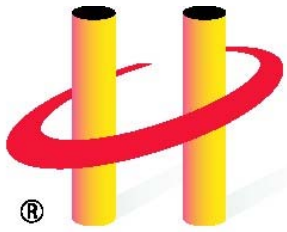

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Alamo, CA 94507-1572
Phone +1.925.462.9105
Fax +1.925.280.7751

EMC Test Report
FCC & IC

Applicant: Scosche Industries Inc.
Address 1550 Pacific Ave
Oxnard, CA 93033
Phone +1 805 486 4450
Fax +1 805 486 9996

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HYPER Corp is a BLUETOOTH Qualification Test Facility (BQTF) and Member of the SIG

Certificate Number 1708-1
HYPER Corp is an Accredited Laboratory by The American Association For Laboratory Accreditation (A2LA) to ISO/IEC 17025-for the scope of BLUETOOTH Testing.

Signature Page

HYPER Corporation personnel listed take responsibility for the content of this test report.

Reviewed

Original signed	08/09/2005
Kevin Marquess	Date

1. List of Revisions

Version	Date	Author(s)	Description
001	July 18, 2005	Mimi Warfel	Initial Version
002	July 25, 2005	Mimi Warfel	Corrections added
003	August 5, 2005	Mimi Warfel	Editorial changes
004	August 8, 2005	Mimi Warfel	Editorial fixes
005	August 9, 2005	Mimi Warfel	Minor fixes

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2. Disclaimer Notice

This test report applies only to the EUT (Equipment Under Test) and the results of the specifications called out in this report. The test results contained herein relate only to the model(s) identified. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics.
This Report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government.

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4. General Information

4.1 Identification of the EUT

Project Number	158-0506001	
Manufacturer	Scosche Industries, Inc.	
EUT/Model Number	IPBCK	
Date(s) tested	07/05/2005 – 07/19/2005	
Description of EUT	Mobile Transmitter & Receiver Car Kit using Bluetooth® Wireless Technology	
Condition of EUT	Received new production units in good quality	
FCC ID	IKQ-BTTRNS – Bluetooth transmitter	
	IKQ-BTREC – Bluetooth Receiver	
Frequency Range:	2402 MHz ~ 2480 MHz	
Number of Channels:	79	
Frequency of Each Channel	2402 + k (MHz), k=0~78	
Type of Modulation	GFSK	
Hardware Version		
Software Version	N/A	
Firmware Version	v6.3.4	
Test Facilities	HYPER Corporation:	
	1735 North First Street, Suite 311	
	San Jose, CA 95112-4511	
	BACL Corp.	Site: 200167-0
	230 Commercial Ave.	
	Sunnyvale, CA	

4.2 Antenna Information

Manuf.	Model Number	Freq. Range (MHz)	Peak Gain	Average Gain	VSWR	Z_0
1	AT9520-B2R4HAA	2400-2500	3.0 dBi (XZ-V)	1.0dBi (XA-V)	2 max.	50 Ω
2	3030A5839-01	2400-2500	4.1dBi		1.5:1	50 Ω

Manufacturers:
1) ACX- AT9520 Series Multilayer Chip Antenna
2) gigaAnt – Rufa 2.4 GHz SMD Antenna

5. Test Summary

This test report is prepared for the project of Scosche I Bluetooth Radio Module.

5.1 Summary of Test Results

Test	FCC Ref	RSS-210 Ref	FCC Results
Line Conducted Emissions	15.207(a)	9.0	Compliant
Carrier Frequency Separation	15.247(a)(1)	6.2.2(o)(a1)	Compliant
Number of Hopping Frequencies	15.247(a)(1)(iii)	6.2.2(o)(a3)	Compliant
Time of Occupancy (Dwell Time)	15.247(a)(1)(iii)	6.2.2(o)(a3)	Compliant
20 dB Bandwidth	15.247(a)(1)	6.2.2(o)(a1)	Compliant
Peak Output Power	15.247(b)(1)	6.2.2(o)(a3)	Compliant
Band-edge Compliance of RF Emissions	15.247(d)	6.2.2(o)(d1)	Compliant
Spurious RF Conducted Emissions	2.1051	6.2.2(o)(e1)	Compliant
Spurious Emissions Radiated	15.205, 15.209 & 15.247(d)	6.2.2(o)(e1)	Compliant
RF Exposure	1.1307(b)(1) & 2.1091	Note[1]	Compliant[1]

Note:
(1) RF Exposure for IC is documented in a supplement to this report

5.2 Test Specifications

The EUT was tested according to the procedures in FCC Part 15 Subpart C section 15.247 and FCC Public Notice DA 00-705, and also to demonstrate compliance with Industry Canada RSS-210 6.2.2 (O).

5.3 Operation Mode

The EUT module was tested using the reference board as the support test host. The EUT was embedded in and received power and data I/O from the host. A PC connection allowed commands to the module to be issued to put the device into the correct test modes.

5.4 Documentation of test device

Documentation of the tested device has been reviewed by HYPER Corporation engineers and found to be in compliance with applicable test specifications. All documentation is kept in the Job Folder.

5.5 General and Special Conditions

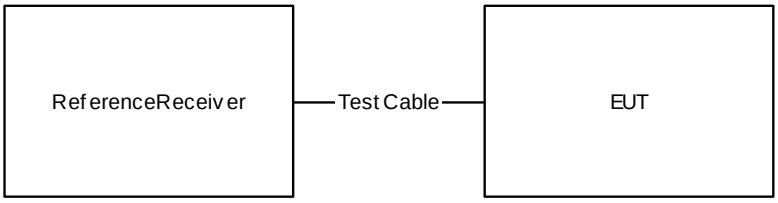
The EUT received power from the test host, which was powered using an AC adaptor plugged into the ac mains. All testing was done in an indoor controlled environment with an average temperature of 23.3º C and relative humidity of 43%.

5.6 Equipment and Cable Configurations

The EUT was tested using serial connector to enable test-modes. The primary cabling considerations were the cable used to connect the antenna port to the measuring equipment.

Manufacturer	Description	Model Number	Serial Number	CAL Date
Agilent Technology	PSA Series Spec. Analyzer	E4440A	US40420768	01/30/04
Agilent Technology	E1852B Bluetooth Test Set	E1852B	DK42050128	01/04/04
Dell	PC	GX-150	N/A	N/A

5.7 Test Setup Block Diagram(s)



6. Test Results

6.1 Conducted Emissions

The results below were provided via subcontract by BACL, as dictated by their laboratory quality system.

Measurement Uncertainty: All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN. Based on NIS 81, the treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ±2.4dB.

Test Setup: The measurement was performed in shield room, using the same setup per ANSI C63.4-2003 measurement procedure. The specification used was FCC Class B limits.
External I/O cables were draped along the edge of the test table and bundled when necessary. The host was connected with LISN-1.

Spectrum Analyzer Setup: The spectrum analyzer was set to investigate the spectrum from 150 kHz to 30 MHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
R&S	Receiver, EMI Test	ESCS30	100176	9/15/2004
R&S	LISN, Artificial Mains	ESH2-Z5	871884/039	8/16/2004

* Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Procedure: During the conducted emissions test, the power cord of the host system was connected to the mains outlet of LISN-1.
Maximizing procedure was performed on the six (6) highest emissions of the EUT. All data was recorded in the following modes: peak detection quasi-peak and average. Quasi-Peak readings are distinguished with a “QP”. Average readings are distinguished with an “Ave”.

