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FCC & Industry Canada Certification Test Report

For the

Cooper Power Systems

RFN-500LG MODULE

FCC ID: P9X-500LG

IC: 6766A-500LG

WLL JOB# 14418-01 Rev 3
February 29, 2016

Re-Issued
October 24, 2016

Prepared for:

Cooper Power Systems
910 Clopper Road, Suite 201 S
Gaithersburg MD 20878

Prepared By:

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

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

Testing Certificate AT-1448

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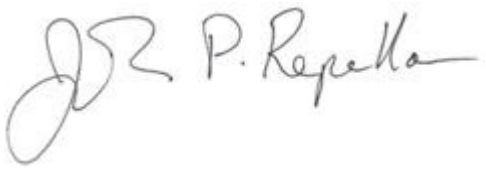

John P. Repella
Compliance Engineer

Reviewed by:

Steven D. Koster
President

Abstract

This report has been prepared on behalf of Cooper Power Systems 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 (10/2014) of the FCC Rules and Regulations and Spectrum Management and Telecommunications Policy RSS-247 Issue 1 of Industry Canada. This Certification Test Report documents the test configuration and test results for the Cooper Power Systems RFN-500LG Module.

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 ACLASS under Certificate AT-1448 as an independent FCC test laboratory.

The Cooper Power Systems RFN-500LG Module complies with the limits for a Frequency Hopping Spread Spectrum Transmitter device under FCC Part 15.247 and Industry Canada RSS-247.

Revision History	Description of Change	Date
Rev 0	Initial Release	February 29, 2016
Rev 1	Update to include to correct grammatical errors, Correct the FCC/IC ID's and the customer address	March 3, 2016
Rev 2	Added Radiated data for new antenna :Molex P-N 1052620003 (pages 62,66,70), added antenna to table 1.	August 23, 2016
Rev 3	Updated to address comments from ACB. Updated section 2.2 to address EUT setup description. Section 5.4 & 5.5 updated to reflect the correct the RBW/VBW stated settings.	October 24, 2016

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1 Introduction

1.1 Compliance Statement

The Cooper Power Systems RFN-500LG Module complies with the limits for a Frequency Hopping Spread Spectrum Transmitter device under FCC Part 15.247 (10/2014) and Industry Canada RSS-247 Issue 1.

1.2 Test Scope

Tests for radiated and conducted (at antenna terminal) emissions were performed. All measurements were performed in accordance with C63.10 "ANSI Procedures for Compliance Testing of Unlicensed Wireless Devices". The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	Cooper Power Systems 910 Clopper Road, Suite 201 S Gaithersburg MD 20878
Purchase Order Number:	4507774621
Quotation Number:	69044

1.4 Test Dates

Testing was performed on the following date(s):	2/16/2016 to 8/23/2016

1.5 Test and Support Personnel

Washington Laboratories, LTD	John P. Repella, James Ritter
Customer Representative	Steve Seymour

1.6 Abbreviations

A	**A**mpere
ac	**a**lternating **c**urrent
AM	Amplitude Modulation
Amps	**Amp**ere**s**
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	**d**eci**B**el
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 RFN-500LG is a radio communications device designed for use in L+G Focus meters. It can also be used in Eaton's Cooper Power Systems Gateways and Relay Nodes. The RFN-500LG provides a 915 MHz radio interface to an RF mesh network.
This test report covers the 902-928MHz FHSS radio.

Table 1: Device Summary

ITEM	DESCRIPTION
Manufacturer:	Cooper Power Systems
FCC ID:	P9X-500LG
IC:	6766A-500LG
Model:	RFN-500LG
FCC Rule Parts:	§15.247
Industry Canada:	RSS-247
Frequency Range:	902.75 – 927.25MHz
Maximum Output Power:	29.520dBm (895.4mW)
Modulation:	FSK
Occupied Bandwidth:	476.4 kHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	50
Power Output Level	Variable from 29.520dBm to -7.129dBm
Antenna Connector	MCX
Antenna Type	4 antennas: • Linx ¼ Wave Through-hole Helical, 2.4dBi Gain • Laird OD9-5 900MHz Omnidirectional Antenna, 5dBi Gain • Laird B(B)8965CN 5/8 Wave Loaded Coil 900MHz Omnidirectional Antenna, 5dBi gain • Omnidirectional Molex P-N 1052620003, 1.2dB Gain
Interface Cables:	None (plug in module)
Power Source & Voltage:	120/240VAC
Emission Designator	484KFXD
Highest TX Spurious Emission	644.8uV/m@3m- 8232.75MHz
Highest RX Spurious Emission	61.1uV/m @ 3m, 167.61MHz

2.2 Test Configuration

The Cooper Power Systems RFN-500LG, Equipment Under Test (EUT), was operated from a 115Vac power supply. Programming commands were sent from a support laptop via a custom RS232 adaptor board to a header on the EUT module. The measurements were performed on the EUT in a manner which represents the typical installation configuration. A piece of closed cell foam was used to support the EUT and antenna combination.

2.3 Testing Algorithm

The RFN-500LG was programmed for operation from a support laptop via a custom RS232 adaptor board to a header on the EUT module. UTF TeraTermPro console program was used on the support laptop to enter commands setting the EUT to the desired channel or hopping mode.

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 ANAB under Testing Certificate AT-1448 as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

ANSI C63.10 “Procedures for Compliance Testing of Unlicensed Wireless Devices”

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

ANSI C63.4 “Methods of Measurement of Radio Noise from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”.

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 (R2002) with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1 to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

Equation 1: Standard Uncertainty

$$u_c = \pm\sqrt{\frac{a^2}{div_a{}^2} + \frac{b^2}{div_b{}^2} + \frac{c^2}{div_c{}^2} + ...}$$

Where u_c = standard uncertainty

a, b, c,.. = individual uncertainty elements

$Div_{a,\ b,\ c}$ = the individual uncertainty element divisor based on the probability distribution

Divisor = 1.732 for rectangular distribution

Divisor = 2 for normal distribution

Divisor = 1.414 for trapezoid distribution

Equation 2: Expanded Uncertainty

$$U = ku_c$$

Where U = expanded uncertainty

k = coverage factor

$k \leq 2$ for 95% coverage (ANSI/NCSL Z540-2 Annex G)

u_c = standard uncertainty

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in Table 2 below.

