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FCC & Industry Canada Certification Test Report

For the

Schmartz Inc

PS3IR-1000 Bluetooth Transceiver

FCC ID: W6K-U1269

IC ID: 8208A-U1269

WLL JOB# **10819**
April 21, 2009

Prepared for:

Schmartz Inc.
2307 Valerian Trl
Round Rock, TX 78665

Prepared By:

Washington Laboratories, Ltd.
7560 Lindbergh Drive
Gaithersburg, Maryland 20879

ACCREDITED
Testing Certificate 2675.01

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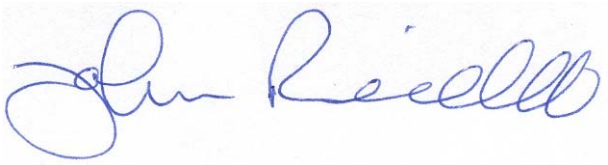

Prepared by: John Reidell
Compliance Engineer

Reviewed by: Steven D. Koster
EMC Operations Manager

Abstract

This report has been prepared on behalf of Schmartz Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Frequency Hopping Spread Spectrum Transmitter under Part 15.247 (10/2008) of the FCC Rules and Regulations and Spectrum Management and Telecommunications Policy RSS-210 of Industry Canada. This Certification Test Report documents the test configuration and test results for a Schmartz Inc. PS3IR-1000 Bluetooth Transceiver.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. The Industry Canada OATS numbers are 3035A-1 and 3035A-2 for Washington Laboratories, Ltd. Site 1 and Site 2, respectively. Washington Laboratories, Ltd. has been accepted by the FCC and approved by the American Association for Laboratory Accreditation (A2LA) under Certificate 2675.01 as an independent FCC test laboratory.

The Schmartz Inc. PS3IR-1000 Bluetooth Transceiver complies with the limits for a Frequency Hopping Spread Spectrum Transmitter device under FCC Part 15.247 and Industry Canada RSS-210.

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1 Introduction

1.1 Compliance Statement

The Schmartz Inc. PS3IR-1000 Bluetooth Transceiver complies with the limits for a Frequency Hopping Spread Spectrum Transmitter device under FCC Part 15.247 (10/2008) and Industry Canada RSS-210 issue 7.

1.2 Test Scope

Tests for radiated and conducted (at antenna terminal) emissions were performed. All measurements were performed in accordance with "FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems".

Contract Information

Customer:	TEM Consulting LP 140 River Road Georgetown, TX 78628
On Behalf of:	Schmartz Inc. 2307 Valerian Trl. Round Rock, Tx 78665
Purchase Order Number:	1027
Quotation Number:	64756

1.3 Test Dates

Testing was performed on the following date(s):	4/01/2009 – 4/10/2009

1.4 Test and Support Personnel

Washington Laboratories, LTD	John Reidell
Client Representative	Stephen Berger

1.5 Abbreviations

A	**A**mpere
ac	**a**lternating **c**urrent
AM	Amplitude Modulation
Amps	**Amp**eres
b/s	**b**its per **s**econd
BW	**B**and**W**idth
CE	**C**onducted **E**mission
cm	**C**enti**m**eter
CW	**C**ontinuous **W**ave
dB	**decibel**
dc	**d**irect **c**urrent
EMI	**E**lectro**m**agnetic **I**nterference
EUT	**E**quipment **U**nder **T**est
FM	**F**requency **M**odulation
G	**g**iga - prefix for 10^9 multiplier
Hz	**H**ertz
IF	**I**ntermediate **F**requency
k	**k**ilo - prefix for 10^3 multiplier
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
M	**M**ega - prefix for 10^6 multiplier
m	**M**eter
µ	**m**icro - prefix for 10^{-6} multiplier
NB	**N**arrow**b**and
QP	**Q**uasi-**P**eak
RE	**R**adiated **E**missions
RF	**R**adio **F**requency
rms	**r**oot-**m**ean-**s**quare
SN	**S**erial **N**umber
S/A	**S**pectrum **A**nalyzer
V	**V**olt

2 Equipment Under Test

2.1 EUT Identification & Description

The Schmartz Inc. PS3IR-1000 Bluetooth Transceiver is a device that receives ordinary Infrared commands and translates them to the appropriate Bluetooth packets that are required to control all media functions of the Playstation 3 (PS3). The device is paired with the PS3 in place of the BD Remote. This unit is also to be marketed under several different model numbers, shown in Table 2.

Table 1 Device Summary

ITEM	DESCRIPTION
Manufacturer:	Schmartz Inc.
FCC ID:	W6K-U1269
IC:	8208A-U1269
Model:	PS3IR-1000 Bluetooth Transceiver
FCC Rule Parts:	§15.247
Industry Canada:	RSS210
Frequency Range:	2402-2480MHz
Maximum Output Power:	3.65mW (5.62dBm) Conducted at antenna port
Modulation:	GFSK
Occupied Bandwidth:	813.7kHz
Keying:	Automatic, Manual
Type of Information:	Digital Audio
Number of Channels:	79
Power Output Level	Fixed
Antenna Connector	Integral Antenna
Antenna Type	Folded Monopole
Antenna Gain	2.8dBi
Interface Cables:	None
Power Source & Voltage:	Battery (rechargeable via USB connection)
Emission Designator	813KFXD
Receiver Spurious (worst Case)	49.1 µV/m @ 3 meters
Transmitter Spurious (worst Case)	137.1 µV/m @ 3 meters

Table 2 Device Model Name Summary

Model
PS3IR-1000
PS3IR-900
PS3IR-800
PS3IZ-500
WiiPRO-500
SchmartIR-1000
IR-1000

2.2 Test Configuration

The PS3IR-1000 Bluetooth Transceiver was controlled from a support laptop PC through a customer provided interface board. This interface board connected into the EUT via soldered on temporary communications cables. For conducted tests a temporary antenna connector replaced the onboard integral antenna.

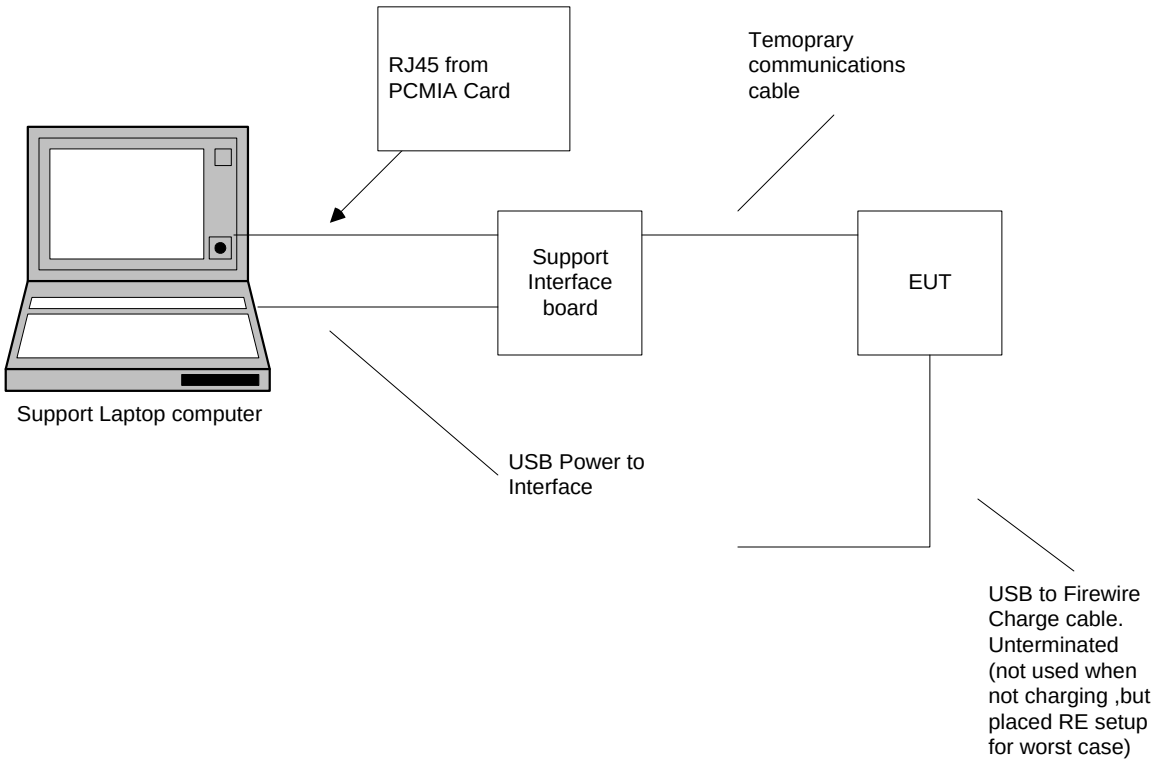

Figure 1: Test Configuration

2.3 Testing Algorithm

The PS3IR-1000 Bluetooth Transceiver was configured with software supplied by the radio chip manufacturer. It allowed for setting the device for continuous transmit mode with both the hopping and non-hopping modes along with channel selection. Additionally, as the device is portable, the emissions were checked in three orthogonal with the worst case being reported.