Plot of Conducted Emissions Test Data:

Bay Area Compliance Laboratory Corp
Class B

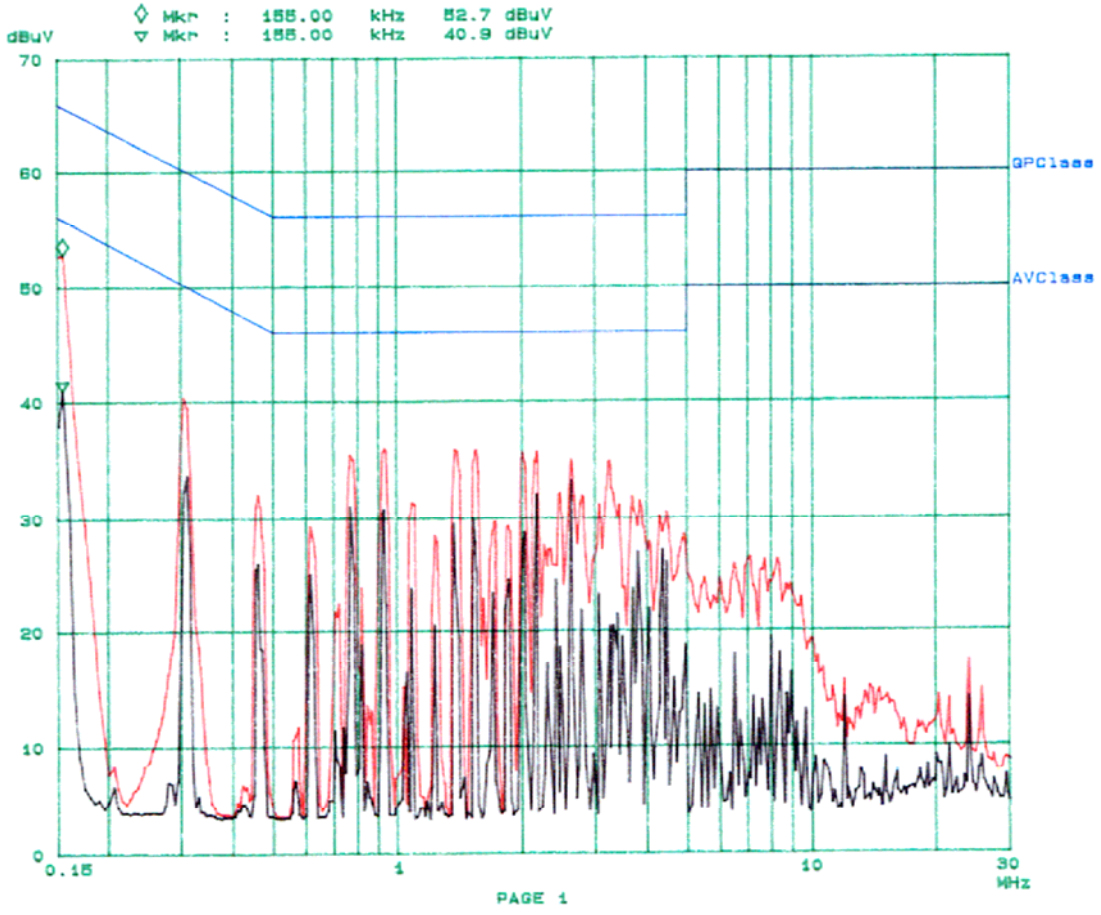
11. Jul 05 13:13

11 July 05
Snell

EUT: BlueTooth Receiver
Manuf: Scosche
Op Cond: Normal
Operator: Snell
Comment: N
120VAC

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	9k	QP+AV	20ms	15dBLN	OFF
1M	5M	10k	9k	QP+AV	1ms	15dBLN	OFF
5M	30M	100k	9k	QP+AV	1ms	15dBLN	OFF



Bay Area Compliance Laboratory Corp

11. Jul 05 13:33

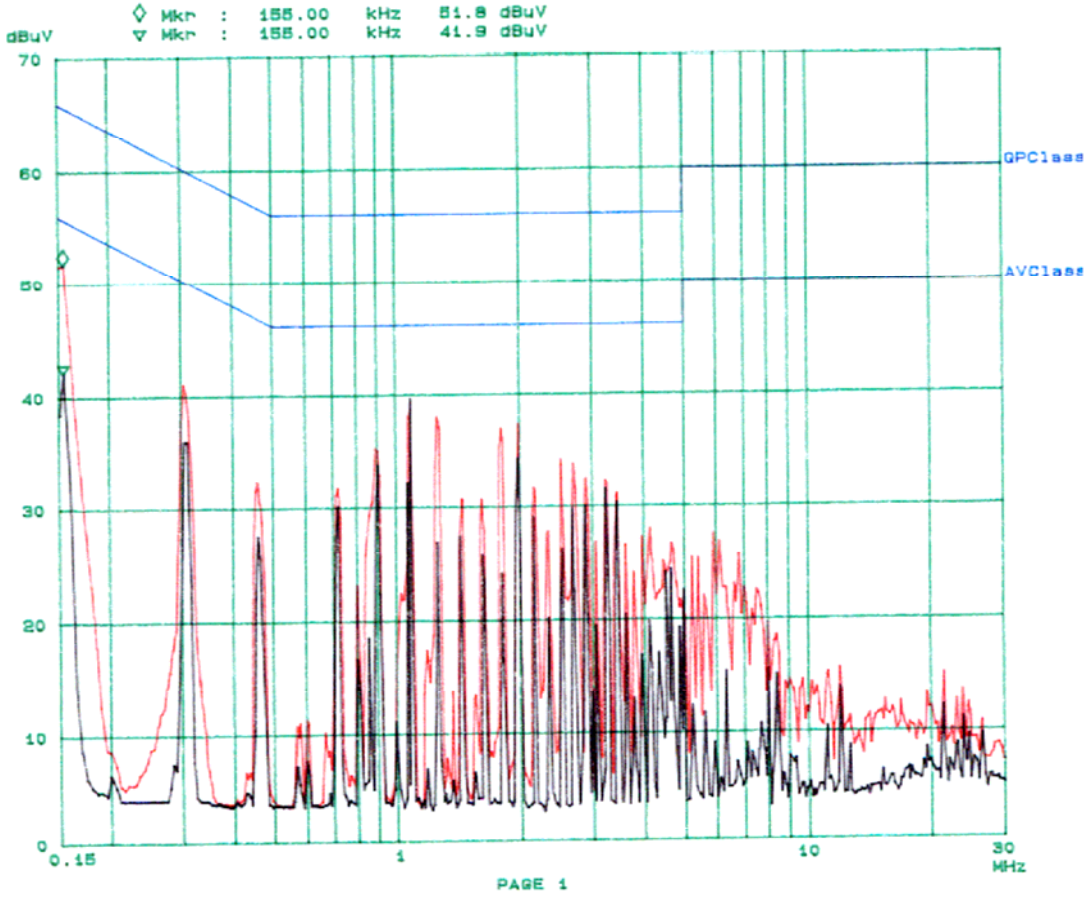
11 July 05
Snell

Class B

EUT: BlueTooth Receiver
Manuf: Scosche
Op Cond: Normal
Operator: Snell
Comment: L
120VAC

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	9k	QP+AV	20ms	15dBLN	OFF
1M	5M	10k	9k	QP+AV	1ms	15dBLN	OFF
5M	30M	100k	9k	QP+AV	1ms	15dBLN	OFF