Table 2: Expanded Uncertainty List

Parameter	Uncertainty	Actual (+/-)	Unit
Radio Frequency	±1 x 10^{-7}	8.64E-08	parts
RF Power conducted (up to 160 W)	±0.75 dB	0.3	dB
Conducted RF Power variations using a test fixture	±0.75 dB	0.3	dB
Radiated RF power	±6 dB	N/A	dB
Average sensitivity (radiated)	±3 dB	N/A	dB

Scope	Standard(s)	Expanded Uncertainty
Conducted Emissions	CISPR11, CISPR22, CISPR14, FCC Part 15	±2.63 dB
Radiated Emissions	CISPR11, CISPR22, CISPR14, FCC Part 15	±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

Test Name:	**Radiated Emissions & Bench Conducted Emissions**	Test Date:	**02/18/2016**
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
823	AGILENT - N9010A	EXA SPECTRUM ANALYZER	8/5/2016
382	SUNOL SCIENCES CORPORATION - JB1	ANTENNA BICONLOG	8/31/2017
276	ELECTROMETRICS - BPA-1000	PRE-AMPLIFIER RF 50KHZ-1GHZ	9/18/2016
627	AGILENT - 8449B	AMPLIFIER 1-26GHZ	6/6/2016
825	MEGAPHASE - TM40-K1K5-36	RF CABLE - 2.9MM-2.9MM 36	11/3/2016

Test Name:	**Conducted Emissions Voltage**	Test Date:	**02/21/2016**
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
125	SOLAR - 8028-50-TS-24-BNC	LISN	10/10/2016
125	SOLAR - 8028-50-TS-24-BNC	LISN	10/10/2016
823	AGILENT - N9010A	EXA SPECTRUM ANALYZER	8/5/2016

4 Test Summary

The Table Below shows the results of testing for compliance with a Frequency Hopping System in accordance with FCC Part 15.247 10/2014 and RSS-247 Issue 1. Full test 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)(i)	RSS-247 Section 5.1 (1)	20dB Bandwidth	Pass
15.247 (b)(2)	RSS-247 Section 5.4 (1)	Transmit Output Power	Pass
15.247 (a)(1)	RSS-247 Section 5.1 (2)	Channel Separation	Pass
15.247 (a)(1)(i)	RSS-247 Section 5.1 (3)	Number of Channels =50 minimum	Pass
15.247 (a)(1)(i)	RSS-247 Section 5.1 (3)	Time of Occupancy	Pass
15.247 (d)	RSS-247 Section 5.5	Occupied BW / Out-of-Band Emissions (Band Edge @ 20dB below)	Pass
15.205 15.209	RSS-247 Section 5.5	General Field Strength Limits (Restricted Bands & RE Limits)	Pass
15.207	RSS-Gen	AC Conducted Emissions	Pass
RX/Digital Test Summary (Frequency Hopping Spread Spectrum)			
FCC Rule Part	**IC Rule Part**	**Description**	**Result**
15.207	RSS-Gen	AC Conducted Emissions	Pass
15.209	RSS-Gen	General Field Strength Limits	Pass

5 Test Results

5.1 Duty Cycle Correction and Time of Occupancy

In accordance with the FCC Public Notice the average spurious radiated emissions measurements may be further adjusted using a duty cycle correction factor if the dwell time per channel of the hopping signal is less than 100 ms.

The duty cycle correction factor is calculated by:

20 x LOG (dwell time/100 ms)

The following figure shows the plot of the dwell time for the transmitter. Based on this plot, the dwell time per hop is 19.04ms. The maximum total dwell time per 100ms is 57.12ms. This corresponds to a duty cycle correction of -4.86dB for radiated spurious emissions.

The transmitter shall have a time of occupancy for systems having a 20dB bandwidth greater than 250 kHz of no more than 0.4seconds in any 10 second period.

These tests were conducted with the RF output connected through appropriate attenuators to the input of a spectrum analyzer set to zero span mode. The unit was set to hopping mode with the spectrum analyzer set to 902.75MHz. The results are shown in the plots below.

Table 5: Duty Cycle/time of Occupancy Results

Test	Result	Limit	Pass/Fail
Dwell time per Hop	19.04ms	NA	NA
Dwell time per 100ms	57.12ms -4.87dB Correction	NA	NA
Time of Occupancy	0.1714s/10 sec	0.4s/10 sec	Pass