Worst case emission levels are provided in the test results data.

2.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. The Industry Canada OATS numbers are 3035A-1 and 3035A-2 for Washington Laboratories, Ltd. Site 1 and Site 2, respectively. Washington Laboratories, Ltd. has been accepted by the FCC and approved by the American Association for Laboratory Accreditation (A2LA) under Certificate 2675.01 as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ±2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, Total Uncertainty = $0.5\ (2^2 + 1^2 + 4^2)^{1/2} = \pm 4.55$ dB.

3 Test Equipment

Table 3 shows a list of the test equipment used for measurements along with the calibration information.

Table 3 Test Equipment List

Typical Equipment List

Test Name: **Conducted Emissions Voltage**		Test Date:	**4/10/2009**
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
125	Solar, 8028-50-TS-24-BNC	LISN	07/01/2009
126	Solar, 8028-50-TS-24-BNC	LISN	07/01/2009
53	HP, 11947A	Limiter, Transient	04/09/2009
68	HP, 85650A	Adapter, QP	07/07/2009
72	HP, 8568B	Analyzer, Spectrum	07/03/2009
70	HP, 85685A	Preselector, RF w/opt 8ZE	07/07/2009
Test Name: **Radiated Emissions**		Test Date:	**4/10/2009**
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
382	Sunol, JB1	Antenna, Biconlog	01/27/2010
4	ARA, DRG-118/A	Antenna, DRG, 1-18GHz	02/06/2011
68	HP, 85650A	Adapter, QP	07/07/2009
72	HP, 8568B	Analyzer, Spectrum	07/03/2009
70	HP, 85685A	Preselector, RF w/opt 8ZE	07/07/2009
528	Agilent, E4446A	Analyzer, Spectrum	04/24/2009
66	HP, 8449B	Pre-Amplifier, RF. 1-26.5GHz	07/15/2009
Test Name:	**Bench Emissions**	Test Date:	**4/3/2009**
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
474	HP, 8563E	Analyzer, Spectrum	02/03/2011

4 Test Summary

The Table Below shows the results of testing for compliance with a Frequency Hopping (Hybrid) System in accordance with FCC Part 15.247:2008 and RSS210e issue 7. Full results are shown in section 5.

Table 4 Test Summary Table

TX Test Summary (Frequency Hopping Spread Spectrum)			
FCC Rule Part	**IC Rule Part**	**Description**	**Result**
15.247 (a)(1)(iii)	RSS-210 [A8. 1]	20dB Bandwidth	Pass
15.247 (b)(1)	RSS-210 [A8.4 (2)]	Transmit Output Power	Pass
15.247 (a)(1)	RSS-210 [A8.1 (2)]	Channel Separation	Pass
15.247 (a)(1)(iii)	RSS-210 [A8. 1 (4)]	Number of Channels >15	Pass
15.247 (a)(1)(iii)	RSS-210 [A8. 1 (4)]	Time of Occupancy	Pass
15.247 (d)	RSS-210 [A8. 5]	Occupied BW / Out-of-Band Emissions (Band Edge @ 20dB below)	Pass
15.205 15.209	RSS-210 [A8. 5]	General Field Strength Limits (Restricted Bands & RE Limits)	Pass
RX/Digital Test Summary (Frequency Hopping Spread Spectrum)			
FCC Rule Part	**IC Rule Part**	**Description**	**Result**
15.207	RSS-Gen [7.2.2]	AC Conducted Emissions	Pass
15.209	RSS-Gen [7.2.3.2]	General Field Strength Limits (Restricted Bands & RE Limits)	Pass

5 Test Results

5.1 Time of Occupancy

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

The following plots show that each channel on time is 430.9uSec per hop with 0.150Sec total on time per 31.6Sec.

TEM Consulting, Job 10819. FCC Pt 15.247 PS3IR-1000 Bluetooth Transceiver Dwell time for a single hop
Measured = 430.9 uSec Per Hop.

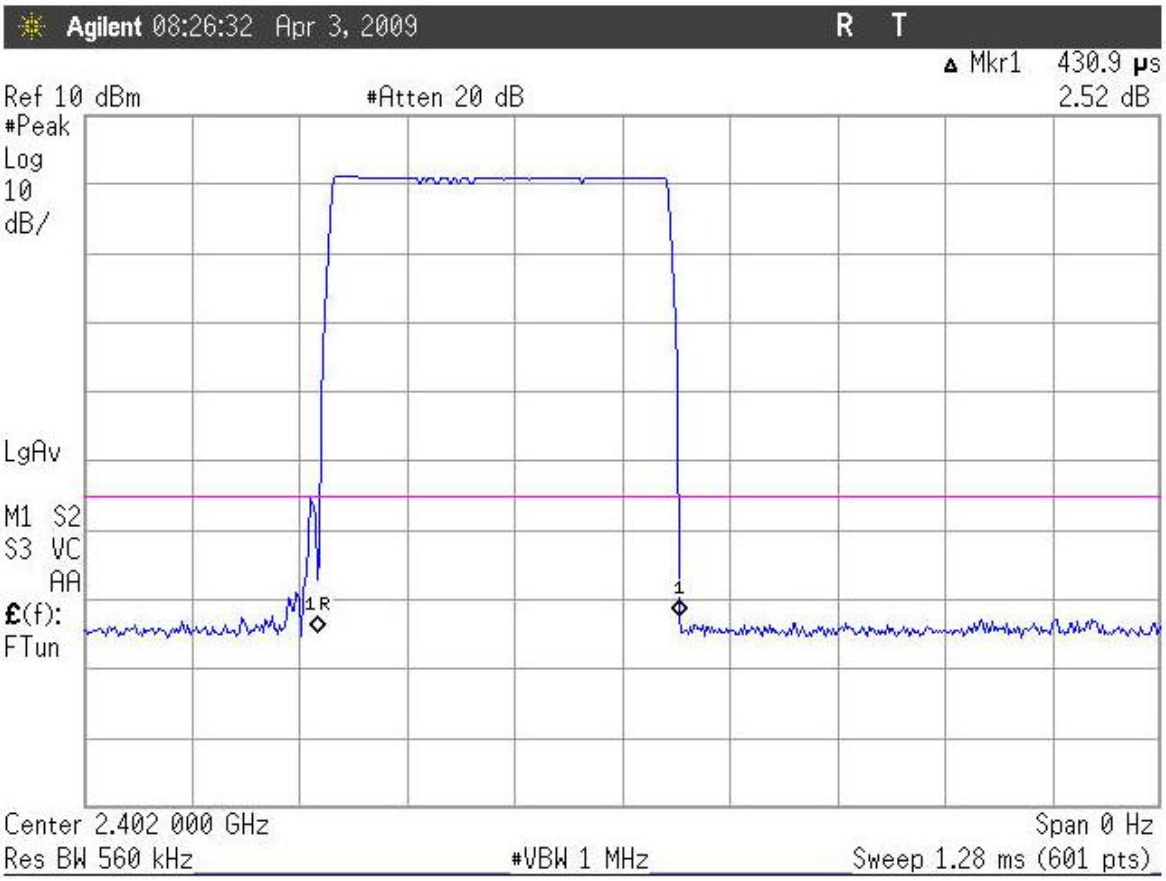

Figure 2: Single Hop Dwell Time

TEM Consulting, Job 10819. FCC Pt15.247 PS3IR-1000 Bluetooth Transceiver
FCC Pt15.247 Time of Occupancy Limit = 0.4 Sec per 0.4 seconds times the number of channels = 0.4per(0.4*79)=0.4Sec per 31.6Sec
Plot shows Evenly spaced carriers