PAGE 1

6.2 Carrier Frequency Separation

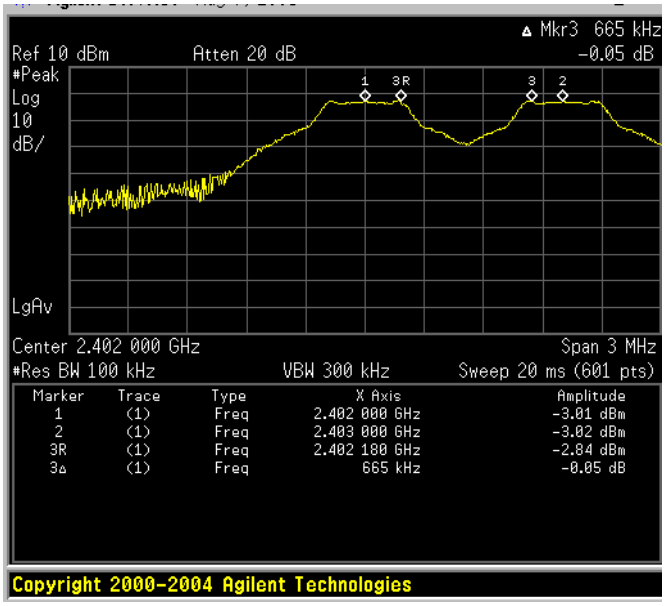
6.2.1 Operation Environment

Temperature: 23.3°C
Relative Humidity: 43%

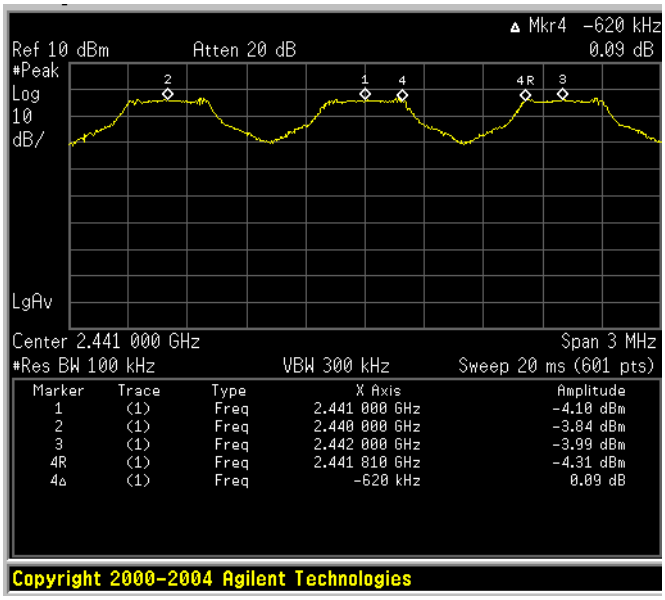
6.2.2 Test procedure

The carrier frequency separation per FCC 15.247(a)(1) / IC RSS210 6.2.2(o)(a1) was measured using a spectrum analyzer with the resolution (or IF) bandwidth (RBW) ≥ 1% of the span, the span should be wide enough to capture the peaks of two adjacent channels, and the video (or average) bandwidth (VBW) should be ≥ RBW. The carrier frequency separation result is described as below:

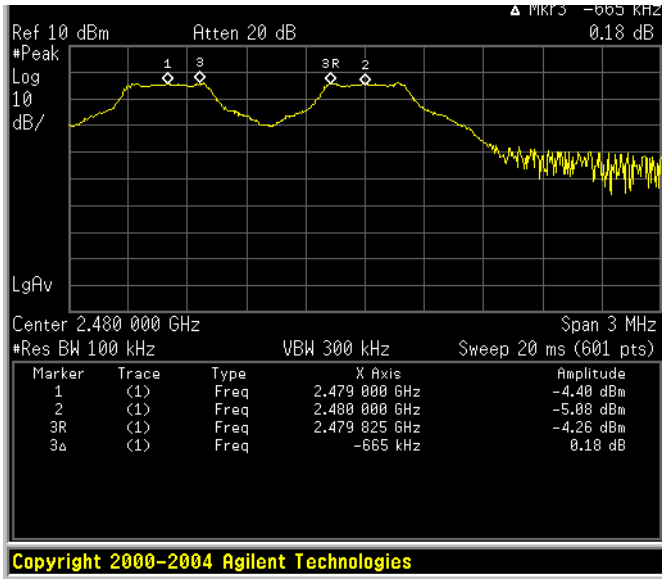
6.2.3 Measured data



Carrier Frequency Separation – DH5 – Low Frequency (2402 MHz)



Carrier Frequency Separation – DH5 - Mid Frequency (2441 MHz)



Carrier Frequency Separation – DH5 – High Frequency (2480 MHz)

Figure 6.2-1: Carrier Frequency Separation

Frequency (MHz)		Minimum Frequency Separation (kHz)	Worst-case Limit (kHz)[1]
Low	2402	665	25
Mid	2441	620	25
High	2480	665	25

Note:
1) Limit is defined as: “carrier frequencies separated by a minimum of 25kHz or the 20dB-bandwidth whichever is greater.”

6.3 Number of Hopping Frequencies

6.3.1 Operation Environment

Temperature: 23.3°C
Relative Humidity: 43%

6.3.2 Test procedure

The carrier frequency separation per FCC 15.247(a)(1)(ii)/ IC RSS210 6.2.2(o)(a3) was measured using a spectrum analyzer with RBW ≥ 1% of the span. The VBW is ≥ RBW and the span shall be equal to the frequency band of operation. The number of hopping frequencies measured data is shown below.

6.3.3 Measured data of test results

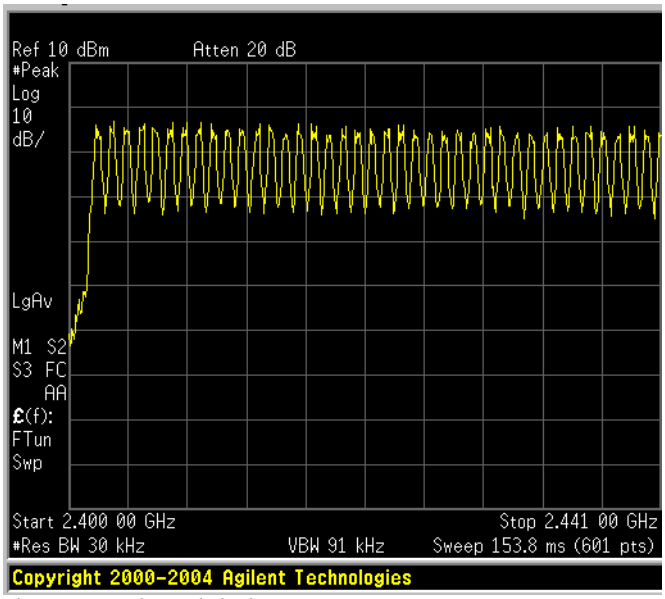


Figure 6.3-1 Channels in the Frequency range 2.400-2.441GHz

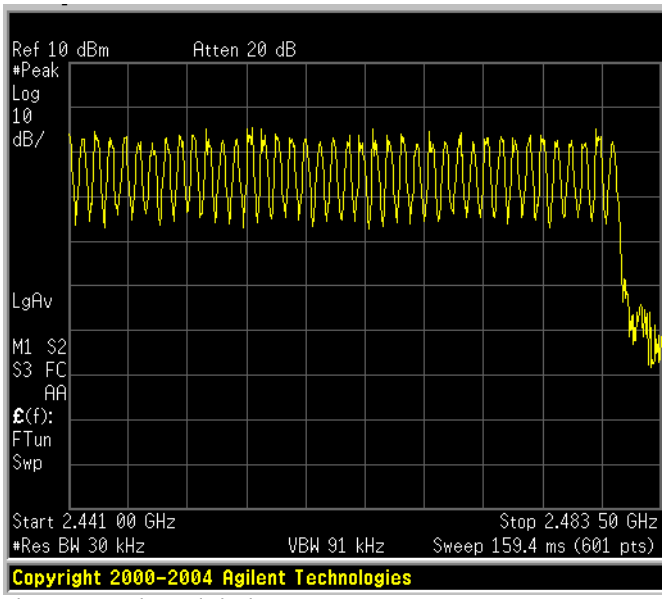


Figure 6.3-2 Channels in the Frequency range 2.440-2.4835GHz

Frequency Range (GHz)	Number of hopping frequencies	Total hopping channels
2.400 ~ 2.441	39.5	79
2.441 ~ 2.4835	39.5	

6.4 Time of Occupancy (Dwell Time)

6.4.1 Operation Environment

Temperature: 23.3°C
Relative Humidity: 43%

6.4.1 Test Procedure

The Time of Occupancy test case per FCC 15.247(a)(1)(ii)/ IC RSS210 6.2.2(o)(a3) was measured using a spectrum analyzer with RBW = 1 MHz. The VBW ≥ RBW and the zero span function of spectrum analyzer were enabled.