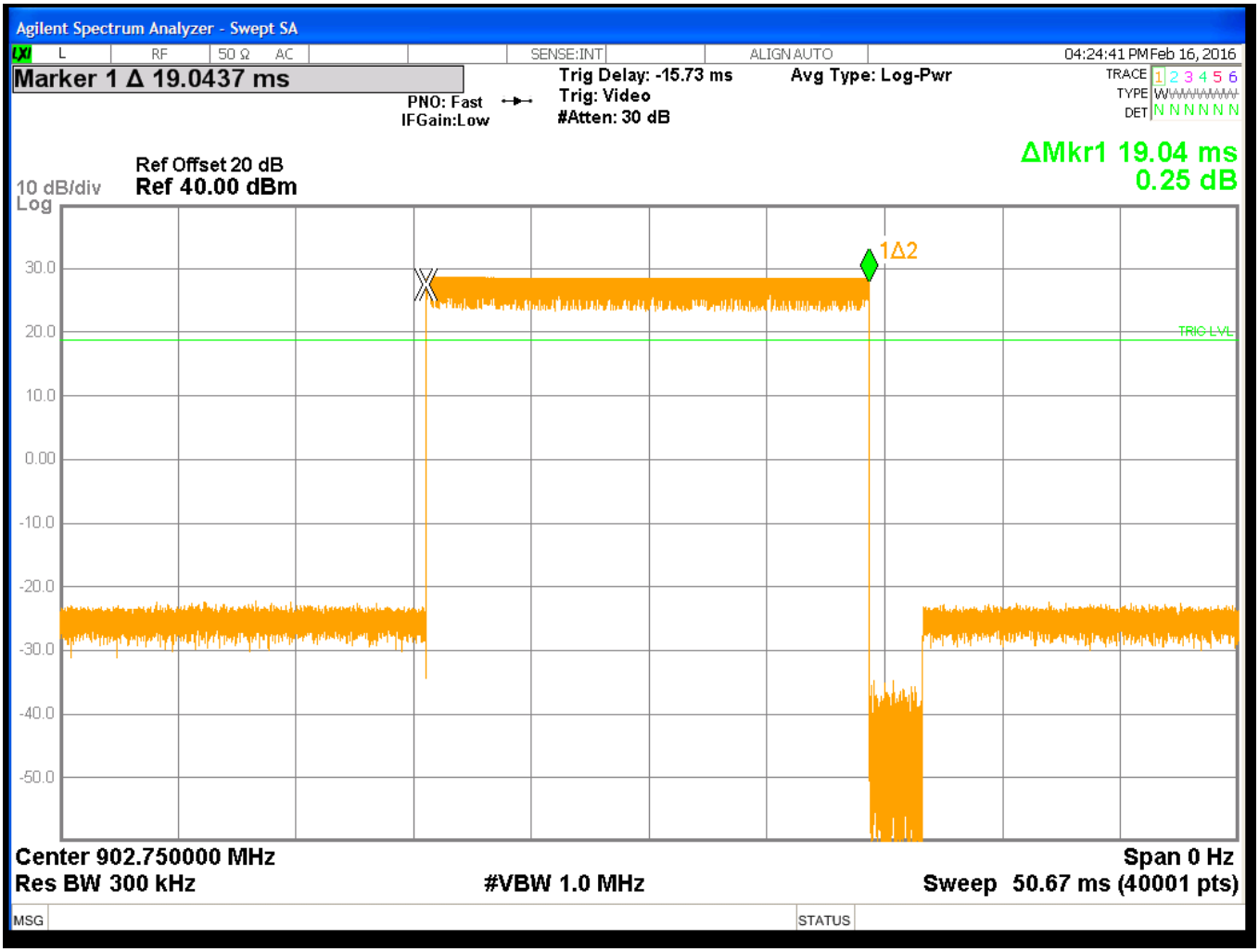

Figure 1: Single Hop Duty Cycle Plot

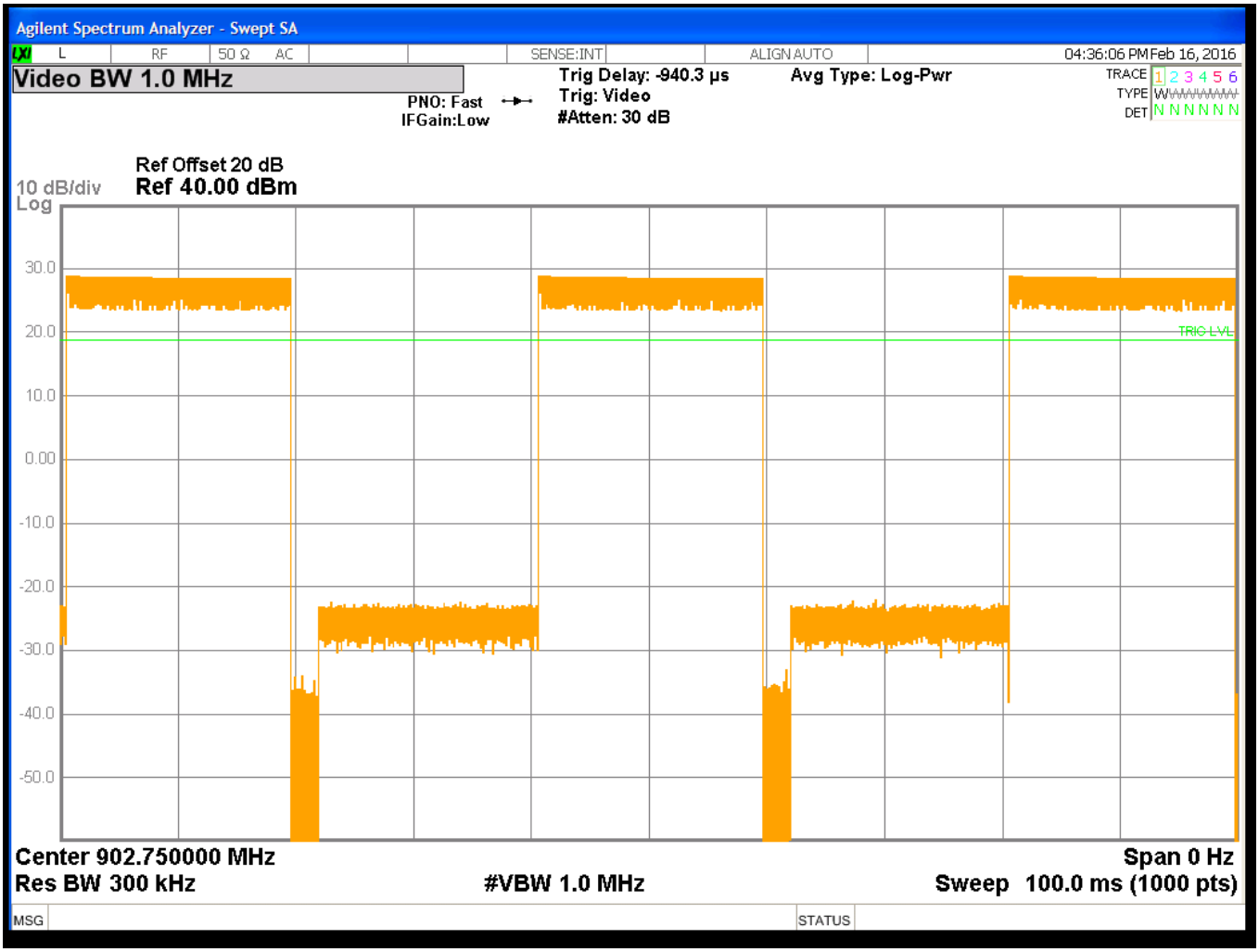

Figure 2: Dwell time per 100ms

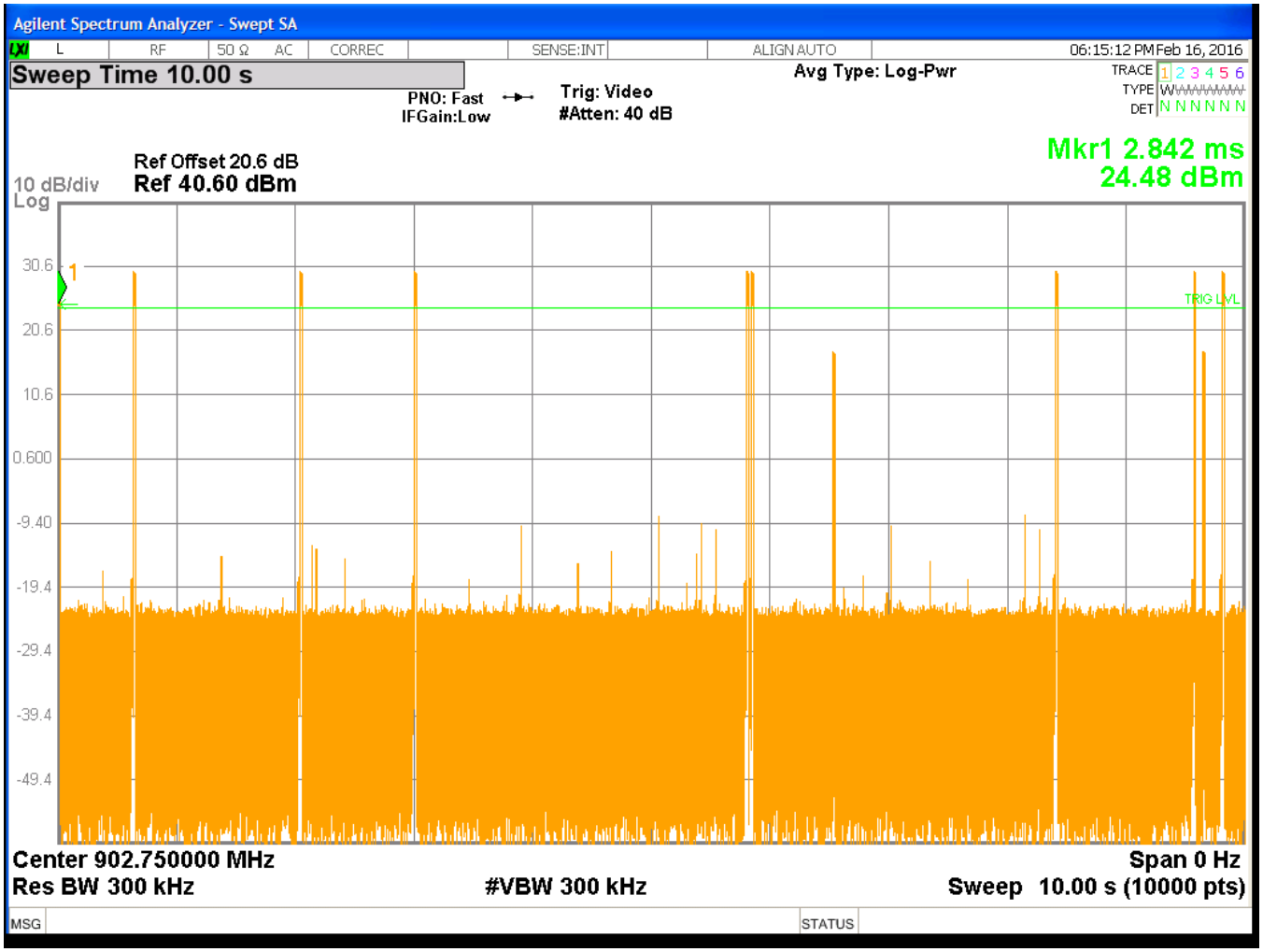

Figure 3: Time of Occupancy

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 Center 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. The EUT has an adjustable output range. The highest and lowest power available is shown below.

Table 6: RF Power Output

Frequency	Power Setting	Level (dBm)	Limit (dBm)	Pass/Fail
Low Channel: 902.75MHz	High	29.285	30	Pass
Center Channel: 914.75MHz	High	29.455	30	Pass
High Channel: 927.25MHz	High	29.520	30	Pass
Low Channel: 902.75MHz	Low	-6.463	30	Pass
Center Channel: 914.75MHz	Low	-6.766	30	Pass
High Channel: 927.25MHz	Low	-7.129	30	Pass