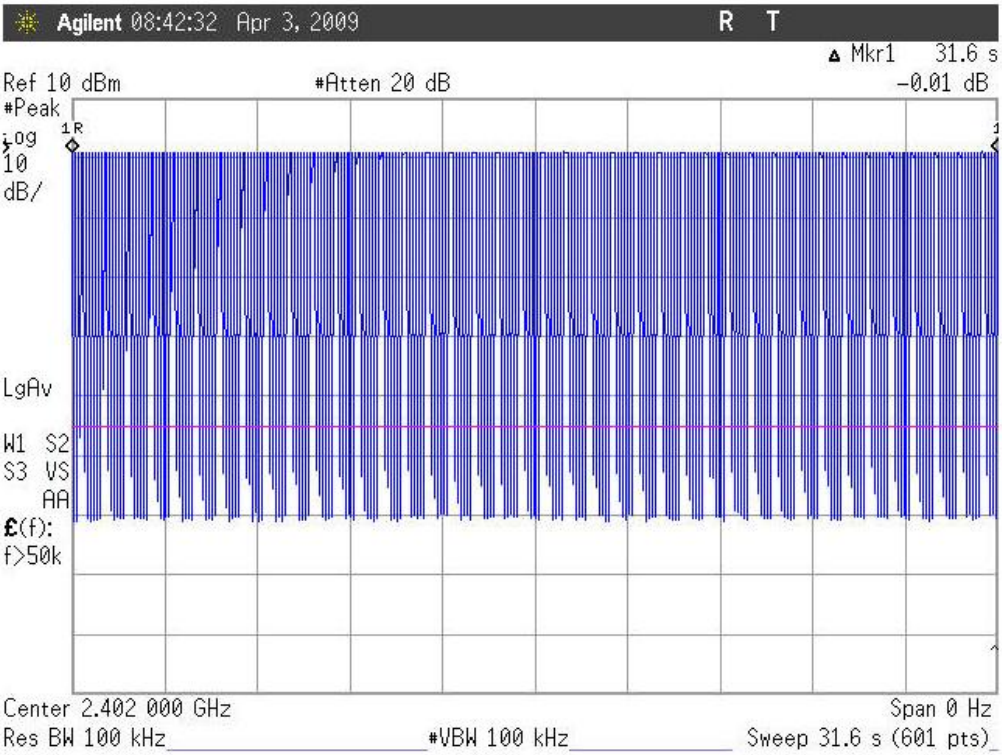

Figure 3: Dwell time per channel over 31.6 Seconds

TEM Consulting, Job 10819. FCC Pt15.247 PS3IR-1000 Bluetooth Transceiver
FCC Pt15.247 Time of Occupancy Limit = 0.4 Sec per 0.4 seconds times the number of channels=0.4per (0.4*79)=0.4Sec per 31.6Sec
Plot shows 11 transmissions in a 1 second period = 11*31.6(seconds required)*430.9uSec(on time of each pulse)=0.150Sec on time Per 31.6 Seconds

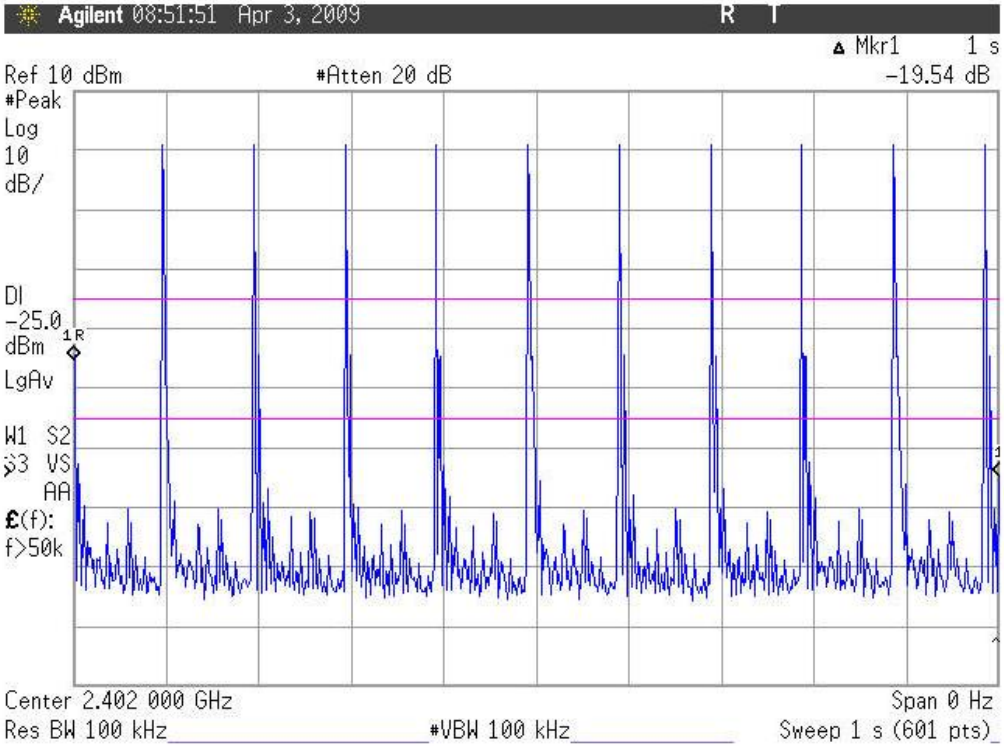

Figure 4: Close-up of Dwell time per channel over 1 Second

5.2 RF Power Output: (FCC Part §2.1046)

To measure the output power the hopping sequence was stopped while the frequency dwelled on a low, high and middle channel. The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer. The analyzer offset was adjusted to compensate for the attenuator and other losses in the system.

Table 5 RF Power Output

Frequency	Level	Limit	Pass/Fail
Low Channel: 2402MHz	5.59 dBm	30 dBm	Pass
Mid Channel: 2441MHz	5.62 dBm	30 dBm	Pass
High Channel: 2480MHz	5.61 dBm	30 dBm	Pass