The worst case time of occupancy (Dwell Time) is (DH5 packet) (4 X 2.933 ms) (dwell time in 1 sec) x 30 seconds= 351.96 ms = 0.35196 sec < 0.4s in 30 sec. – Compliant

Summary Table			
Frequency	MHz	Dwell Time	Limit (Sec)
Low	2402	2.640 msec	0.4
Mid	2441	2.652 msec	0.4
High	2484	2.6401 msec	0.4
DH5 in 30 seconds		245.54 μsec	0.4

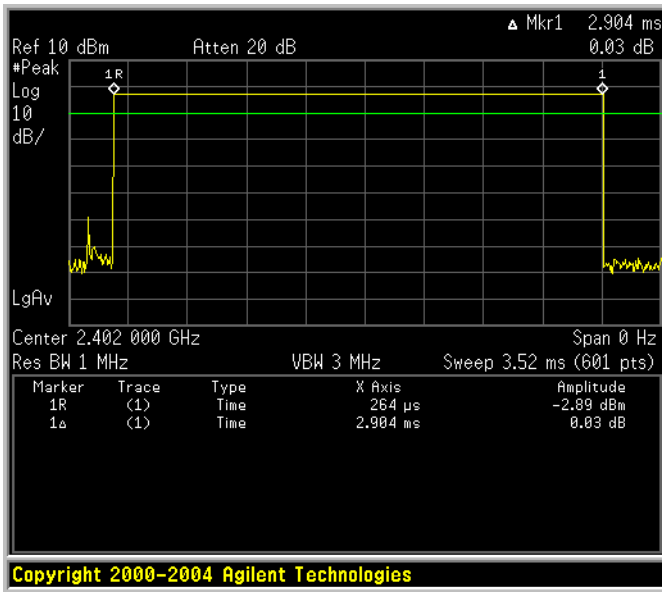


Figure 6.4-1: DH5 Mode Dwell Time

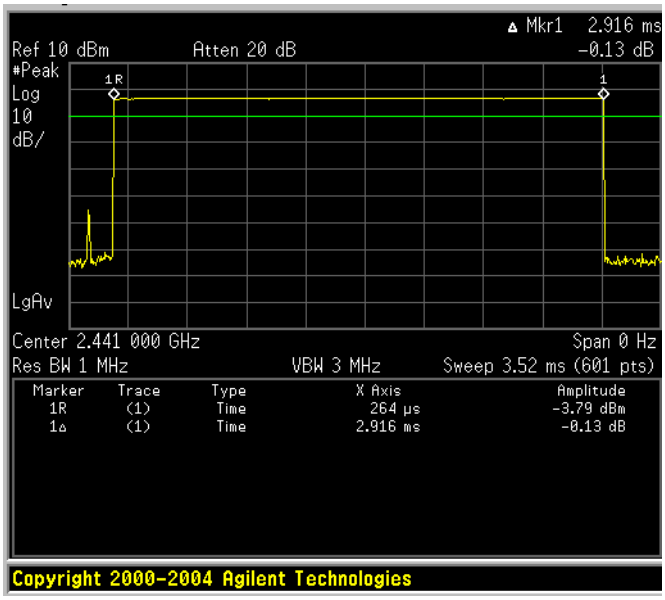


Figure 6.4-2: DH5 Mode Dwell Time

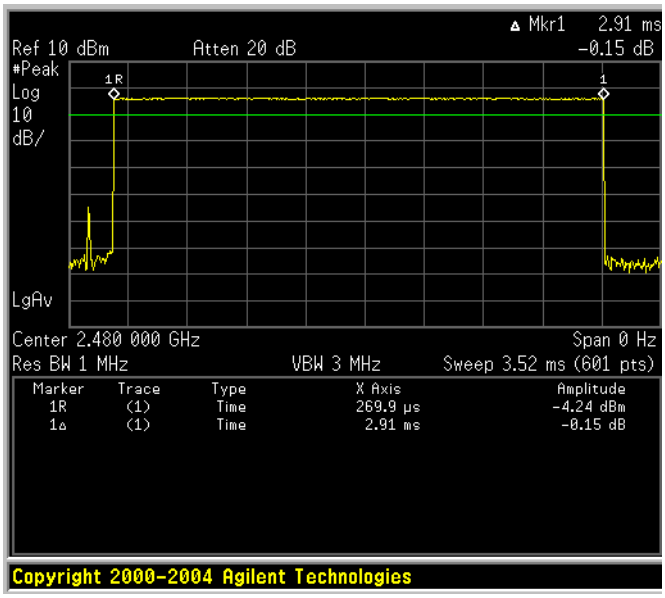


Figure 6.4-3: DH5 Mode Dwell Time

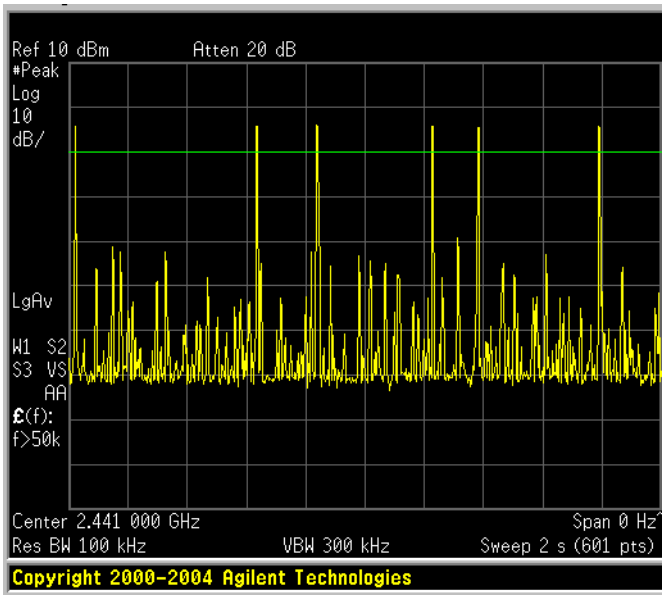


Figure 6.4-4: Plot showing numbers of pulses in 1 second in DH5 Mode
3 occurrences of DH5 packets in 1 second (6 in 2 seconds)

6.5 20 dB Bandwidth

6.5.1 Operation Environment

Temperature:	23.3°C
Relative Humidity:	43%

6.5.2 Test procedure

The 20dB bandwidth per FCC 15.247(a)(1)(ii)/IC RSS210 6.2.2(o)(a1) was measured using spectrum analyzer with the resolution bandwidth > 1% of the 20 dB bandwidth. The VBW shall be ≥ RBW, and the span shall equal to approximately 2 to 3 times the 20 dB bandwidth. This test was performed at 3 different channels (low, mid and high), and the maximum 20dB modulation bandwidth is listed below:

6.5.3 Measured data

Channel	Frequency (MHz)	Measured Bandwidth (kHz)	Limit (MHz)
Low	2402	845	1
Middle	2441	845	1
High	2480	840	1