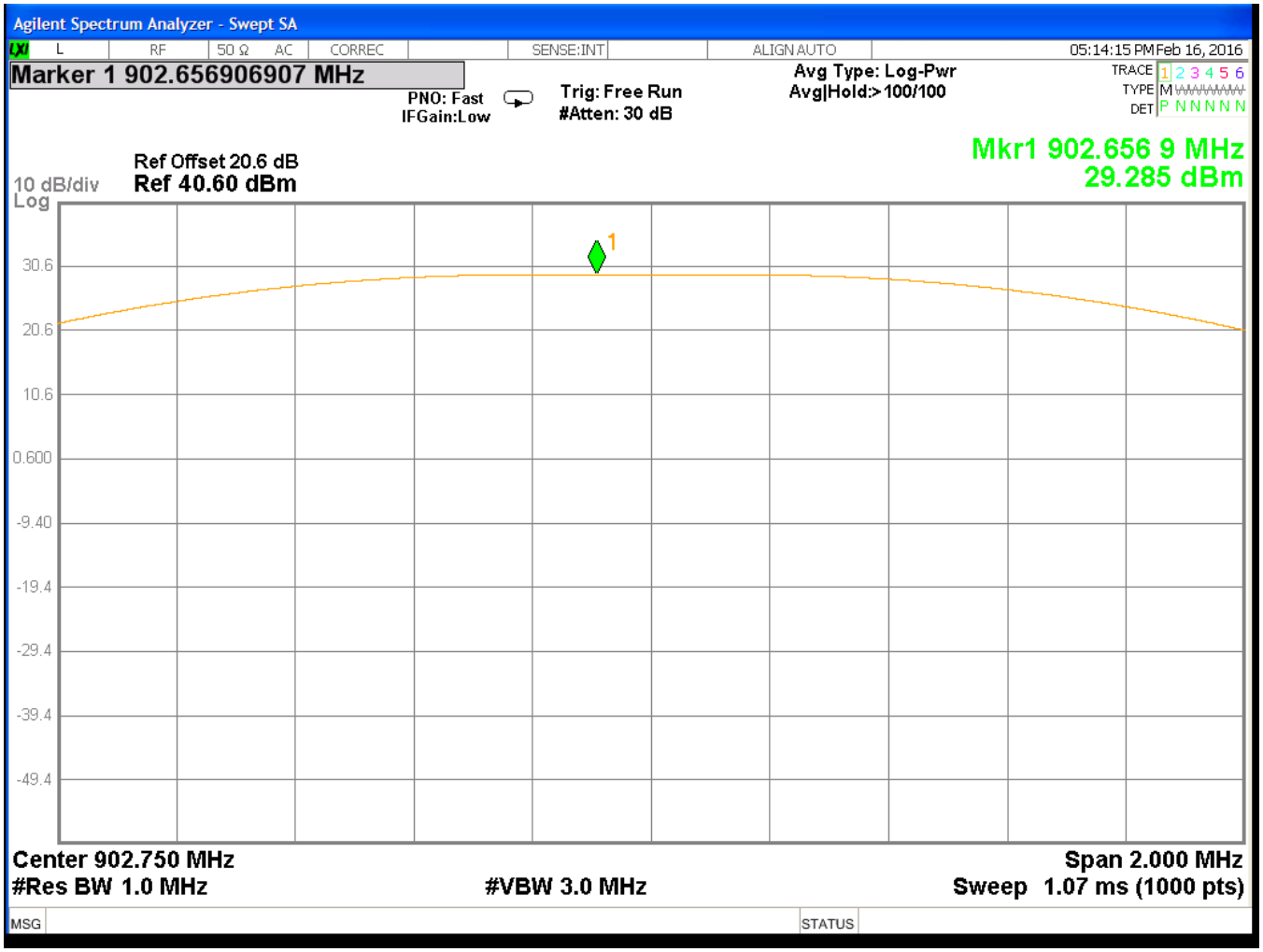

Figure 4: RF Peak Power, High Power, Low Channel

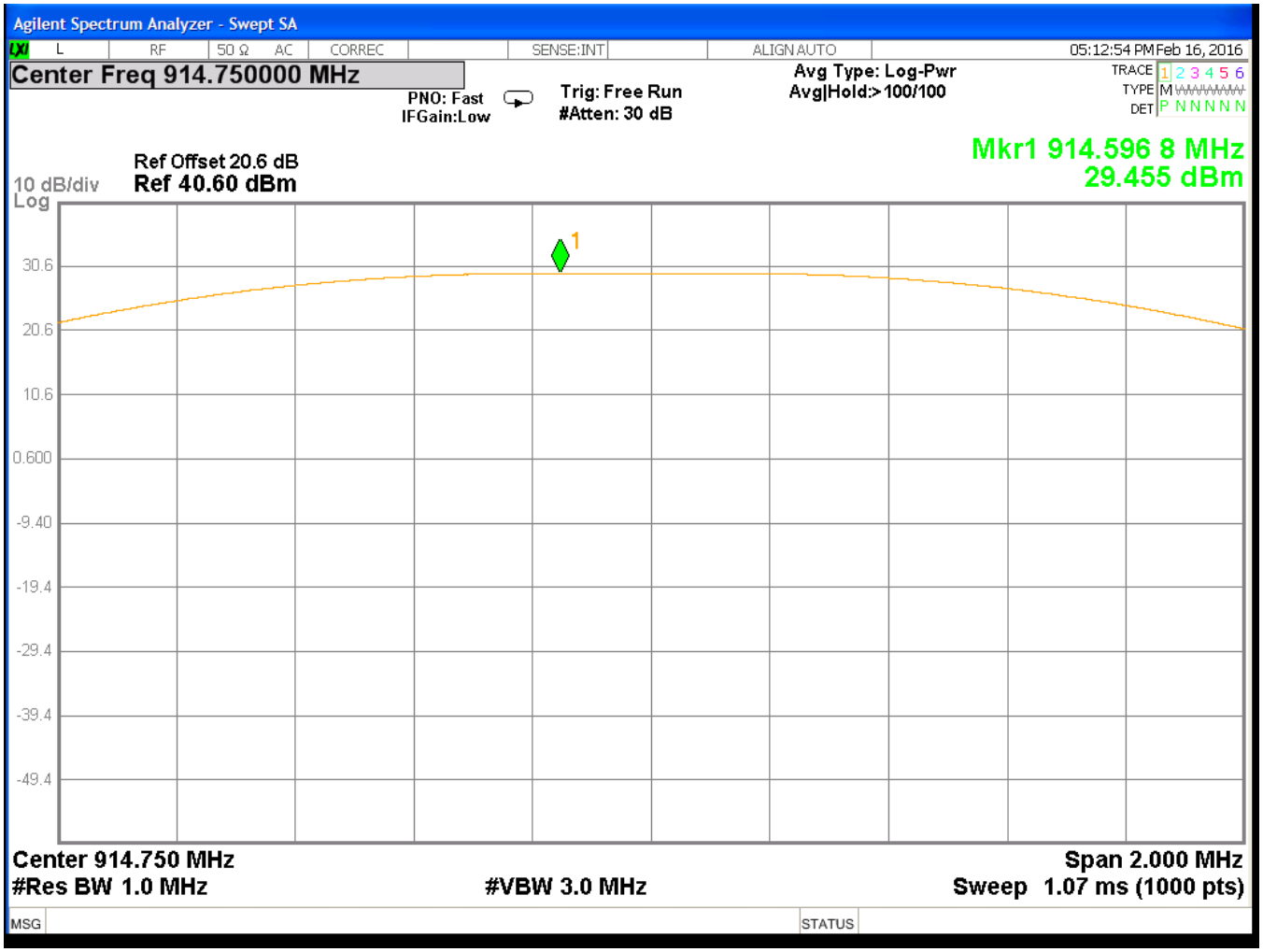

Figure 5: RF Peak Power, High Power, Center Channel

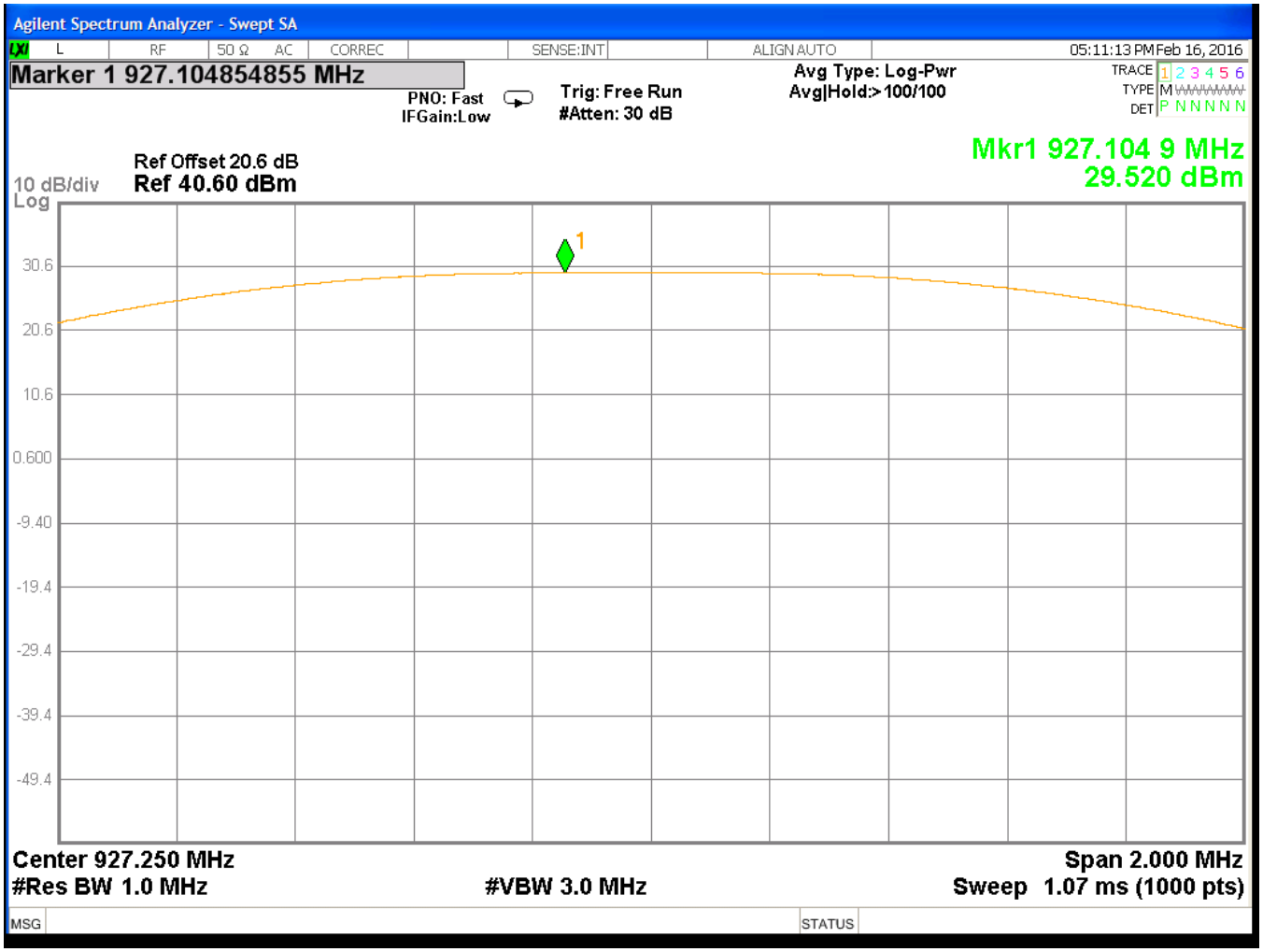

Figure 6: RF Peak Power, High Power, High Channel

