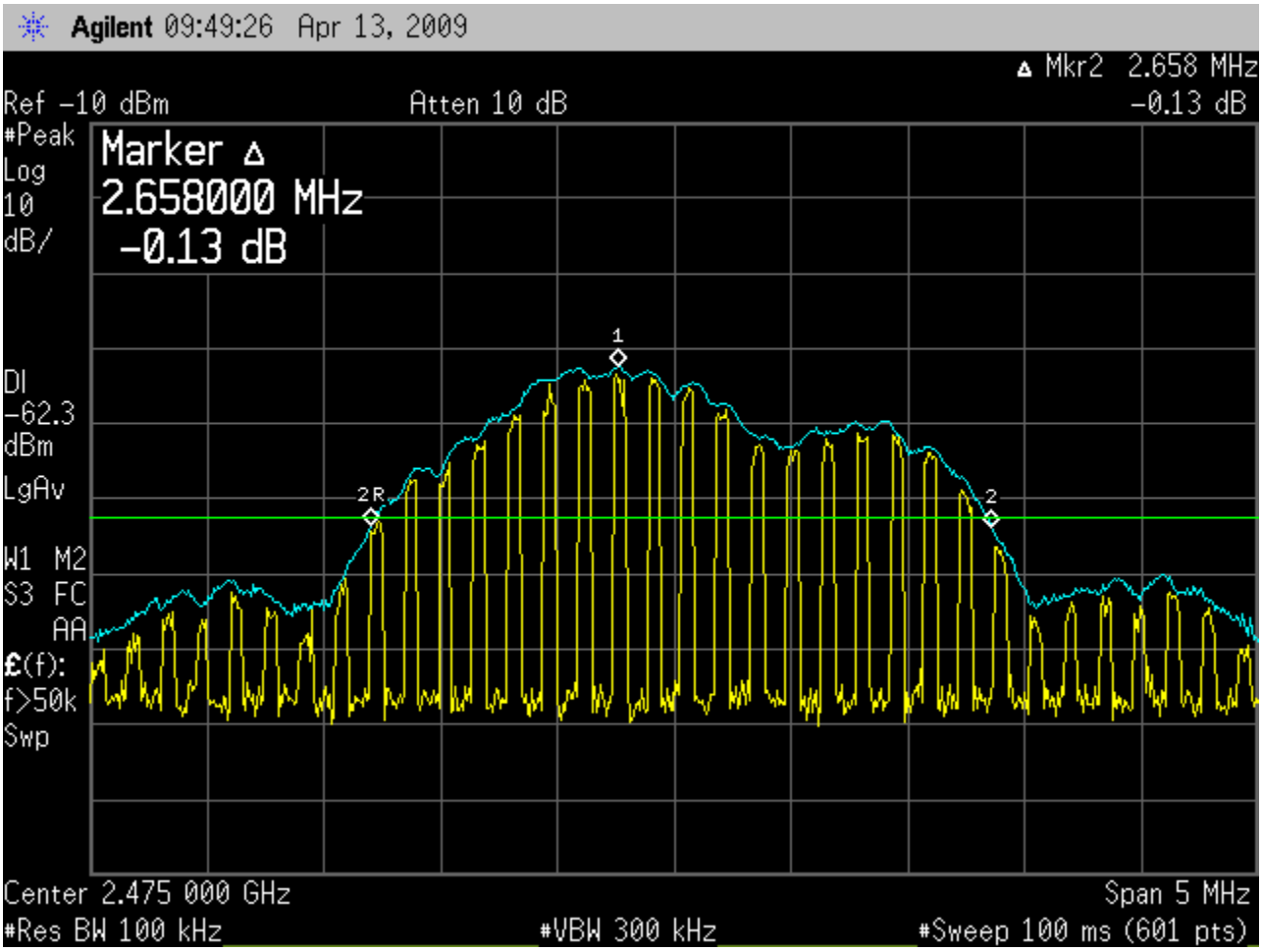

HIGH Channel (2475 MHz)

Section 15.247(a)(2) – Minimum 6dB RF Bandwidth

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Conditions:

Sample Number:	165541	**Temperature:**	18.9°C
Date:	April 13, 2009	**Humidity:**	48%
Modification State:	Low, Mid and High Channel	**Tester:**	FSCustodio
		Laboratory:	SOATS

Test Results:

See attached plots

Additional Observations:

- Measurements were made at 3 meters. Each channel investigated was maximized in the OATS before any reading was made. Analyzer RES BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was plotted; a DISPLAY line was drawn 6 dB lower than PEAK level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

Channel Range	6 dB Bandwidth
Low (2425 MHz)	1.692 MHz
Mid (2450 MHz)	1.642 MHz
High (2475 MHz)	1.642 MHz