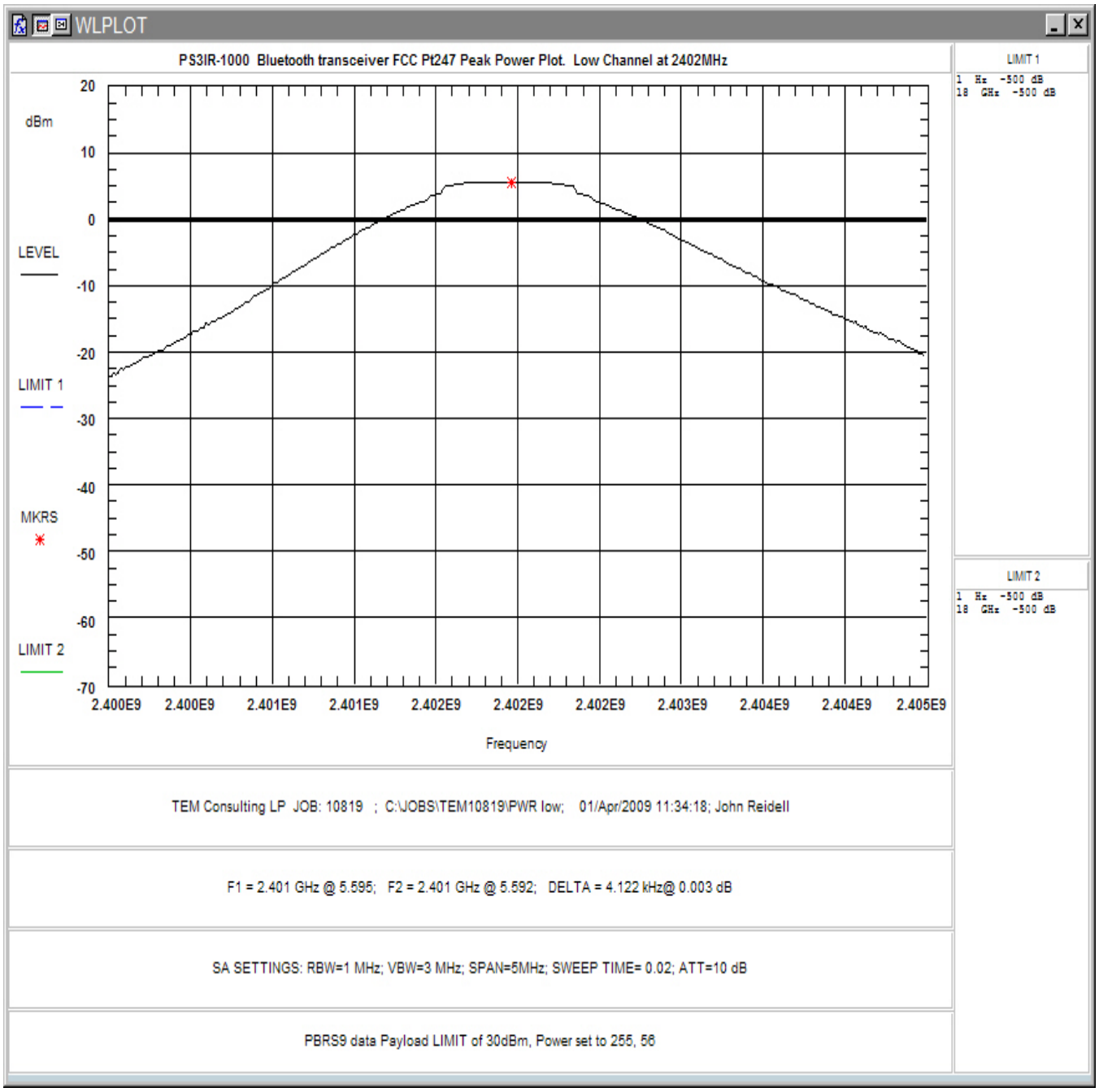

Figure 5: RF Peak Power, Low Channel

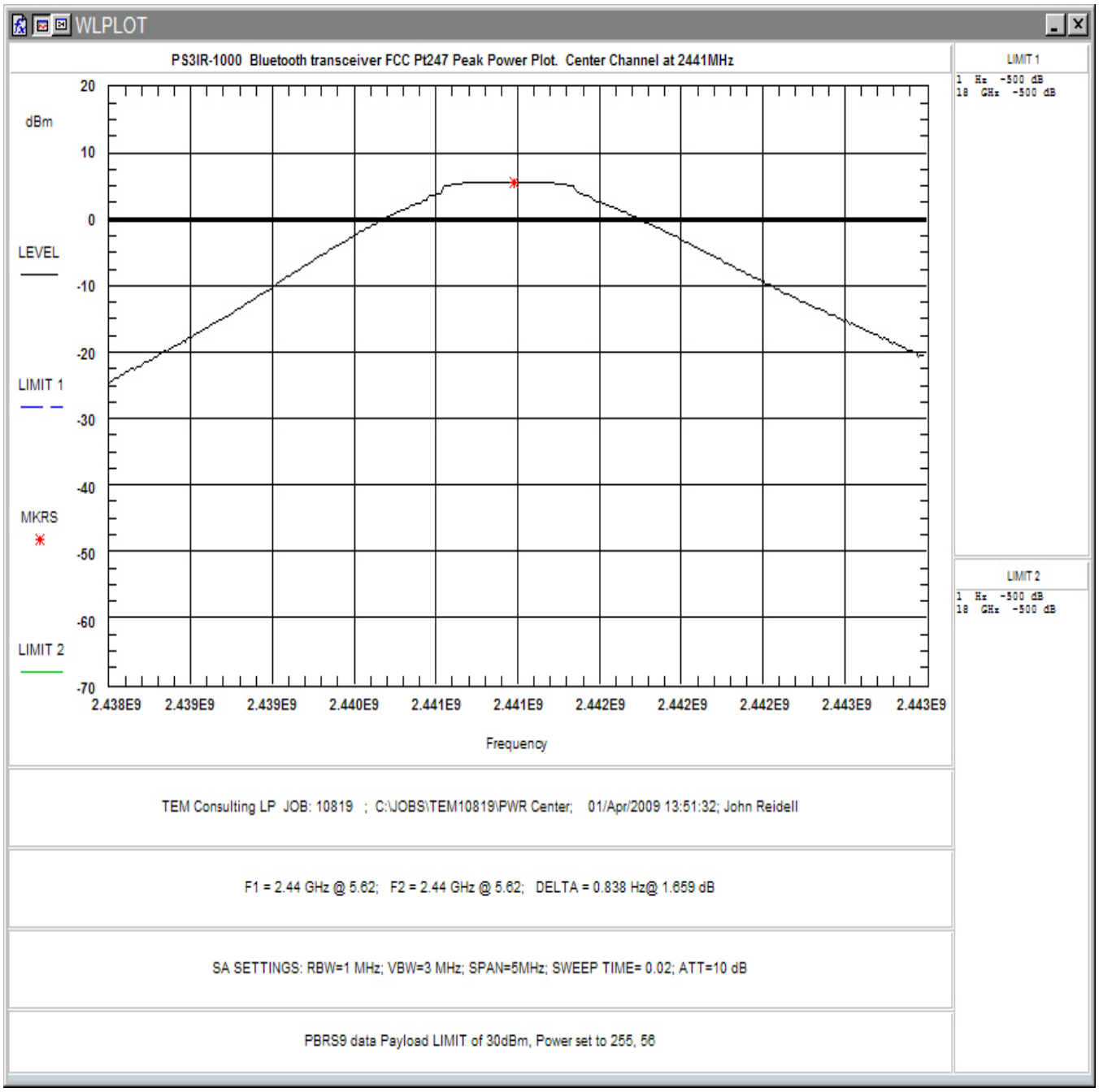

Figure 6: RF Peak Power, Mid Channel

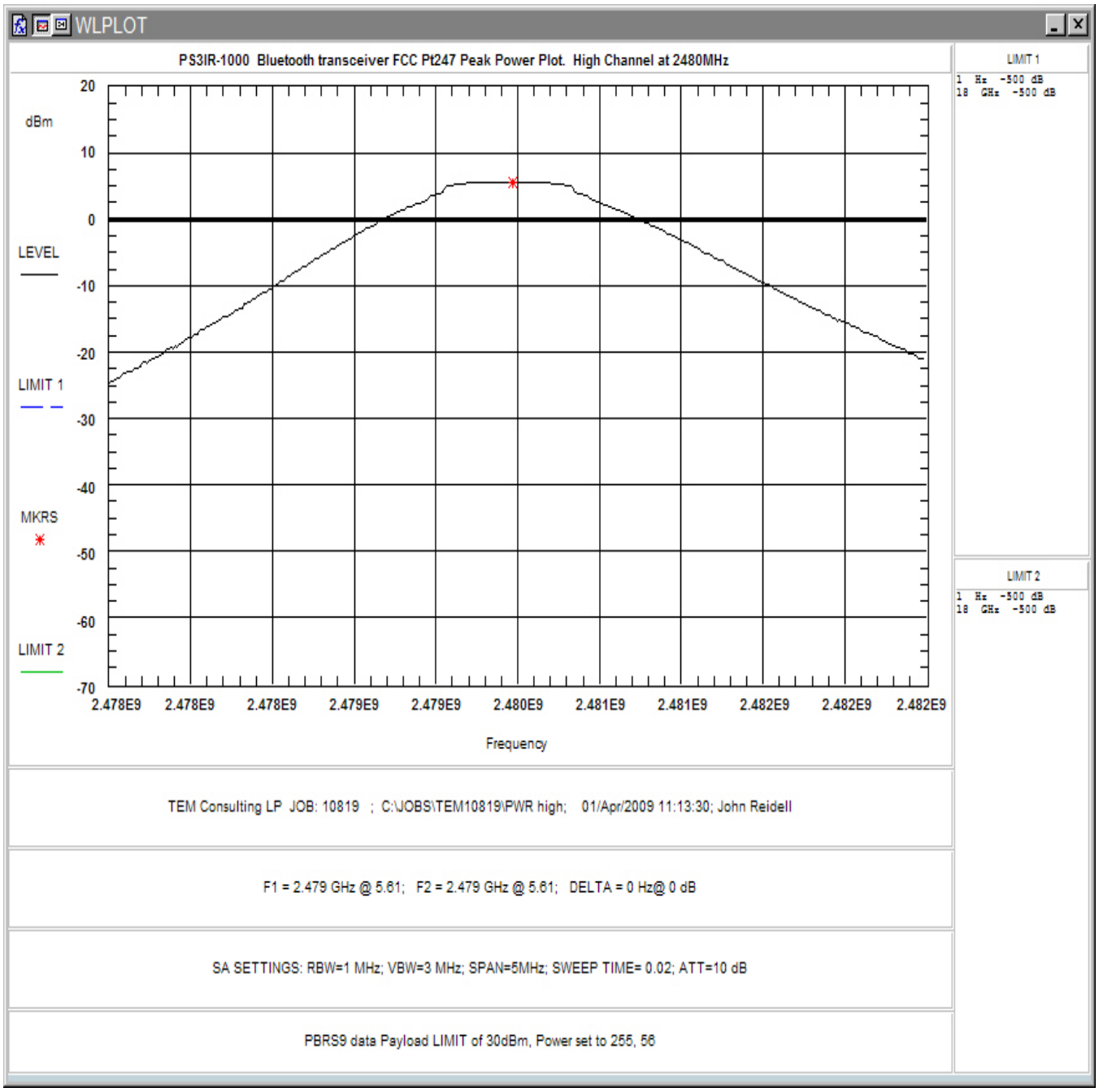

Figure 7: RF Peak Power, High Channel

5.3 Occupied Bandwidth: (FCC Part §2.1049)

Occupied bandwidth was performed by coupling the output of the EUT to the input of a spectrum analyzer.

At full modulation, the occupied bandwidth was measured as shown:

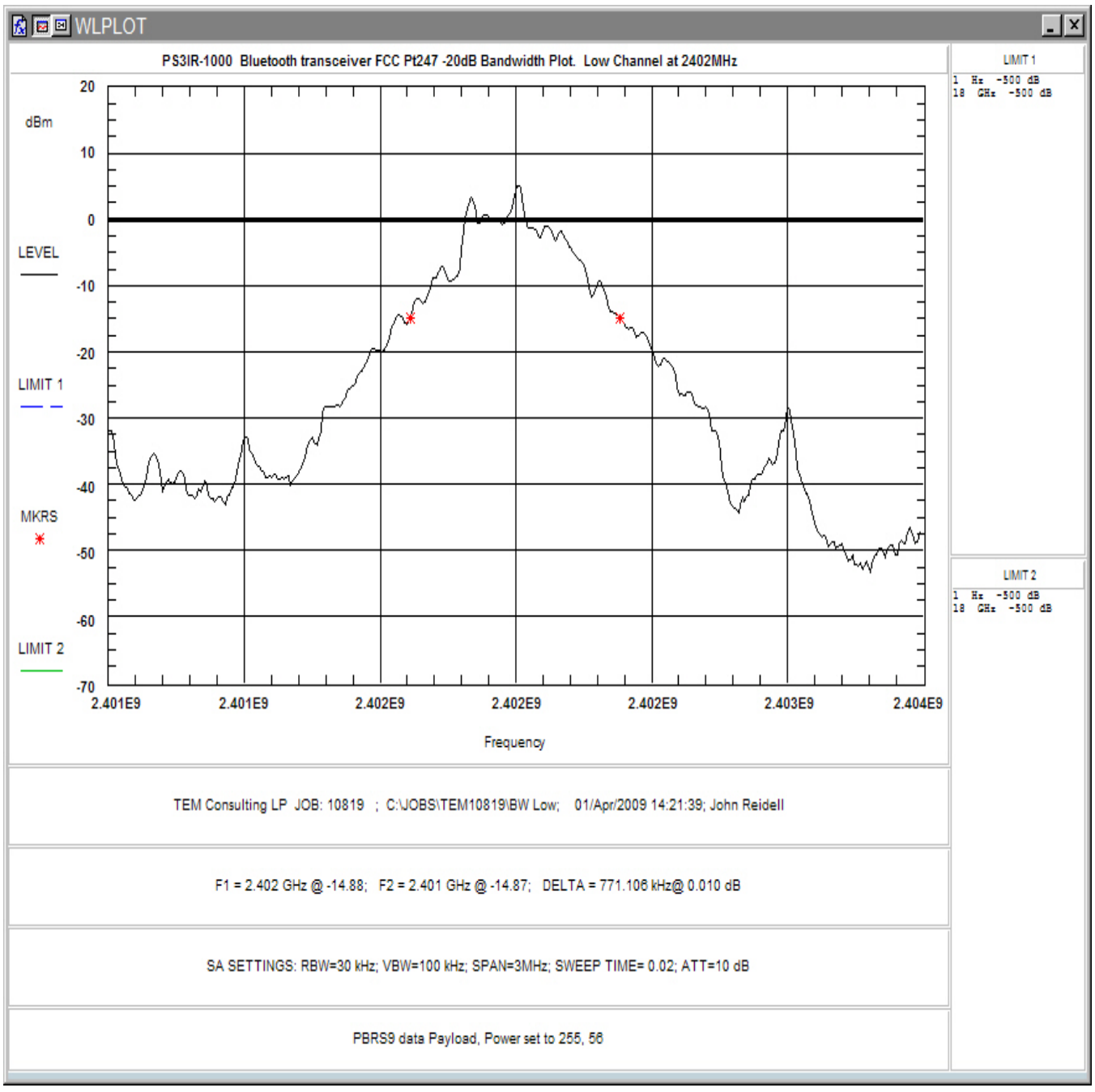

Figure 8: Occupied Bandwidth, Low Channel

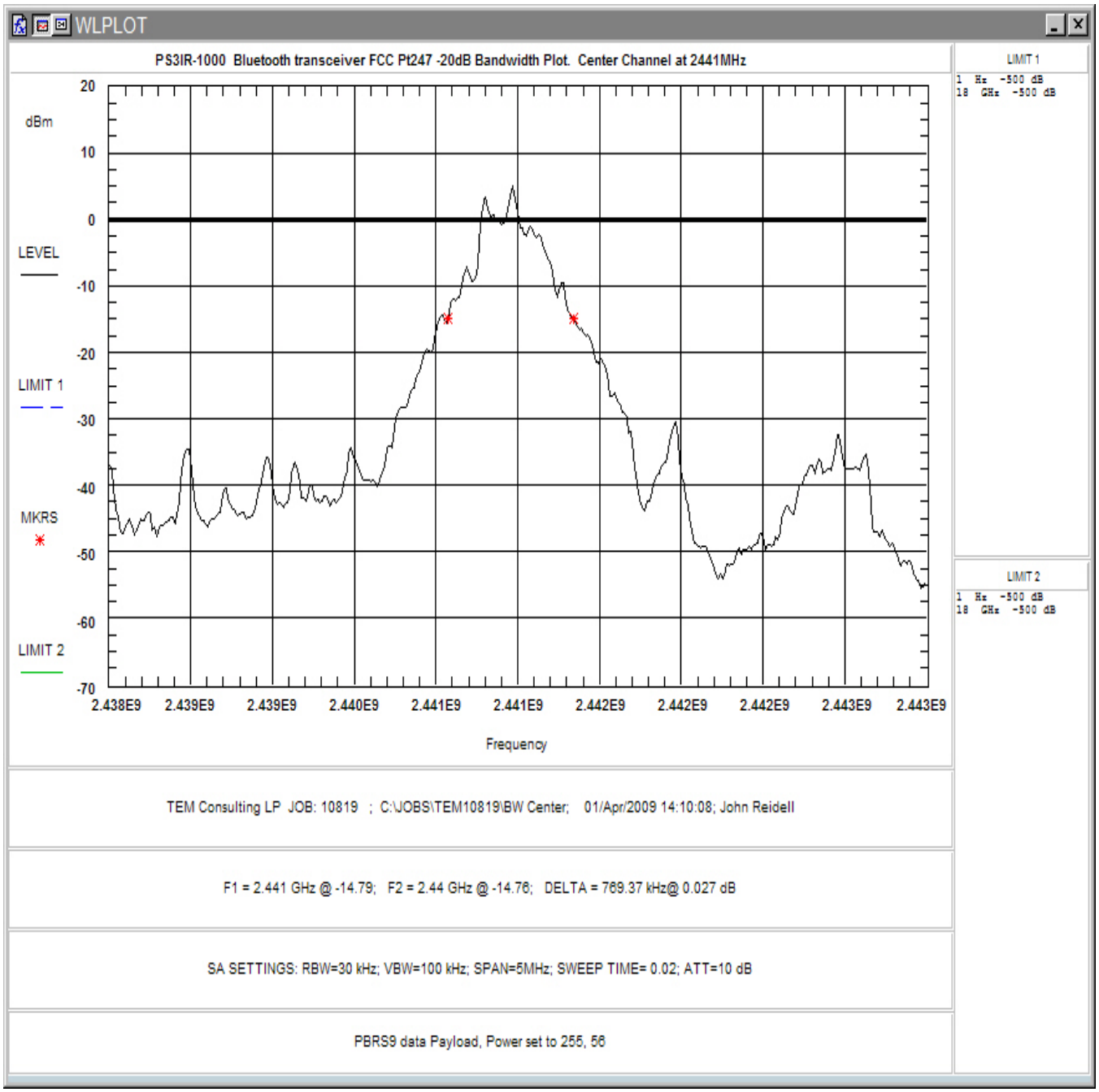

Figure 9: Occupied Bandwidth, Mid Channel

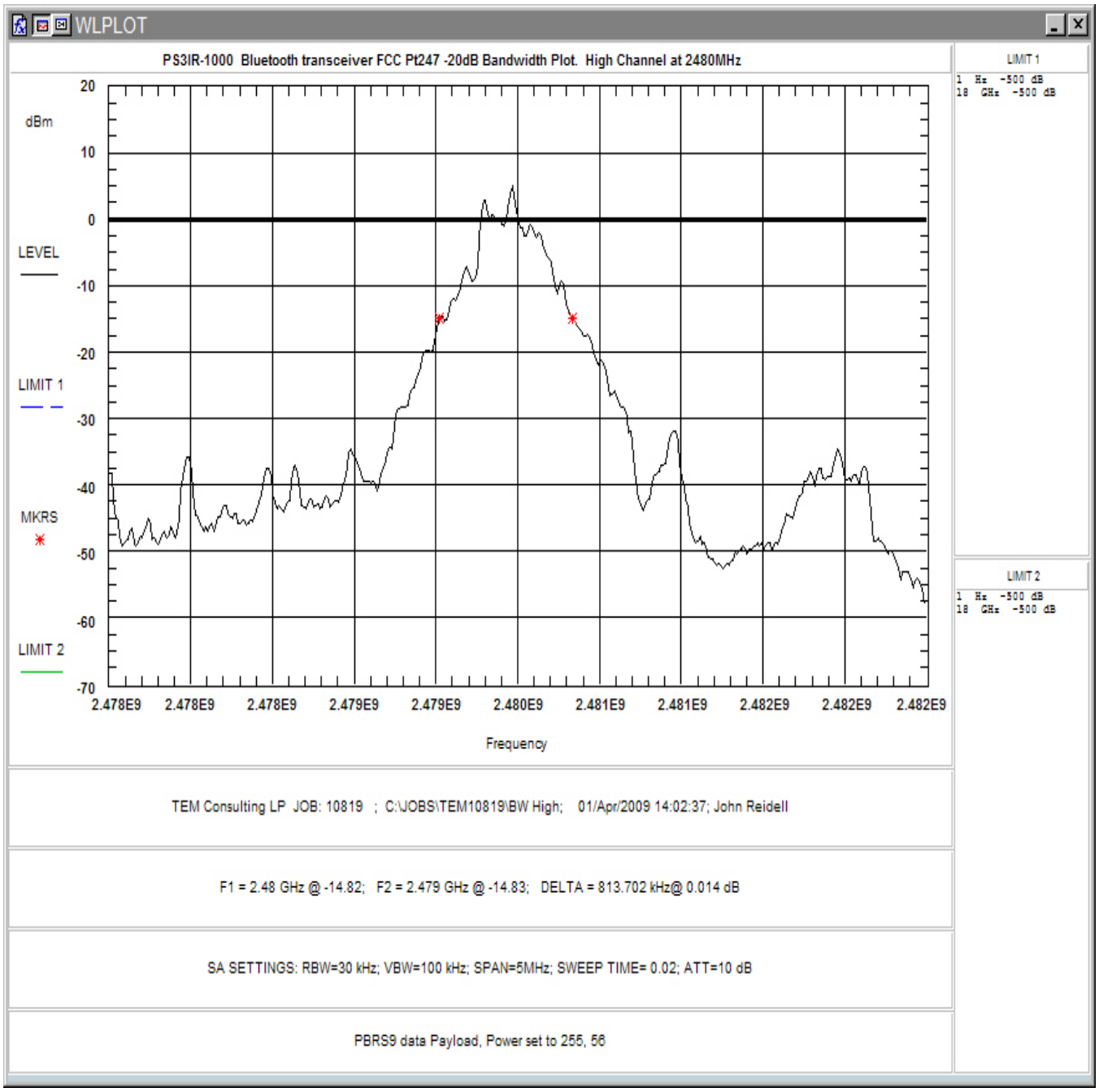

Figure 10: Occupied Bandwidth, High Channel

Table 6 provides a summary of the Occupied Bandwidth Results.