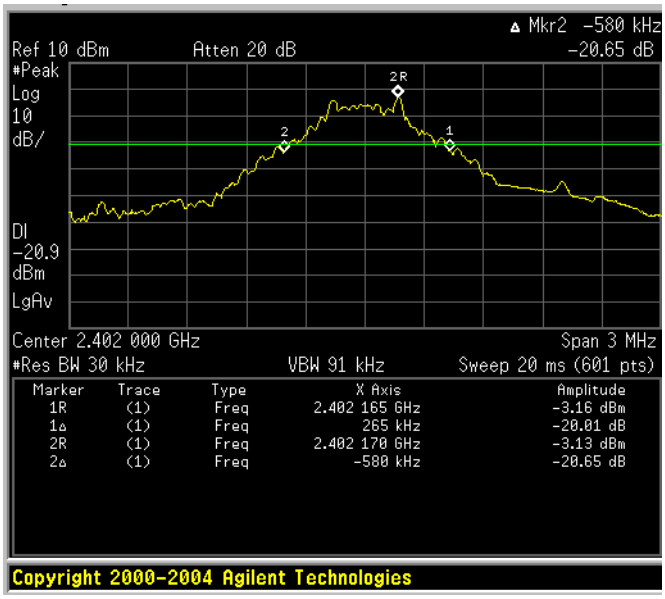


Figure 6.5-1: Bandwidth of the 2402 MHz channel

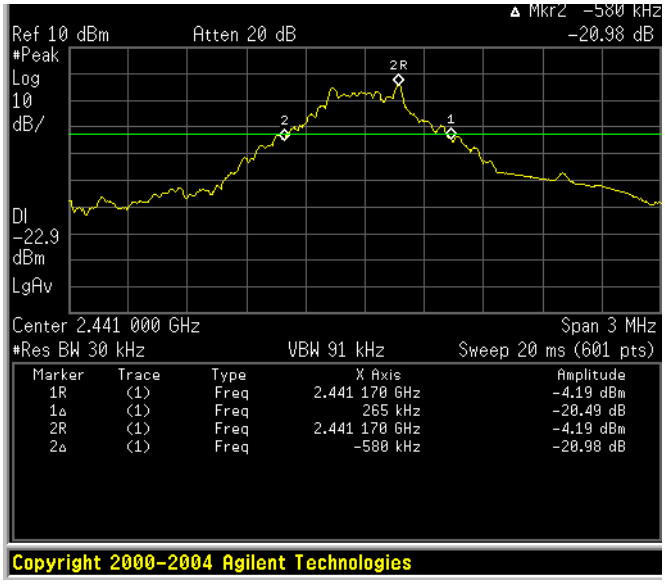


Figure 6.5-2: Bandwidth of the 2441 MHz channel

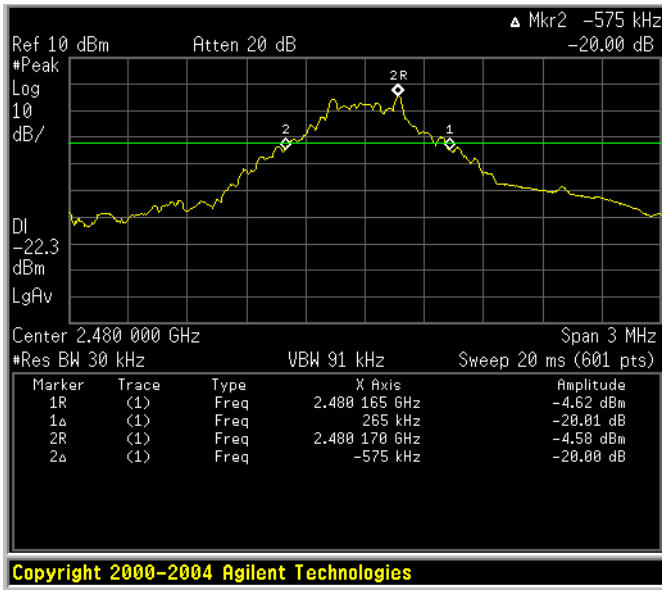


Figure 6.5-3: Bandwidth of the 2480 MHz channel

6.6 Peak Output Power

6.6.1 Operation Environment

Temperature: 23.3°C
Relative Humidity: 43%

6.6.2 Test procedure:

The Peak Output Power per FCC 15.247(b)(1)/
IC RSS210 6.2.2(o)(a3) was measured on the EUT using a 50-Ohm SMA cable connected to the spectrum analyzer.

6.6.3 Measured data of test results

Channel	Frequency (MHz)	Transmitter Peak Output Power (dBm)	Limit (dBm)
Low	2402	-3.02	20.97
Middle	2441	-4.36	20.97
High	2480	-4.67	20.97
			20.97dBm = 0.125 W

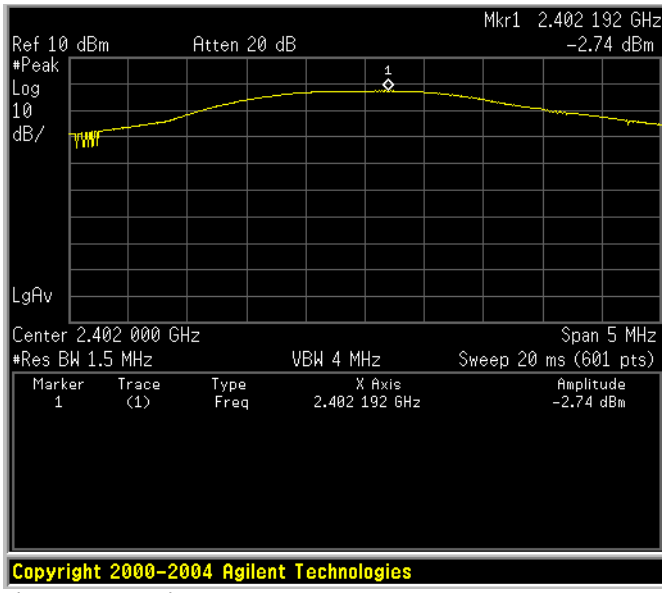


Figure 6.6-1: Peak Output Power on 2402 MHz

Cable correction = 0.28 dBm

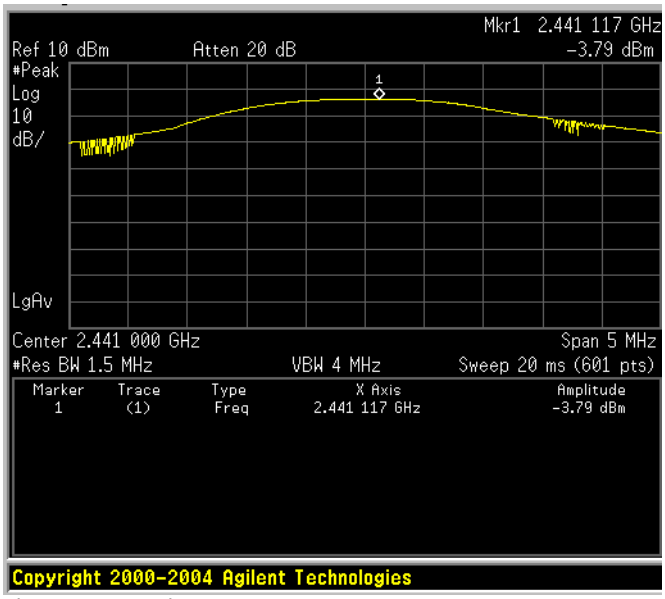


Figure 6.6-2: Peak Output Power on 2441 MHz

Cable correction = 0.57 dBm

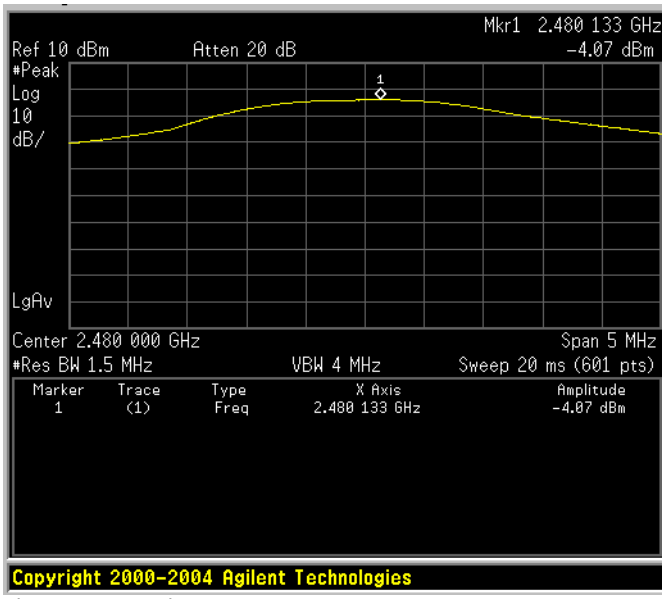


Figure 6.6-3: Peak Output Power on 2480 MHz
Cable correction = 0.60 dBm

6.7 Band-Edge Compliance of RF Conducted Emissions

6.7.1 Operation Environment

Temperature: 23.3°C
Relative Humidity: 43%

6.7.2 Test procedure

The band-edge compliance of RF conducted emissions of the EUT was measured per FCC 15.247(c)/IC RSS210 6.2.2(o)(d1). The EUT was set to operate on the lowest operating frequency and the level at the lower band-edge was measured. The upper band-edge level was then measured with the EUT operating on the highest operating frequency.