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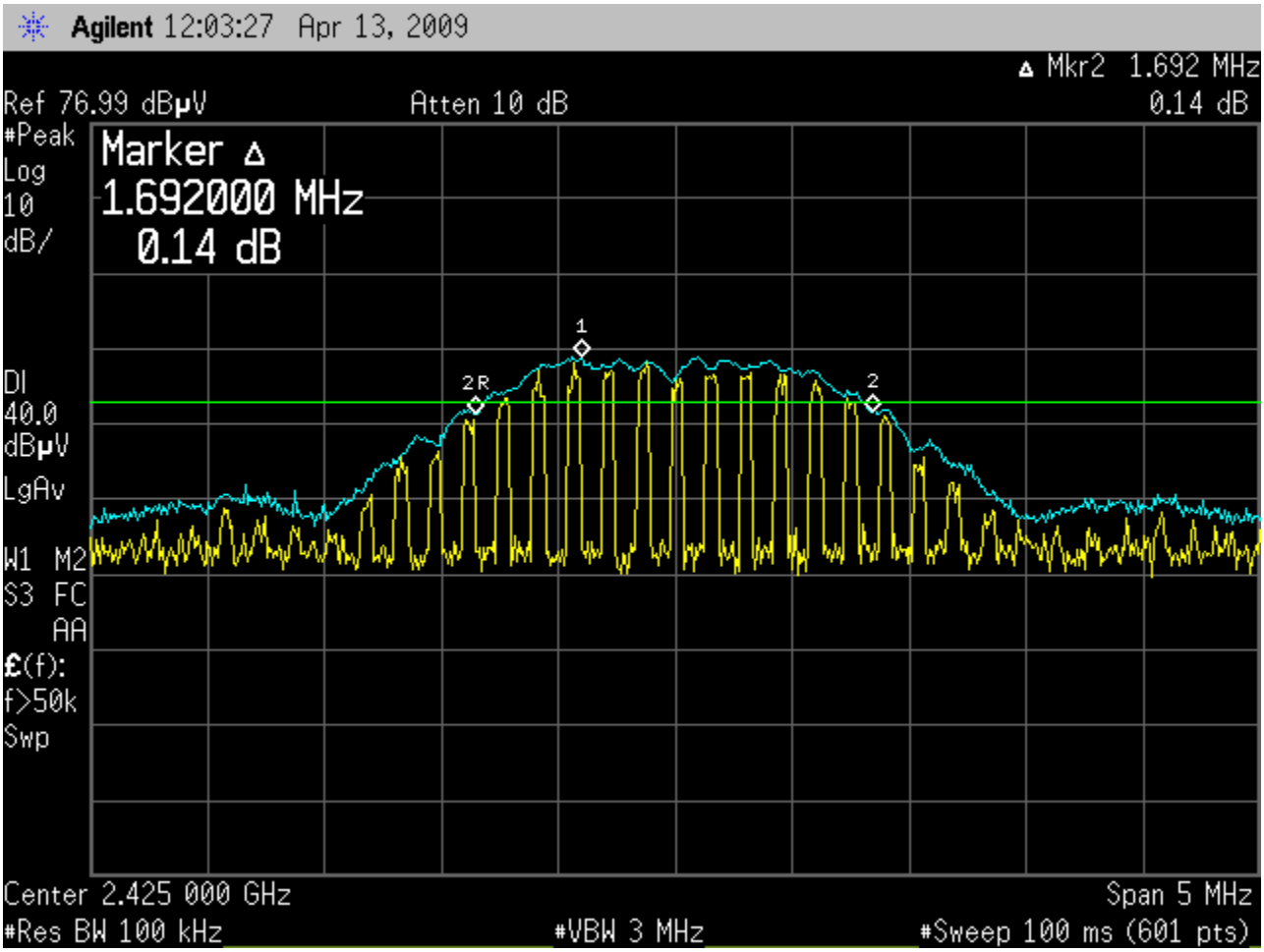

LOW Channel (2425 MHz)

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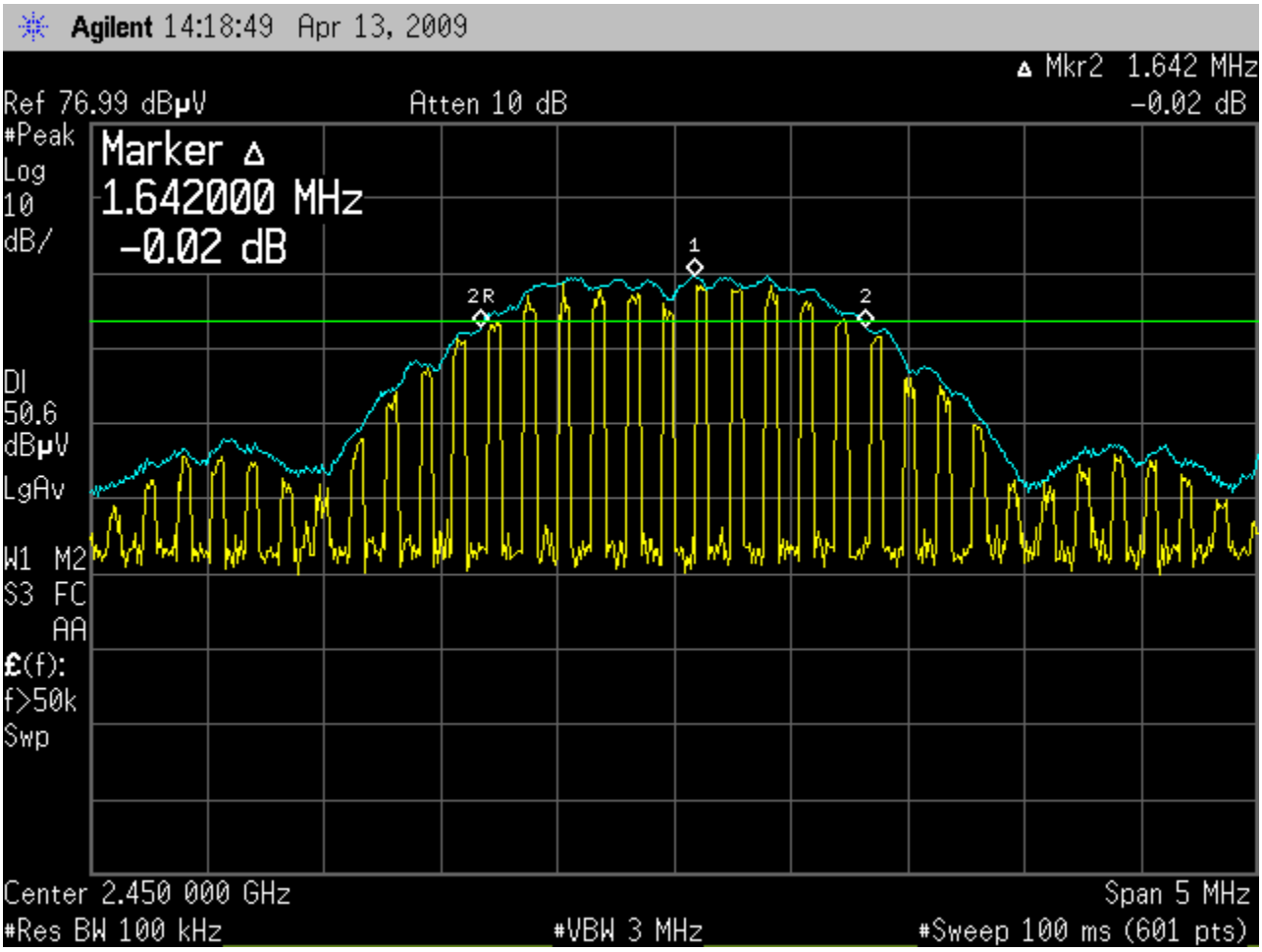