Table 6 Occupied Bandwidth Results

Frequency	Bandwidth
Low Channel: 2402MHz	771.1kHz
Mid Channel: 2441MHz	796.4kHz
High Channel: 2480MHz	813.7kHz

5.4 Channel Spacing and Number of Hop Channels (FCC Part §15247(a)(1)

Per the FCC requirements, frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the two thirds of the 20 dB bandwidth, whichever is greater. The maximum 20dB bandwidth measured is 911.4kHz so the channel spacing must be more than 607.3kHz. In addition, for a 2.4GHz the number of hopping channels shall be stated.

The EUT antenna was removed and the cable was connected directly into a spectrum analyzer through a 10 dB attenuator. An offset was programmed into the spectrum analyzer to compensate for the loss of the external attenuator. The spectrum analyzer resolution bandwidth was set to 100 kHz and the video bandwidth was set to 100 kHz. The channel spacing of 2 adjacent channels was measured using a spectrum analyzer span setting of 2.3MHz. Also, the number of hopping channels was measured from 2.4GHz to 2.5GHz.

The following are plots of the channel spacing and number of hopping channels data. The channel spacing was measured to be 1.001MHz and the number of channels used is 79.

Table 7 Channel spacing and number of hopping channels summary

Test	Result	Limit	Pass/Fail
Channel spacing	1.002MHz	542.46kHz Minimum	Pass
Number of Channels	79 channels	15 channels minimum	Pass