Measured data of test results

Band-edge Frequency (MHz)	Attenuation (dB) Relative to Peak Carrier Power
2400 (Hopping Off)	-41.09
2400 (Hopping On)	-30.94
2483.5 (Hopping Off)	-30.16
2483.5 (Hopping On)	-28.20

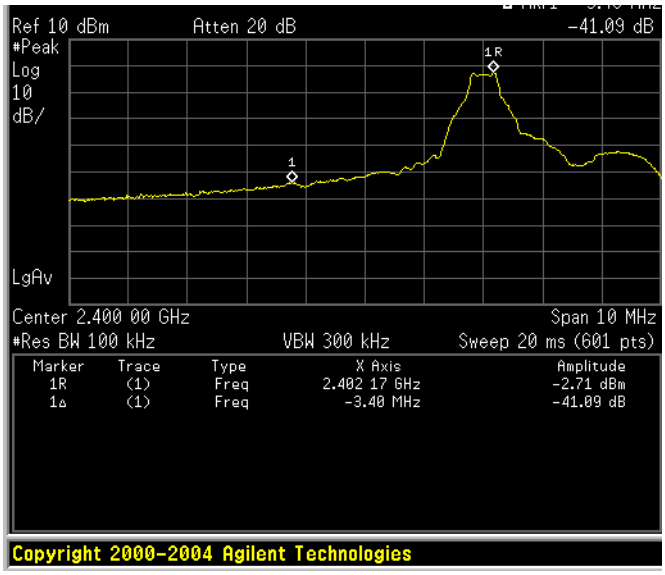


Figure 6.7-1: Band-Edge Compliance – Lower Band-Edge (2400MHz) – Hopping Off

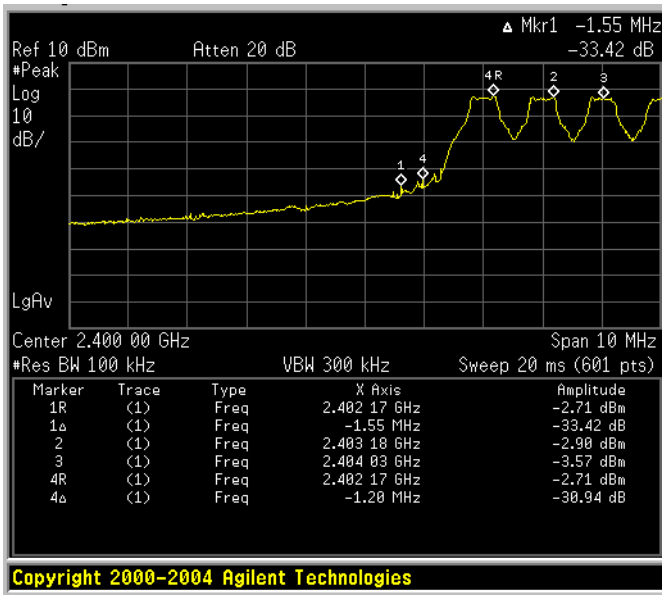


Figure 6.7-2: Band-Edge Compliance – Lower Band-Edge (2400MHz) – Hopping On

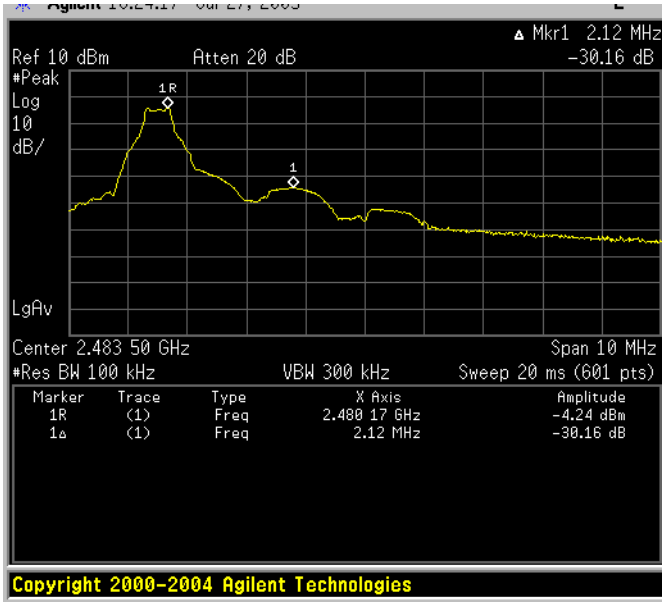


Figure 6.7-3: Band-Edge Compliance – Upper Band-Edge (2400MHz) Hopping Off

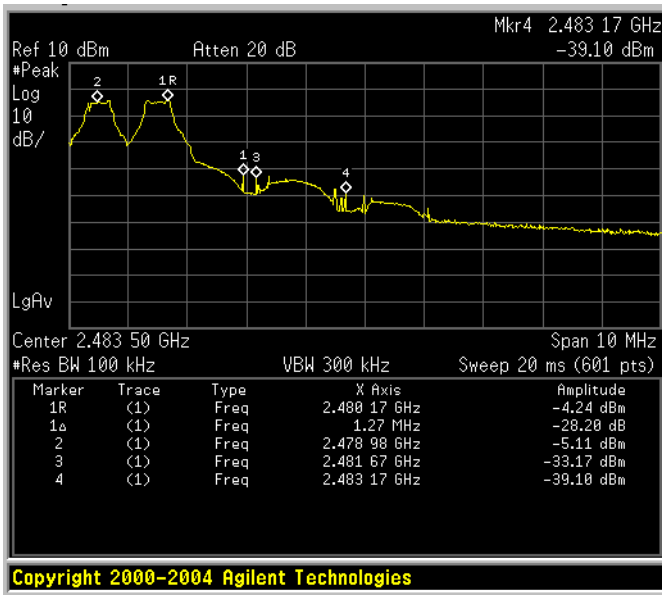


Figure 6.7-4: Band-Edge Compliance – Upper Band-Edge (2400MHz) Hopping On

6.8 Spurious RF Conducted Emissions

6.8.1 Operation Environment

Temperature:	23.3°C
Relative Humidity:	43%

6.8.2 Test procedure

The spurious RF conducted emissions were measured with the EUT set to low, middle, and high transmit frequencies per FCC 15.247(c) IC RSS210 6.2.2(o)(e1). The EUT was transmitting at its maximum data rate with the maximum channel occupancy time. At each frequency the spectrum was scanned from 0 MHz to 25 GHz.