MID Channel (2450 MHz)

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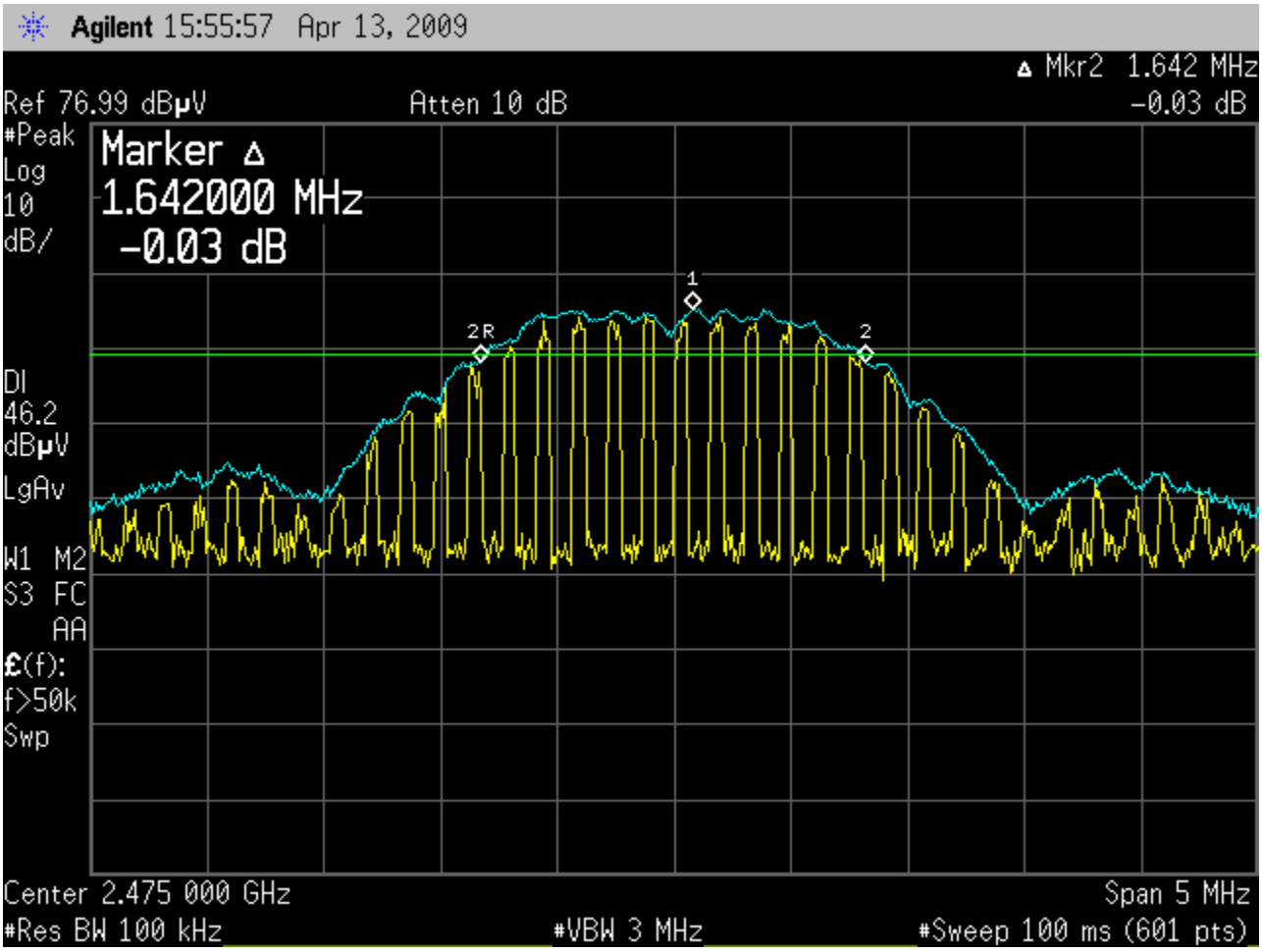
Phone (858) 755-5525 Fax (858) 452-1810



HIGH Channel (2475 MHz)

Section 15.247(d) – Radiated Emissions within Restricted Bands/ A8.5 Out-of-band Emissions

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

A8.5 In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

Test Conditions:

Sample Number:	**165541**	**Temperature:**	18.9°C
Date:	April 13, 2009	**Humidity:**	48%
Modification State:	Low, Mid and High Channel	**Tester:**	FSCustodio
		Laboratory:	SOATS

Test Results:

See attached plots.
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Additional Observations:

- The Spectrum was searched from 30MHz to the 10th Harmonic, 25000 MHz. There are no emissions found that do not comply to the restricted bands defined in FCC Part 15 Subpart C, 15.205 or Part 15.247(d).
- The EUT emissions was maximized and measured on three orthogonal axis.
- Radiated Measurements below 1GHz were performed at 3m with a Quasi-Peak detector (RBW 120kHz/VBW 300kHz) while Radiated Peak (RBW 1MHz/VBW 3MHz) measurements conducted above 1GHz.
- Average = Peak – Duty Cycle Factor

- The device has an integral antenna with no conducted emissions measurement capability.