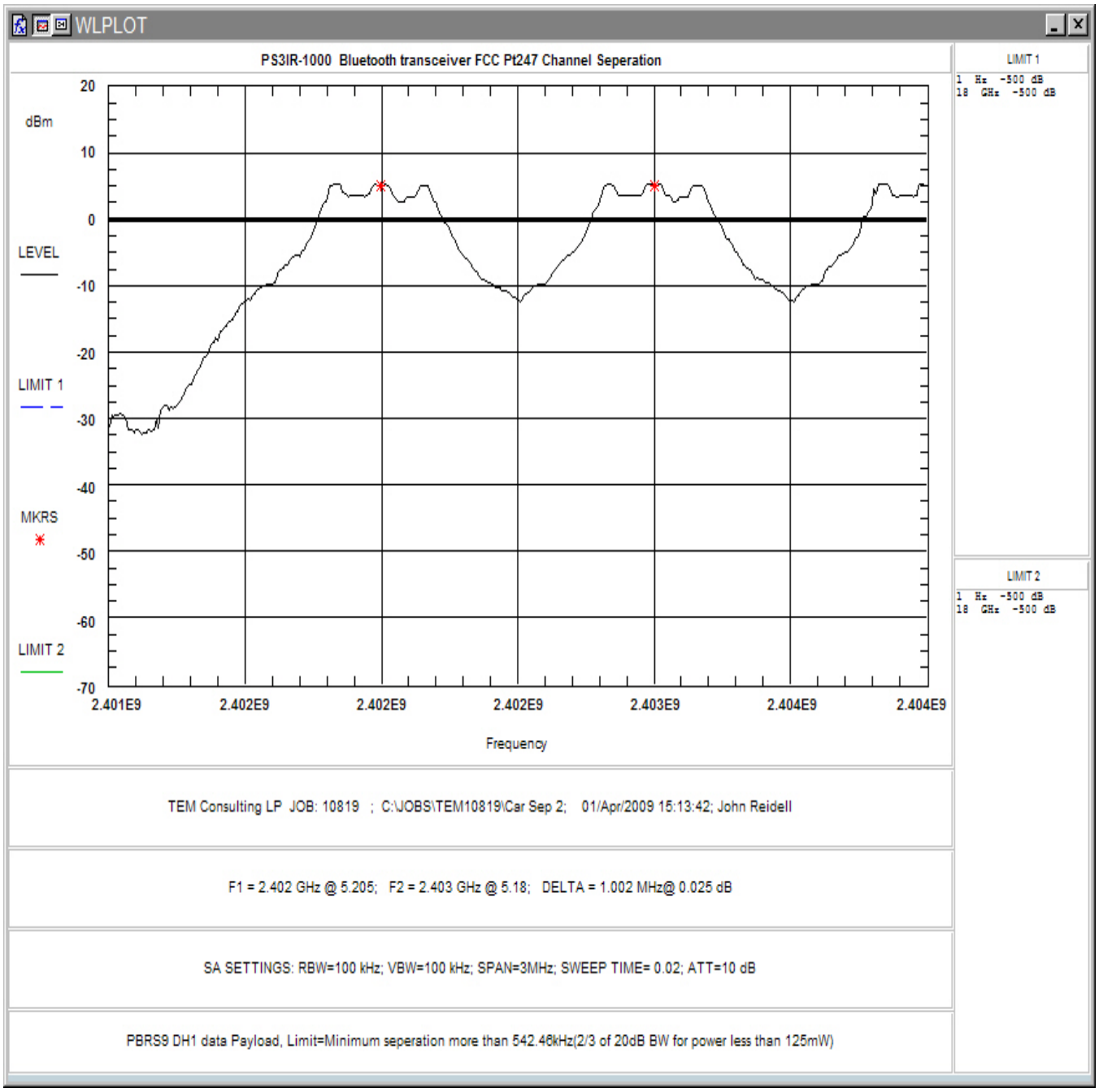

Figure 11: Channel Spacing

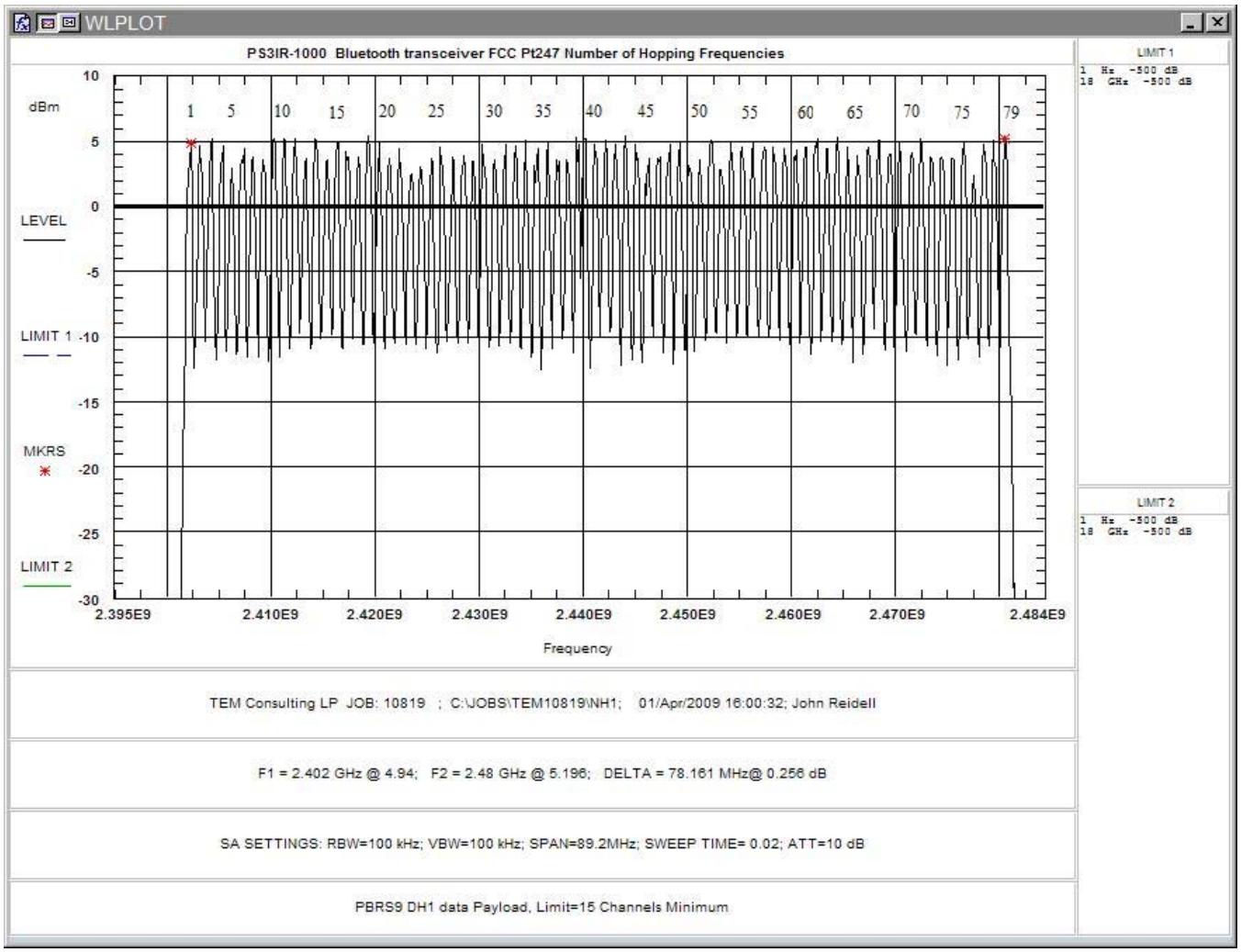

Figure 12: Number of Channels

5.5 Conducted Spurious Emissions at Antenna Terminals (FCC Part §2.1051)

The EUT must comply with requirements for spurious emissions at antenna terminals. Per §15.247(c) all spurious emissions in any 100 kHz bandwidth outside the frequency band in which the spread spectrum device is operating shall be attenuated 20 dB below the highest power level in a 100 kHz bandwidth within the band containing the highest level of the desired power.

The EUT antenna was removed and the cable was connected directly into a spectrum analyzer through a 10 dB attenuator. An offset was programmed into the spectrum analyzer to compensate for the loss of the external attenuator. The spectrum analyzer resolution bandwidth was set to 100 kHz and the video bandwidth was set to 100 kHz. The amplitude of the EUT carrier frequency was measured to determine the emissions limit (20 dB below the carrier frequency amplitude). The emissions outside of the allocated frequency band were then scanned from 30 MHz up to the tenth harmonic of the carrier.

Close-up plots of the 2400- 2483.5MHz band edges are provided in both the hopping and non-hopping modes to show compliance at both of these points

The following are plots of the conducted spurious emissions data.