Spectrum plots with transmitter operating on 2.402GHz non-hopping:

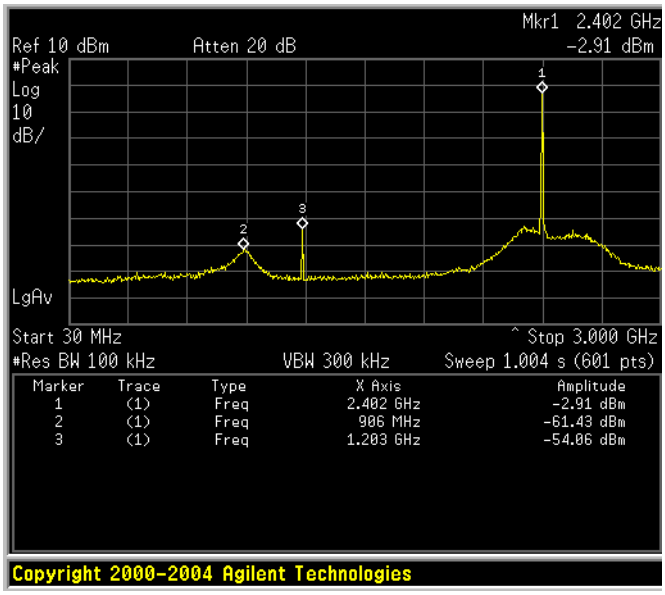


Figure 6.8-1: Conducted Spurious Emissions -1 (30MHz – 3.0 GHz) –Channel = 2402MHz

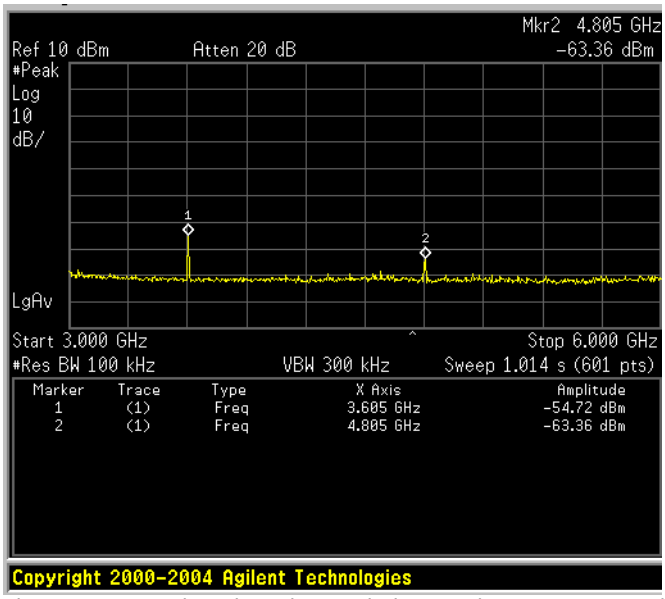


Figure 6.8-2: Conducted Spurious Emissions – 2 (3.0 GHz – 6.0 GHz) Channel = 2402MHz

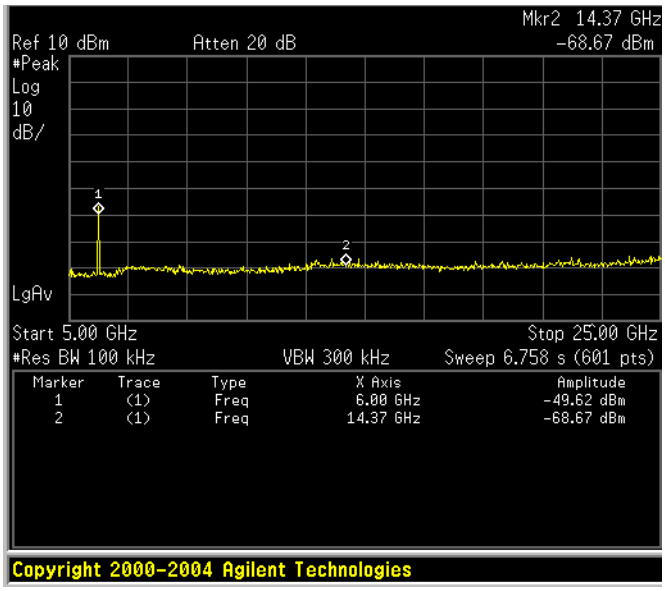


Figure 6.8-3: Conducted Spurious Emissions -3 (5 – 25 GHz) Channel = 2402MHz

Spectrum plots with transmitter operating on 2.440GHz non-hopping:

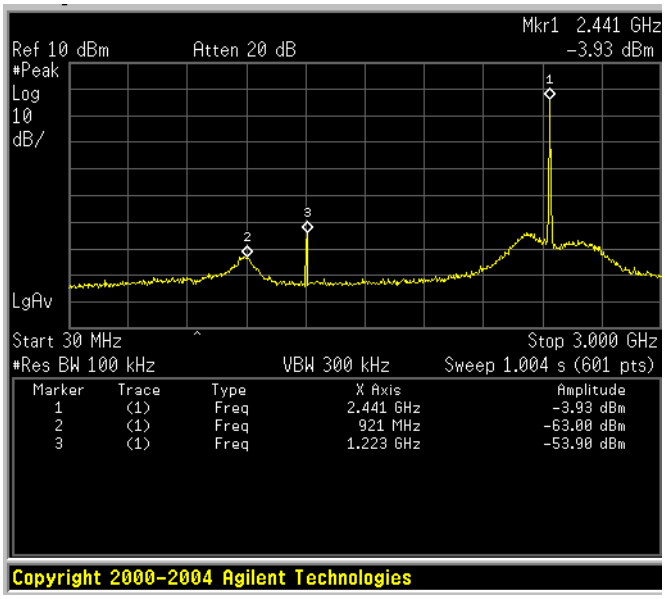


Figure 6.8-4: Conducted Spurious Emissions -1 (30MHz-3.0GHz) - Channel = 2441MHz

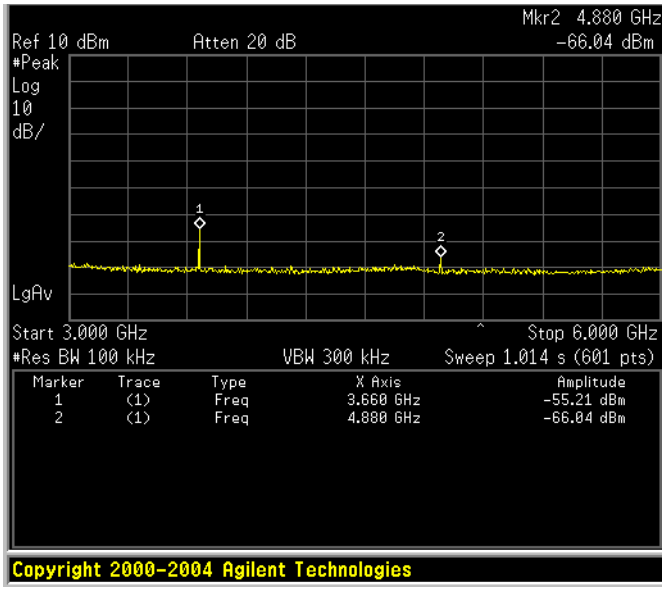


Figure 6.8-5: Conducted Spurious Emissions -2 (3.0 – 6GHz) Channel= 2441MHz

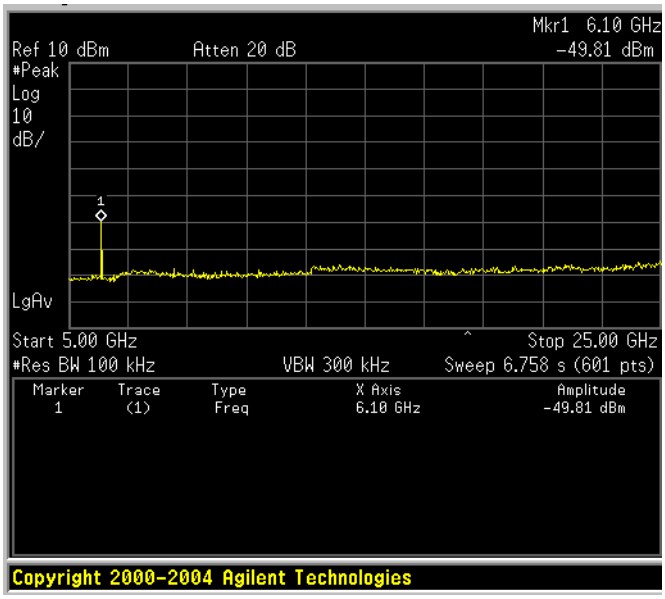


Figure 6.8-6: Conducted Spurious Emissions -3 (5 – 25GHz) Channel = 2441MHz

Spectrum plots with transmitter operating on 2.480GHz non-hopping:

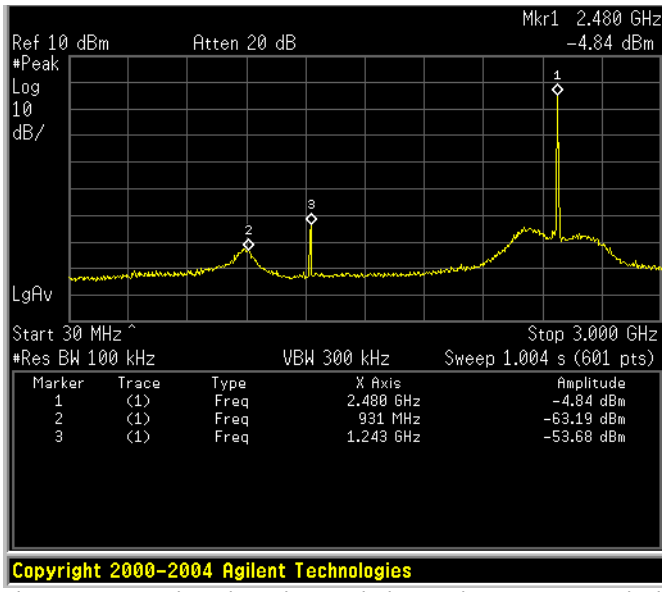


Figure 6.8-7: Conducted Spurious Emissions -1 (30MHz – 3.0GHz) Channel = 2480MHz

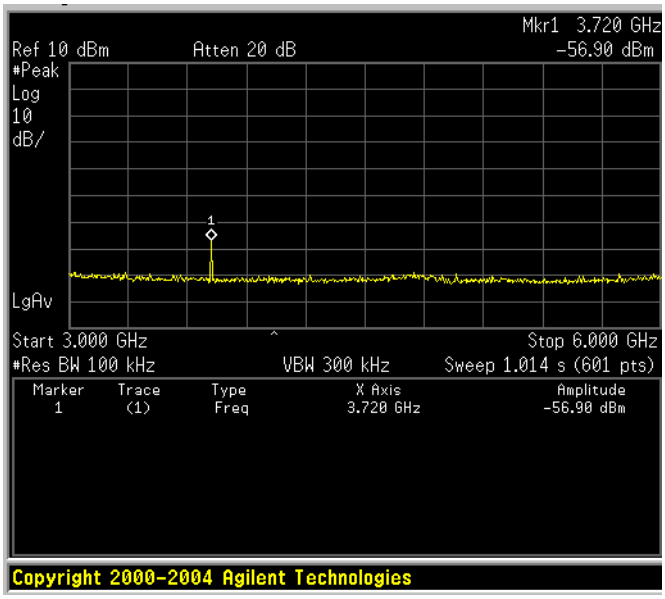


Figure 6.8-8: Conducted Spurious Emissions -2 (3.0 – 6GHz) Channel = 2480MHz

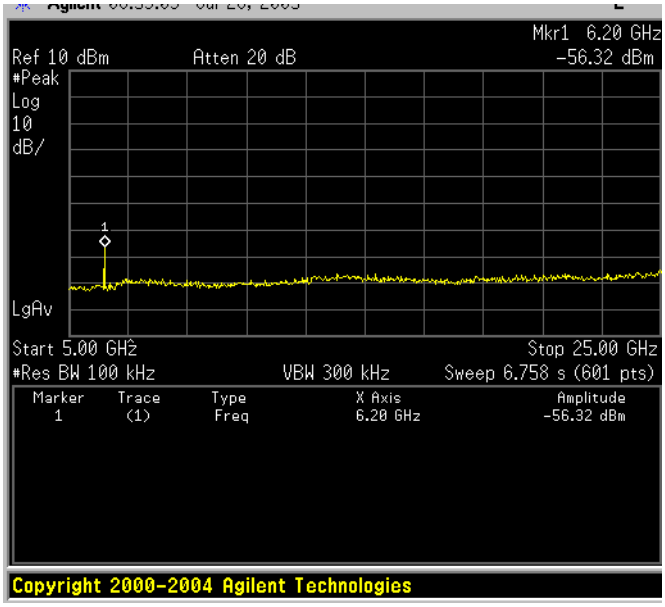


Figure 6.8-9: Conducted Spurious Emissions -3 (5.0 – 25 GHz) Channel = 2480MHz

6.9 Spurious Radiated Emission

The results below were provided via subcontract by BACL. The testing was performed as dictated by their ISO/IEC 17025-laboratory quality system.

6.9.1 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209 limits. The spacing between the peripherals was 10 centimeters. External I/O cables were draped along the edge of the test table and bundled when necessary. The EUT was connected to the power adapter, which was connected with 120 Vac/60Hz power source.

6.9.2 Corrected Amplitude & Margin Calculation

The corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor then subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl = Indicated Reading + Antenna Factor = Cable Factor – Amplifier Gain

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of –7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows: Margin = Corr. Ampl. – FCC 15.209 Limit.

Run#1-1 Primary scan 1 GHz-25GHz

Lowest channel. : 2401.87 MHz

Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar H/V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	15.247 Limit (dBuV/m)
4803.7400	38.6	270	2.4	v	32.5	3.1	34.8	39.4	54
4803.7400	35.6	180	2.3	h	32.5	3.1	34.8	36.4	54
7205.6100	31.9	180	2.0	v	36.7	4.3	34.7	38.3	54
7205.6100	30.5	90	2.0	h	36.7	4.3	34.7	36.8	54
6005.0200	32.5	180	2.0	v	35.0	3.7	34.5	36.7	54
6005.0200	31.6	90	2.0	h	35.0	3.7	34.5	35.8	54

Middle channel. : 2442 MHz

Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar H/V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	15.247 Limit (dBuV/m)
4884.0000	39.0	270	2.4	v	32.5	3.1	34.8	39.8	54
4884.0000	36.0	180	2.3	h	32.5	3.1	34.8	36.8	54
7326.0000	32.2	180	2.0	v	36.7	4.3	34.7	38.5	54
7326.0000	30.8	90	2.0	h	36.7	4.3	34.7	37.1	54
3663.5800	39.8	180	2.0	v	30.0	2.7	34.8	37.7	54
6105.0000	33.9	180	2.0	v	35.0	3.7	34.5	38.1	54
6105.0000	31.6	90	2.0	h	35.0	3.7	34.5	35.8	54

Highest channel. : 2483 MHz

Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar H/V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	15.247 Limit (dBuV/m)
4962.0000	39.4	270	2.4	v	32.5	3.1	34.8	40.2	54
4962.0000	36.4	180	2.3	h	32.5	3.1	34.8	37.2	54
7443.0000	32.5	180	2.0	v	36.7	4.3	34.7	38.8	54
7443.0000	31.1	90	2.0	h	36.7	4.3	34.7	37.4	54
6132.7000	34.2	180	2.0	v	35.0	3.7	34.5	38.4	54

6.10 MPE Prediction

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S = PG/4 \pi R^2$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	-3.02 dBm	0.493 mW
Prediction frequency:	2402 MHz	
Antenna Gain:	3.0 dBi	
Prediction distance	20 cm	
Power density at prediction frequency at 20 cm:	0.198 mW/cm^2.	
MPE Limit for uncontrolled exposure at prediction frequency:		1.0 mW/cm^2 .