- Measurements were made after fresh batteries were installed.

- Bandedge plots presented are direct measurements. Antenna factor, cable loss and preamp gain are applied automatically by the radiated emission spreadsheet. See sample computation below.

- Sample Computation:

Correction factor @ 2400MHz	= 0.2 = Antenna factor + Cable loss – Preamp gain = 28.3 + 5.9 – 34
Corrected reading	= Max. reading + Correction factor = 62.48 + 0.2 = 62.6 dBµV/m

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Radiated Emissions Data

Job # :	23904-1	Date :	04/13/2009	Page	1 of 1
NEX #:	123926	Time :	10AM		
		Staff :	FSC		

Client Name :	SMK Electronics Inc.	EUT Voltage :	Battery
EUT Name :	Set top box remote	EUT Frequency :	
EUT Model # :	165541	Phase:	
EUT Serial # :	N/A	NOATS	
EUT Config. :	Transmit-- test configuation	SOATS	X
		Distance < 1000 MHz:	3 m
		Distance > 1000 MHz:	3 m

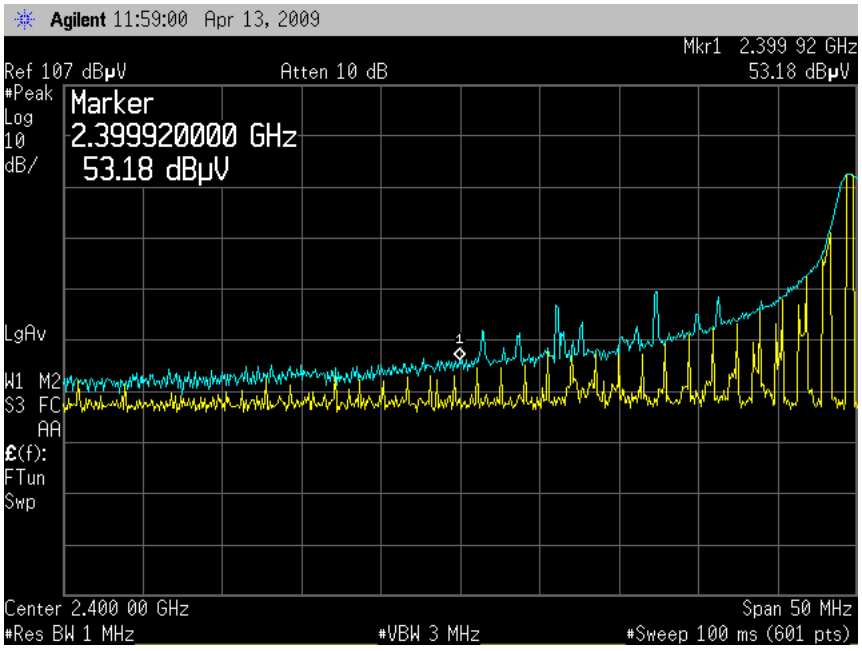
Specification :	CFR47 Part 15C 15.249 15.209		
Loop Ant. #:	NA		
Bicon Ant.#:	128_10m	Temp. (°C) :	18.9
Log Ant.#:	111_10m	Humidity (%) :	48
DRG Ant. #	529	Spec An.#:	911
Cable LF#:	SOATS	Spec An. Display #:	911
Cable HF#:	40ft	QP #:	911
Preamp LF#:	NA	PreSelect#:	NA
Preamp HF#	919	DC CF	-9.81

Quasi-Peak	RBW: 120 kHz
	Video Bandwidth 300 kHz
Peak (Fundamental)	RBW: 3 MHz
	Video Bandwidth 3 MHz
Peak	RBW: 1 MHz
	Video Bandwidth 3 MHz