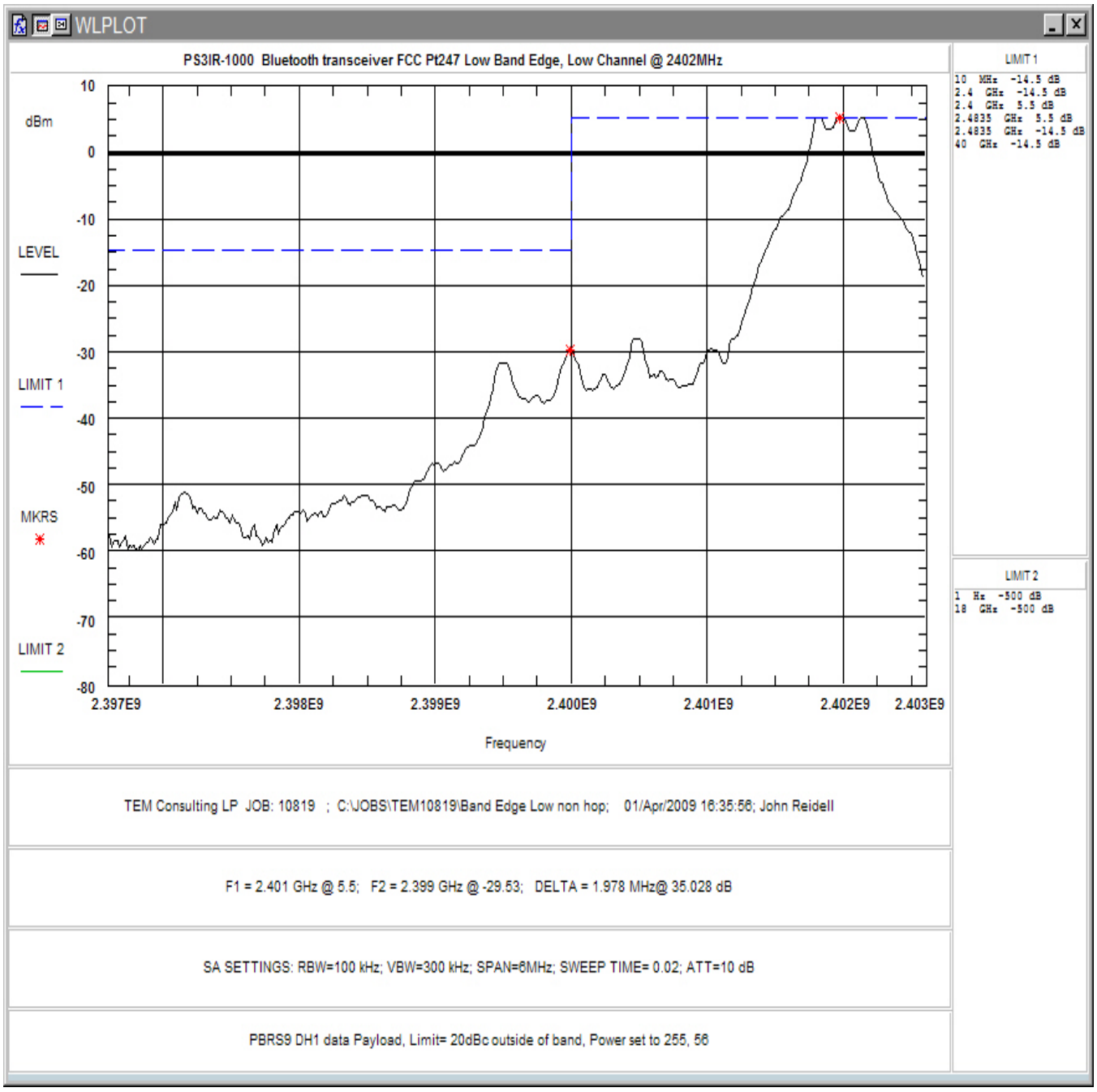

Figure 13: Lower Band Edge Plot, Low Channel

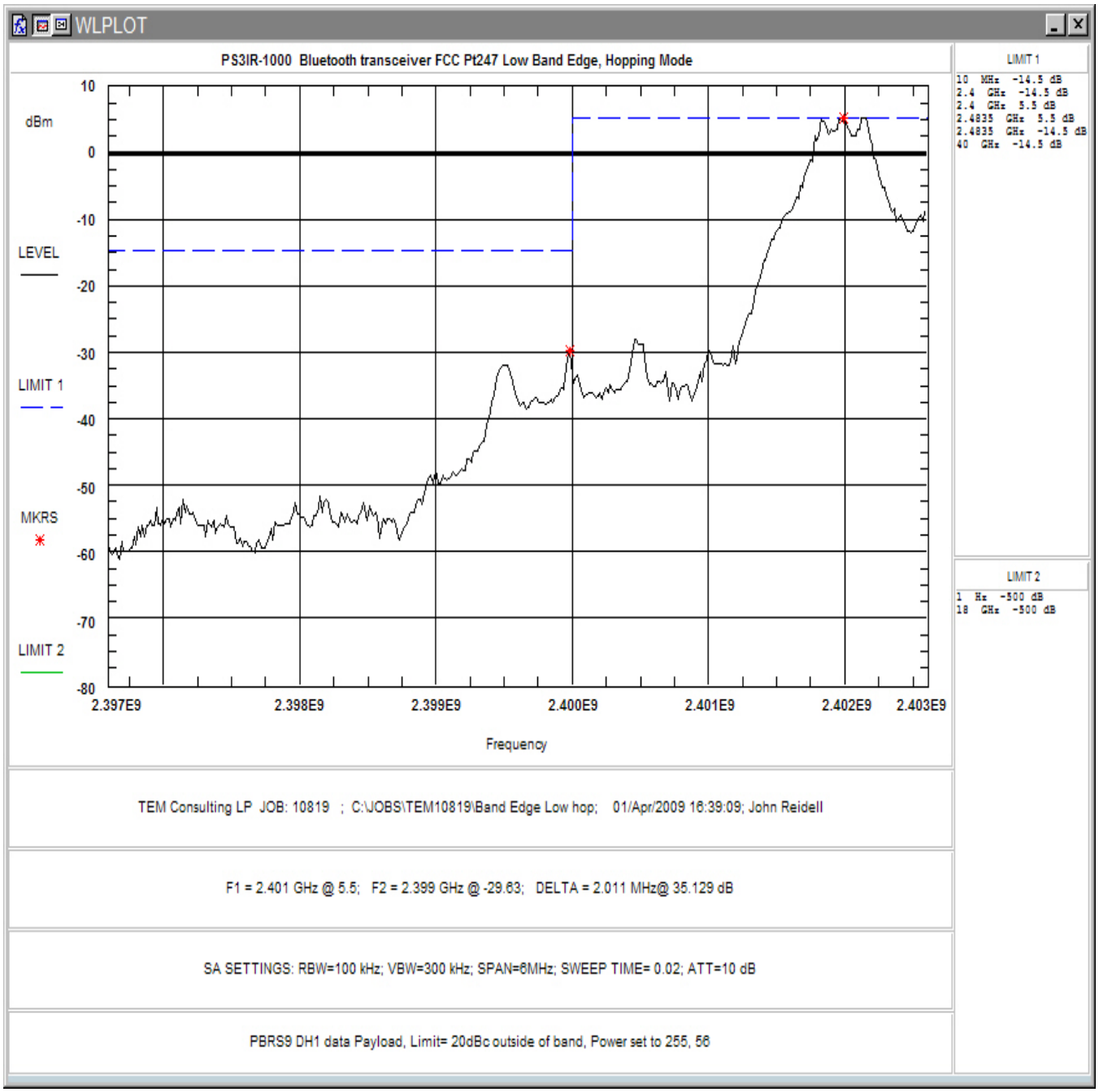

Figure 14: Lower Band Edge Plot, Hopping Mode

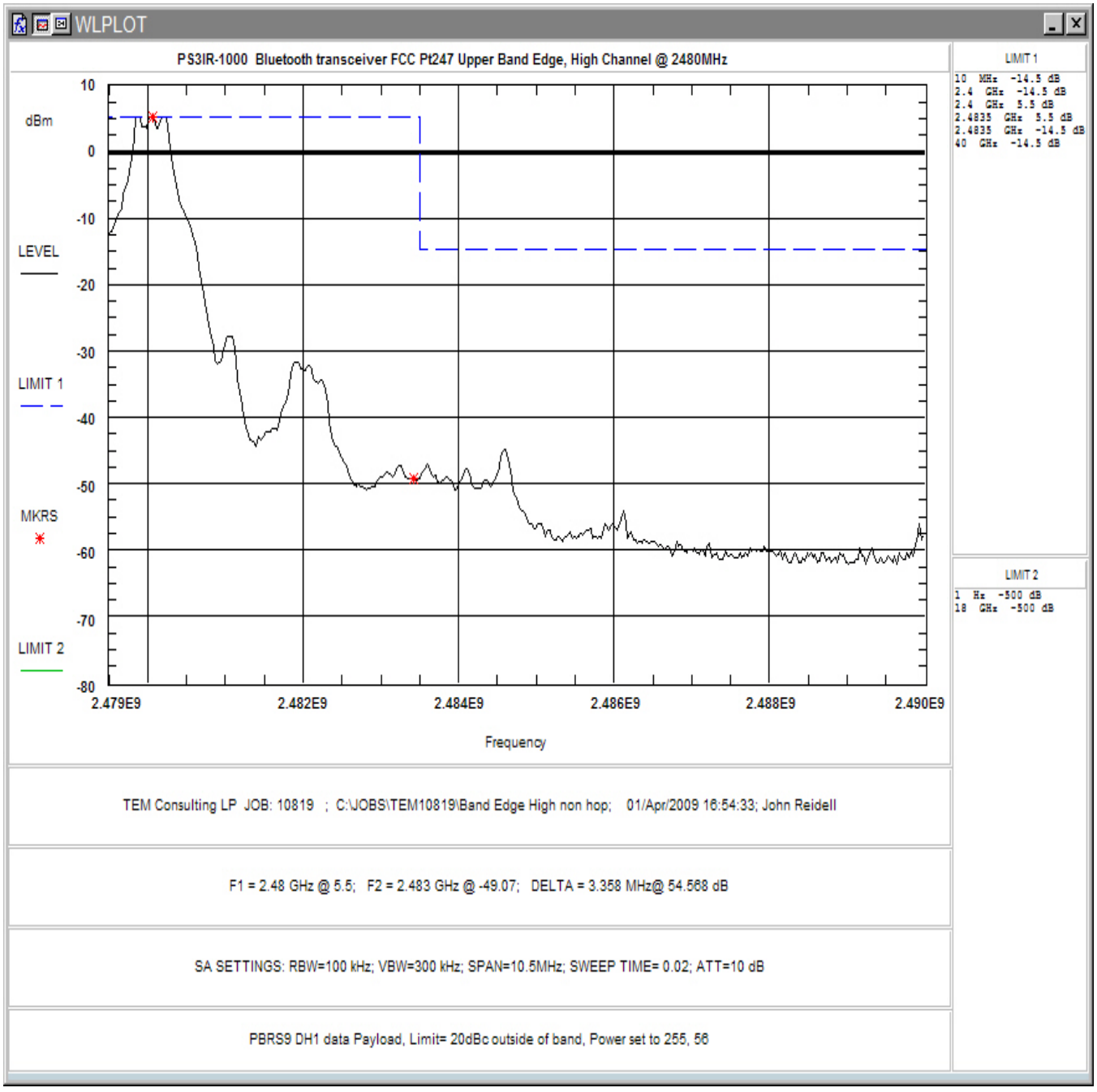

Figure 15: Upper Band Edge Plot, High Channel

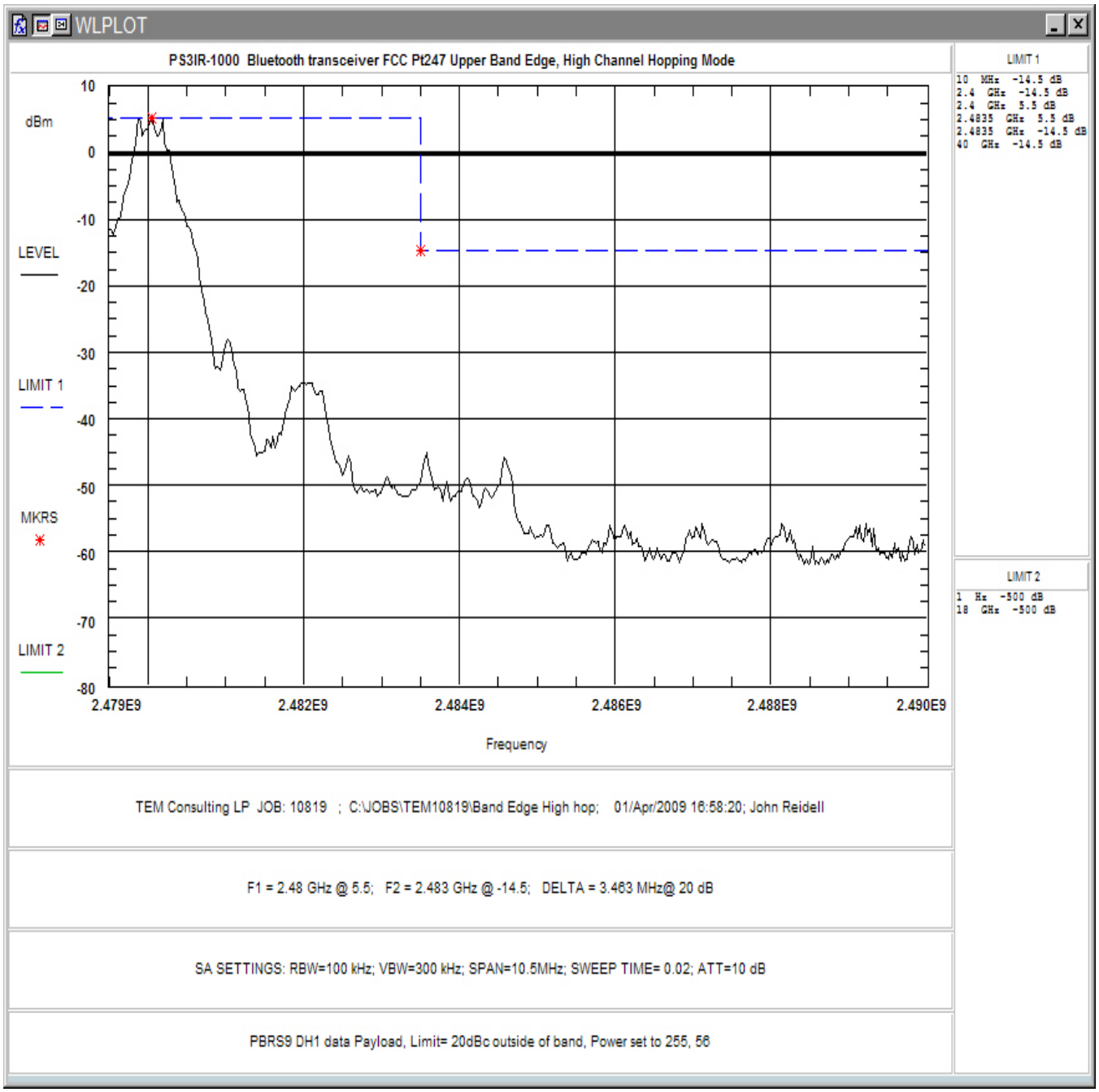

Figure 16: Upper Band Edge Plot, Hopping Mode