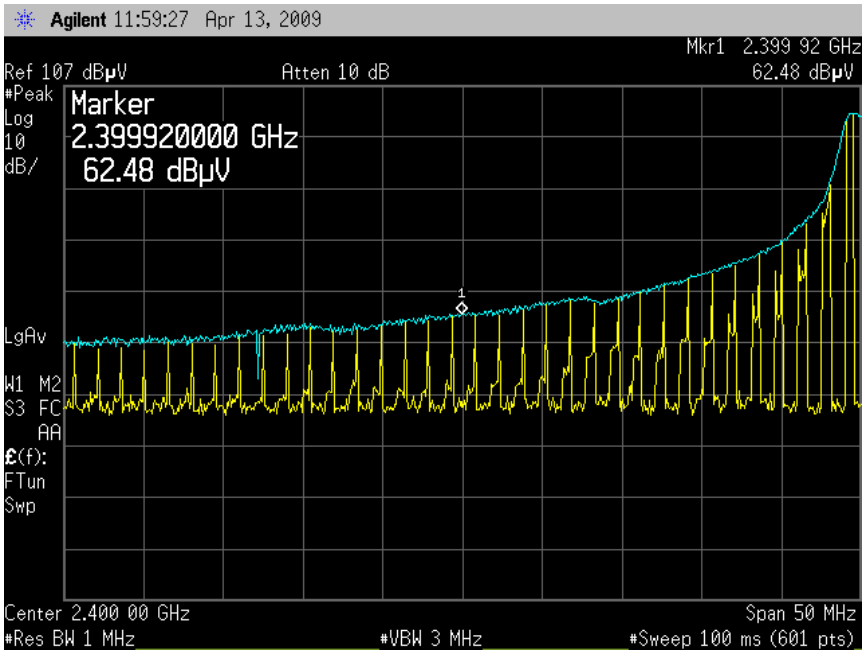
Average = Peak + Duty Cycle Factor

Meas. Freq. (MHz)	Meter Reading **Vertical**	Meter Reading **Horizontal**	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dBµV)	Corrected Reading (dBµV/m)	Spec. limit (dBµV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
2400.0	53.2	62.5	P	BL	1.0	62.48	62.6	74.0	-11.4	Pass	
2400.0	43.4	52.7	A	BL	1.0	52.67	52.8	54.0	-1.2	Pass	
2425.0	59.0	61.8	P	BL	1.0	61.79	95.9	125.2	-29.3	Pass	X
2425.0	60.2	55.0	P	F	1.0	60.2	94.4	125.2	-30.9	Pass	Y
2425.0	60.1	60.6	P	L	1.0	60.63	94.8	125.2	-30.4	Pass	Z
4850.0	52.6	51.5	P	BR	1.0	52.63	58.8	74.0	-15.1	Pass	X
4850.0	42.8	41.7	A	BR	1.0	42.82	49.0	54.0	-4.9	Pass	X
4850.0	54.6	54.1	P	F	1.0	54.59	60.8	74.0	-13.2	Pass	Y
4850.0	44.8	44.3	A	F	1.0	44.78	51.0	54.0	-3.0	Pass	Y
4850.0	54.5	52.0	P	L	1.0	54.48	60.7	74.0	-13.3	Pass	Z
4850.0	44.7	42.2	A	L	1.0	44.67	50.9	54.0	-3.1	Pass	Z
2450.0	58.9	60.6	P	BR	1.8	60.56	94.7	125.2	-30.5	Pass	X
2450.0	59.1	54.3	P	F	1.0	59.08	93.2	125.2	-32.0	Pass	Y
2450.0	57.6	59.7	P	F	1.0	59.68	93.8	125.2	-31.4	Pass	Z
4900.0	51.3	51.9	P	BR	1.8	51.85	58.3	74.0	-15.7	Pass	X
4900.0	41.5	42.0	A	BR	1.8	42.04	48.5	54.0	-5.5	Pass	X
4900.0	51.6	52.6	P	F	1.0	52.64	59.1	74.0	-14.9	Pass	Y
4900.0	41.7	42.8	A	F	1.0	42.83	49.3	54.0	-4.7	Pass	Y
4900.0	52.6	51.4	P	F	1.0	52.59	59.0	74.0	-15.0	Pass	Z
4900.0	42.8	41.6	A	F	1.0	42.78	49.2	54.0	-4.8	Pass	Z
2475.0	57.1	57.7	P	BL	2.2	57.69	91.8	125.2	-33.4	Pass	X
2475.0	58.7	52.4	P	F	1.0	58.69	92.8	125.2	-32.4	Pass	Y
2475.0	54.3	57.2	P	L	1.2	57.19	91.3	125.2	-33.9	Pass	Z
2483.5	63.3	50.1	P	F	1.0	63.29	63.4	74.0	-10.6	Pass	
2483.5	53.5	40.3	A	F	1.0	53.48	53.6	54.0	-0.4	Pass	
4950.0	50.2	49.6	P	BL	2.2	50.2	56.6	74.0	-17.4	Pass	X
4950.0	40.4	39.8	A	BL	2.2	40.39	46.8	54.0	-7.2	Pass	X
4950.0	50.4	51.1	P	F	1.0	51.14	57.6	74.0	-16.4	Pass	Y
4950.0	40.6	41.3	A	F	1.0	41.33	47.8	54.0	-6.2	Pass	Y
4950.0	50.0	49.9	P	L	1.2	50	56.4	74.0	-17.6	Pass	Z
4950.0	40.2	40.0	A	L	1.2	40.19	46.6	54.0	-7.4	Pass	Z

Lower Bandedge Measurements Plots (2400MHz)

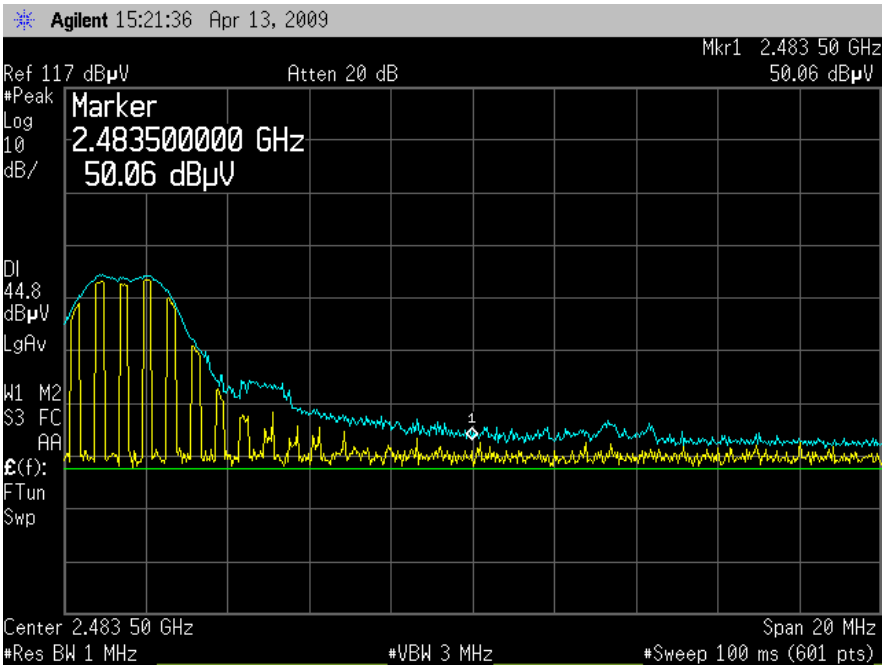


Vertical

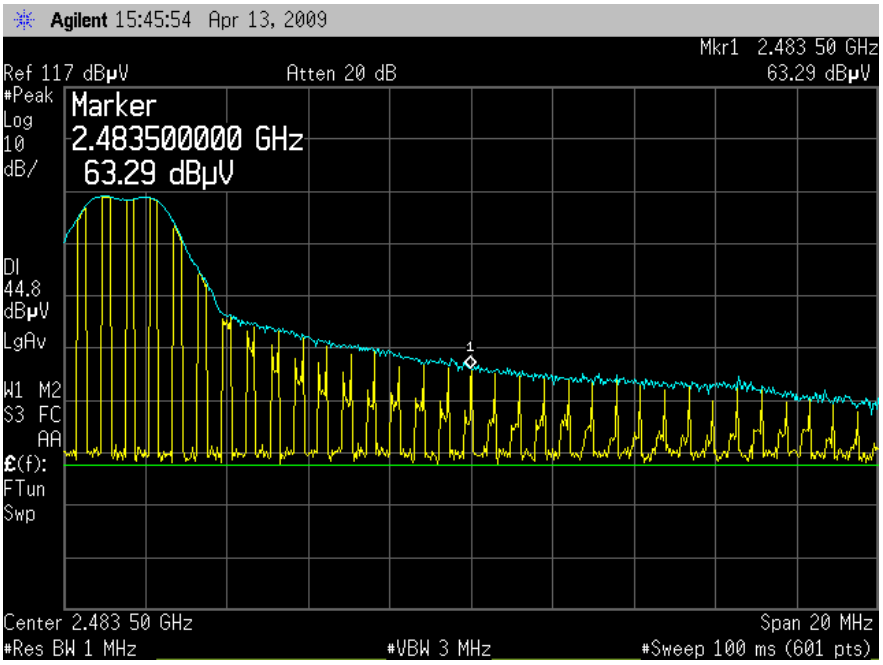


Horizontal

Upper Bandedge Measurements Plots (2483.5MHz)



Horizontal



Vertical

Section 15.247(b)(3) – Power Output (Radiated Emission Test)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

Test Conditions:

Sample Number:	165541	**Temperature:**	18.9°C
Date:	April 13, 2009	**Humidity:**	48%
Modification State:	Low, Mid and High Channel	**Tester:**	FSCustodio
		Laboratory:	SOATS

Test Results:

See table.

Additional Observations:

- Investigations were made at 3 meters. Each channel investigated was maximized in the OATS. Analyzer RES BW was set to 3 MHz and VBW to 3 MHz for fundamental power level measurements.
- A correction factor of 34.2 dB was added to compensate for antenna factor and cable loss at the fundamental frequencies.
- Measurements were made after fresh batteries were installed.
- Manufacturer's antenna gain: -2 dBi
- The peak level measured was converted to mW using the formula:

$$P = (E \times d)^2 / (30 \times G)$$

Where: **P** is power in watts
E is measured maximum field strength in V/m
D is measurement distance
G is numeric gain of the transmitting antenna over an isotropic radiator

Convert maximum reading in dBµV/m to V/m:

E = $10^{((dB\mu V/m\ -120)/20)}$
= $10^{((95.9-120)/20)}$
= 0.062373 V/m

Convert dB gain to numeric gain:

G = $10^{(G/10)}$
= $10^{(-2/10)}$
= 0.63

Going back to the original formula:

P = $(0.062373 \times 3)^2 / (30 \times 0.63)$
= **0.001852 watts**

Converting watts to dBm:

P = 10 log (0.000738) + 30
= **2.68 dBm**

Correction factor @ 2425MHz
= 34.2
= Antenna factor + Cable loss – Preamp gain
= 28.3 + 5.9 – 0

Corrected reading = Max. reading + Correction factor
= 61.79 + 34.2
= 95.9 dBµV/m

Channel	Frequency (MHz)	Measured Output Power (dBµV/m)	Measured Output Power (mW)	Measured Output Power (dBm)
Low	2425	95.9	1.852	2.68
Mid	2450	94.7	1.405	1.47
High	2475	92.8	0.907	-0.424

Section 15.247(e) – Power Spectral Density

15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

A8.2(b) The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0-second duration. This power spectral density shall be determined in accordance with the provisions of Section A8.4(4); (i.e. the power spectral density shall be determined using the same method for determining the conducted output power).

Test Conditions:

Sample Number:	165541	**Temperature:**	18.9°C
Date:	April 13, 2009	**Humidity:**	48%
Modification State:	Low, Mid and High Channel	**Tester:**	FSCustodio
		Laboratory:	SOATS

Test Results:

See attached plots.

Additional Observations:

- Measurements were made at 3 meters. Each channel investigated was maximized in the OATS before any reading was made.
- Analyzer RES BW was set to 3 kHz and the Span was set to 1.5 MHz. Sweep was 600 seconds For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier.
- Measurements were made after fresh batteries were installed.
- Peak level obtained after the 500-second sweeps are compared to the +8 dBm limit for each channel.

Frequency (MHz)	RF Field Strength(dBµV/m)	Calculated PSD @ -2 dBi gain (dBm)	Maximum Limit (dBm)	Pass/Fail
2425	82.41	-10.82	8	Pass
2450	81.03	-12.19	8	Pass
2475	76.73	-16.49	8	Pass

Convert RF Field strength reading from dBm to dBµV/m:

= -24.59dBm + 107

= 82.41 dBµV/m @ 3m

Convert maximum reading in dBµV/m to V/m:

E = $10^{((dB\mu V/m\ -120)/20)}$

= $10^{((82.41-120)/20)}$

= 0.01319 V/m

Convert dB gain to numeric gain:

G = $10^{(G/10)}$

= $10^{(-2/10)}$

= 0.63

Using the formula from Section 15.247(b) (3) – Power Output (Radiated Emission Test)

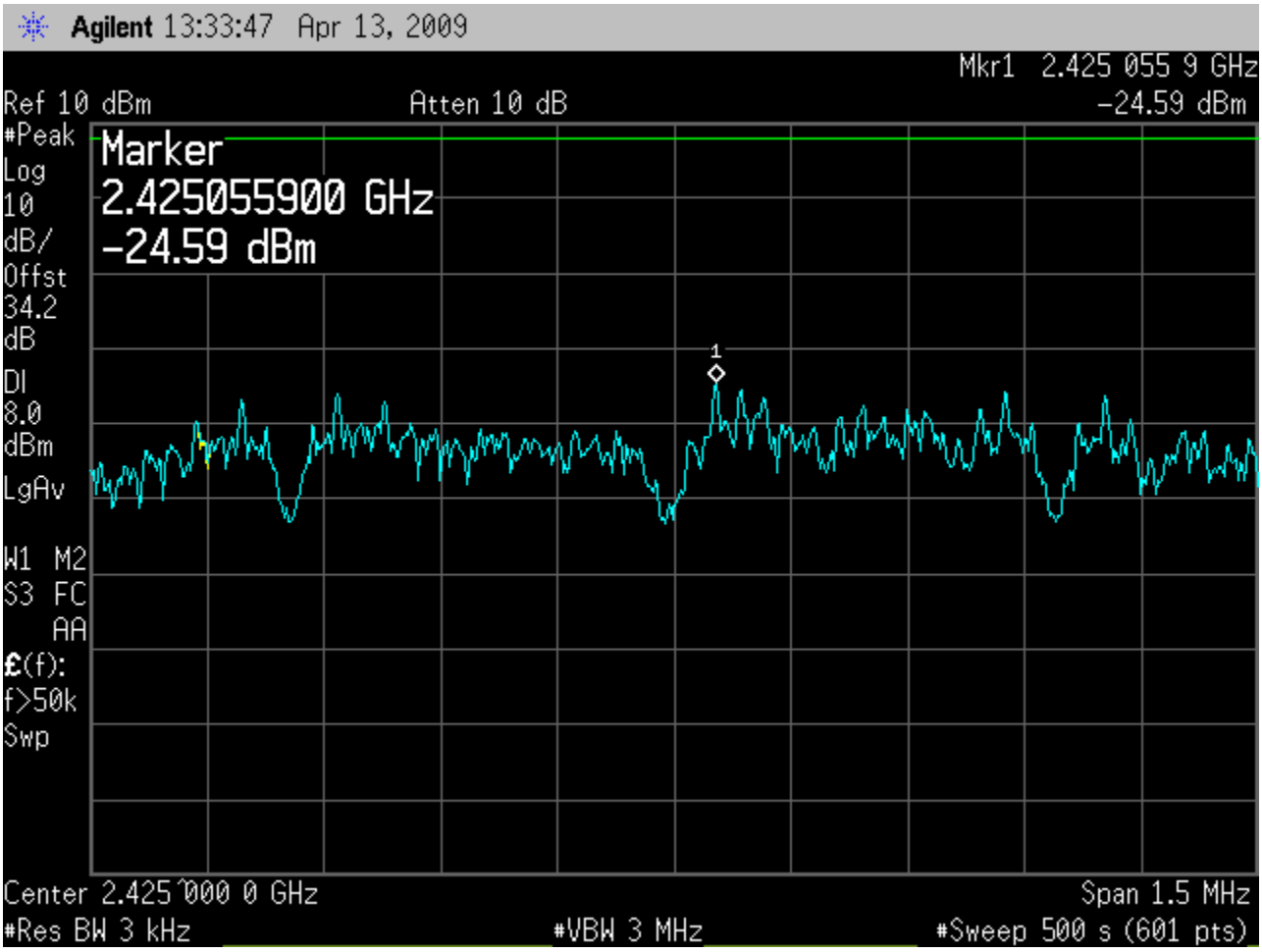
P = $(0.01319 \times 3)^2 / (30 \times 0.63)$

= **0.00008284 watts**

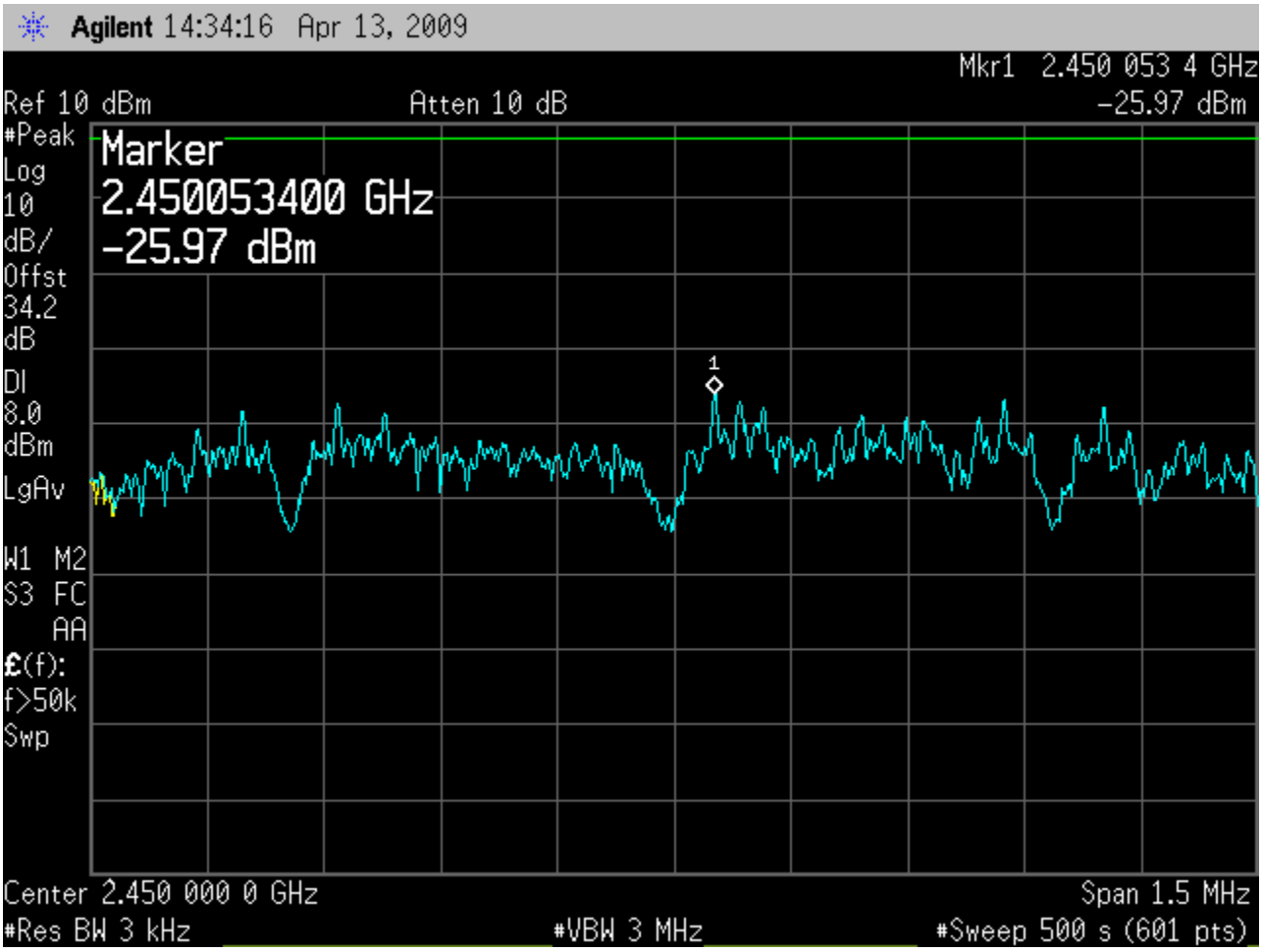
Converting watts to dBm:

P = 10 log (0.00008284) + 30

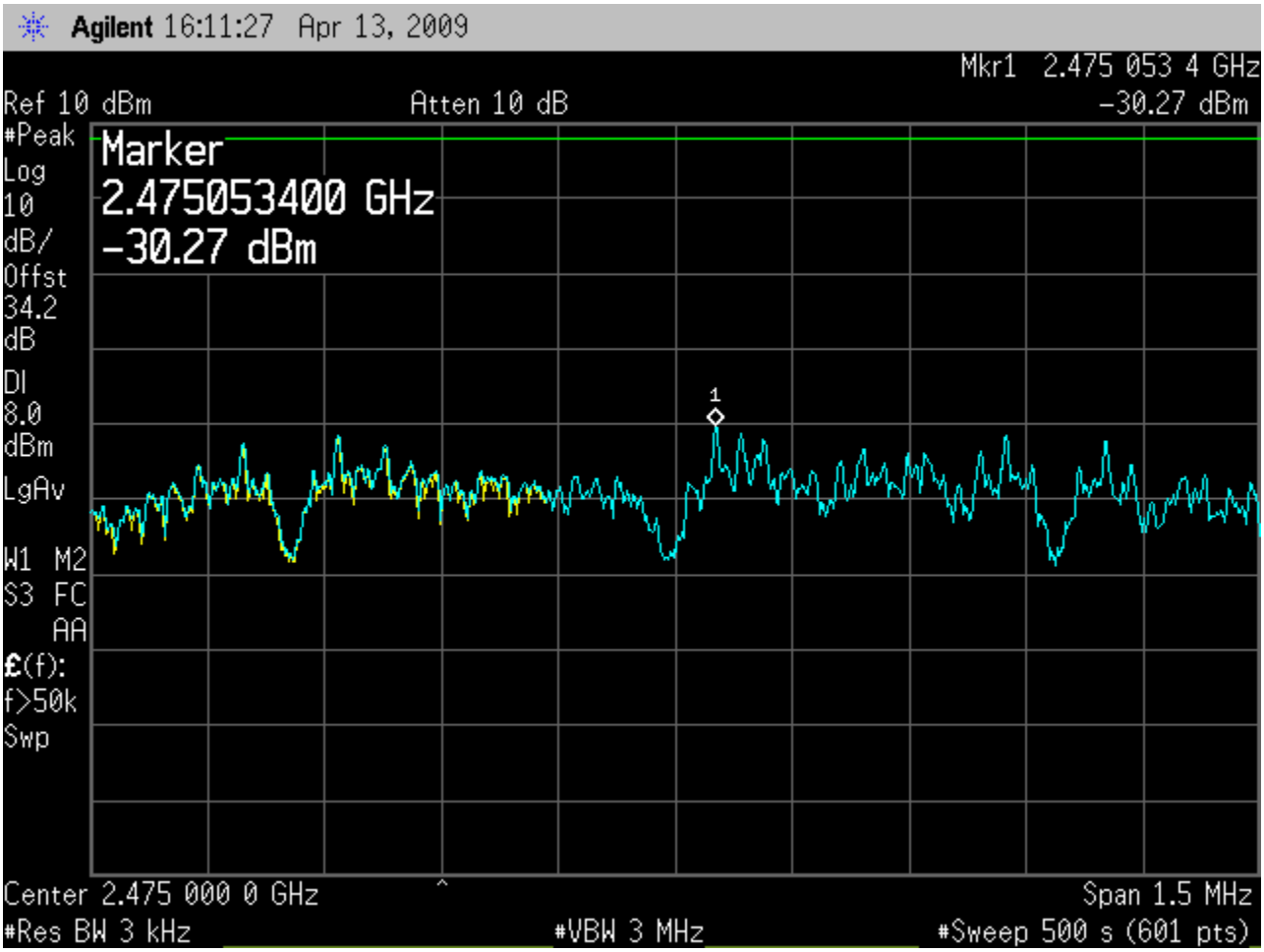
= **-10.82 dBm**



Low Channel 2425 MHz



Mid Channel 2450 MHz



High Channel 2475 MHz

Appendix C: Block Diagram of Test Setups

Test Site For Radiated Emissions