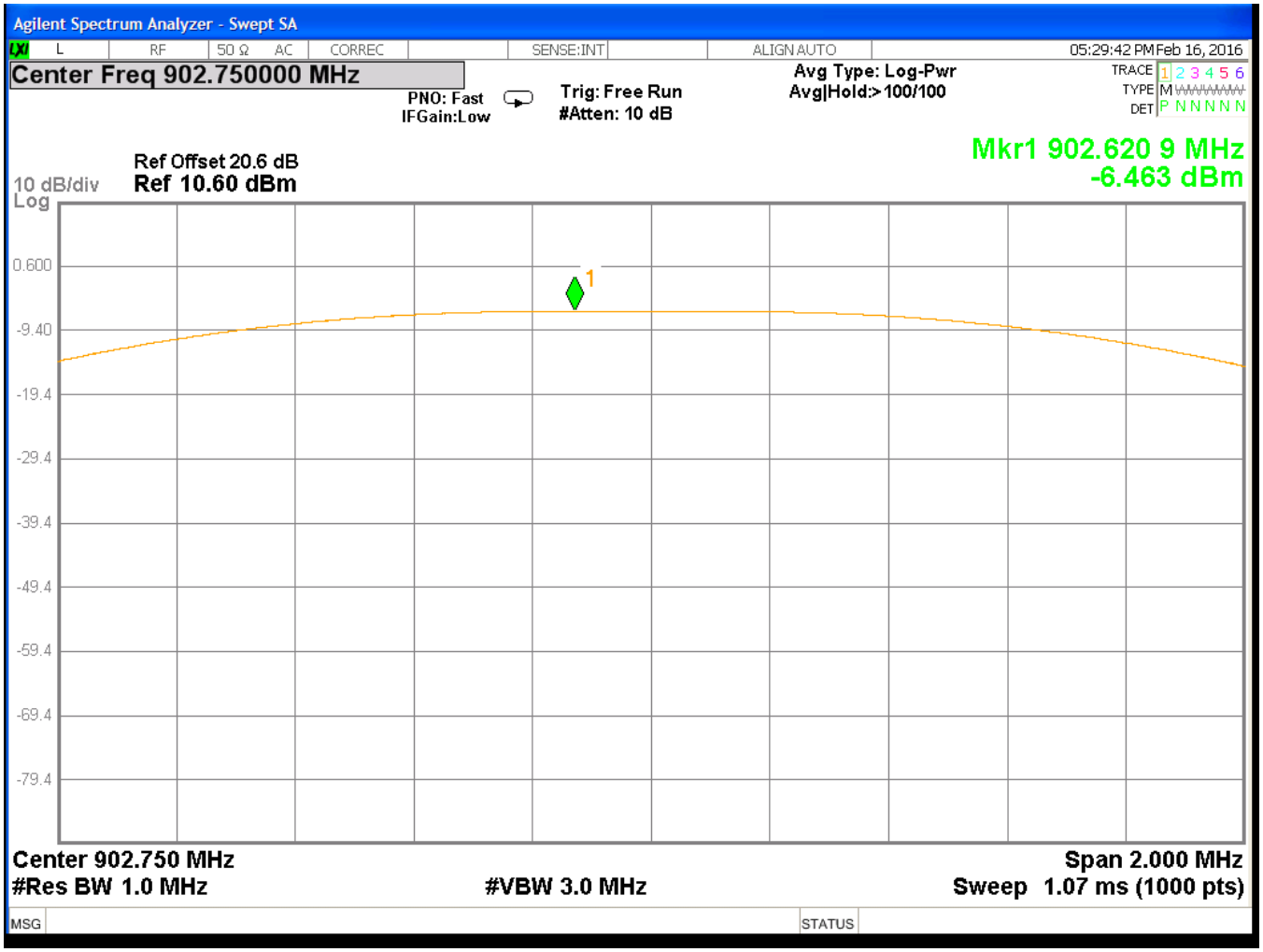

Figure 7: RF Peak Power, Low Power, Low Channel

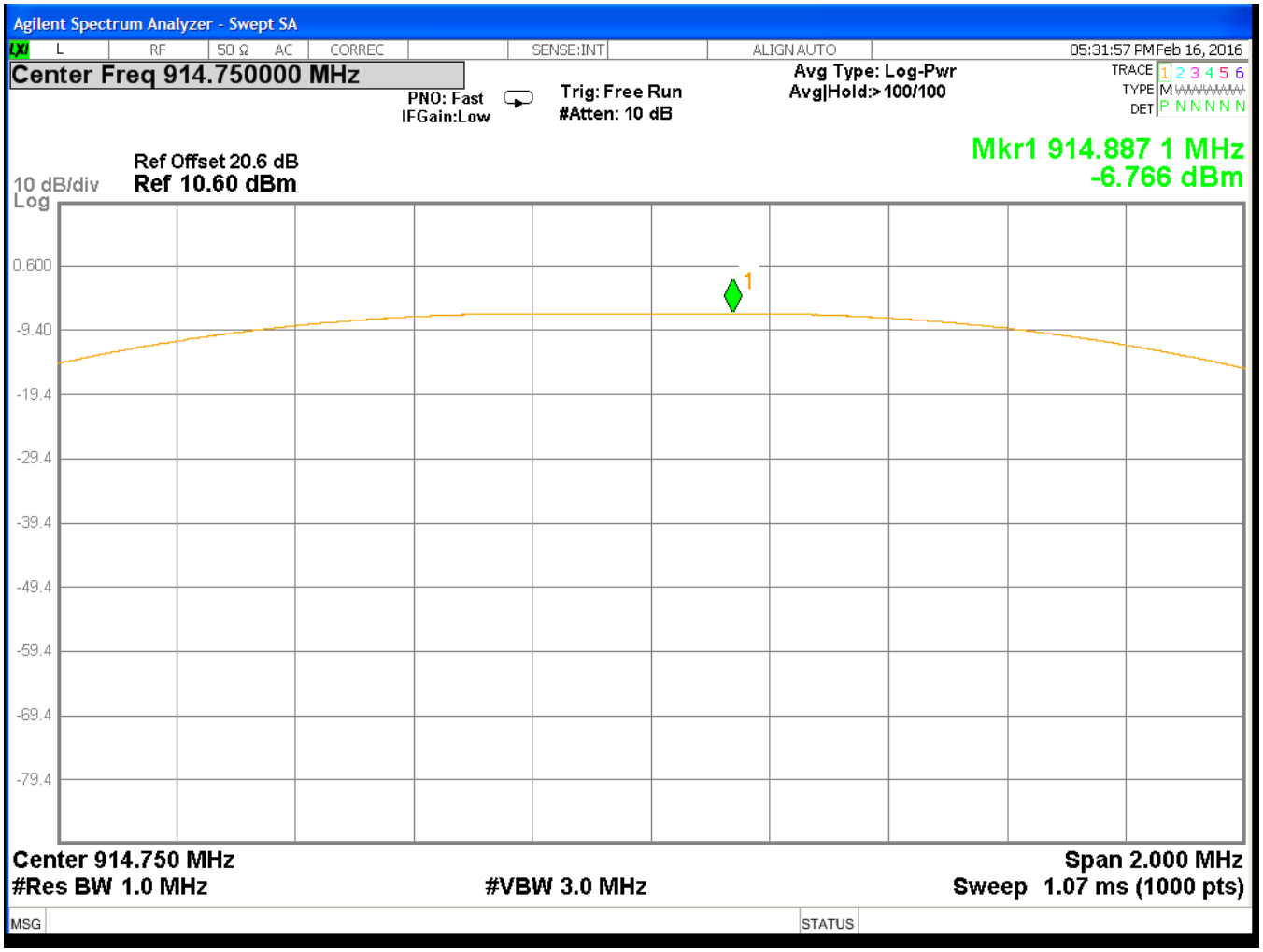

Figure 8: RF Peak Power, Low Power, Center Channel

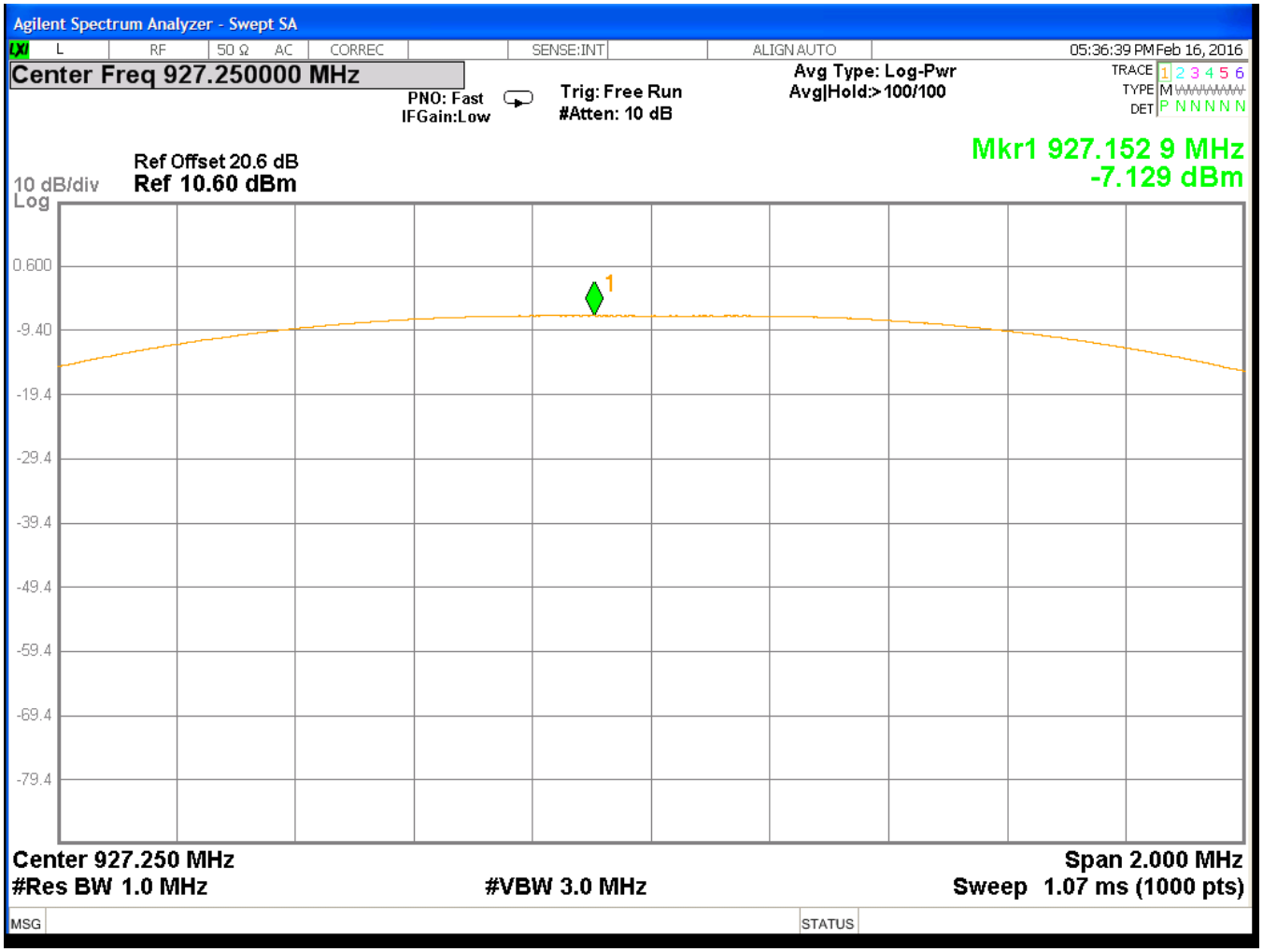

Figure 9: RF Peak Power, Low Power, High Channel

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.

For Frequency Hopping Spread Spectrum Systems, FCC Part 15.247 requires the maximum 20 dB bandwidth not exceed 500 kHz.

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

Table 7 provides a summary of the Occupied Bandwidth Results.

Table 7: Occupied Bandwidth Results

Frequency	Bandwidth (kHz)	Limit (kHz)	Pass/Fail
Low Channel: 902.75MHz	471.3	500	Pass
Center Channel: 914.75MHz	473.4	500	Pass
High Channel: 927.25MHz	476.4	500	Pass

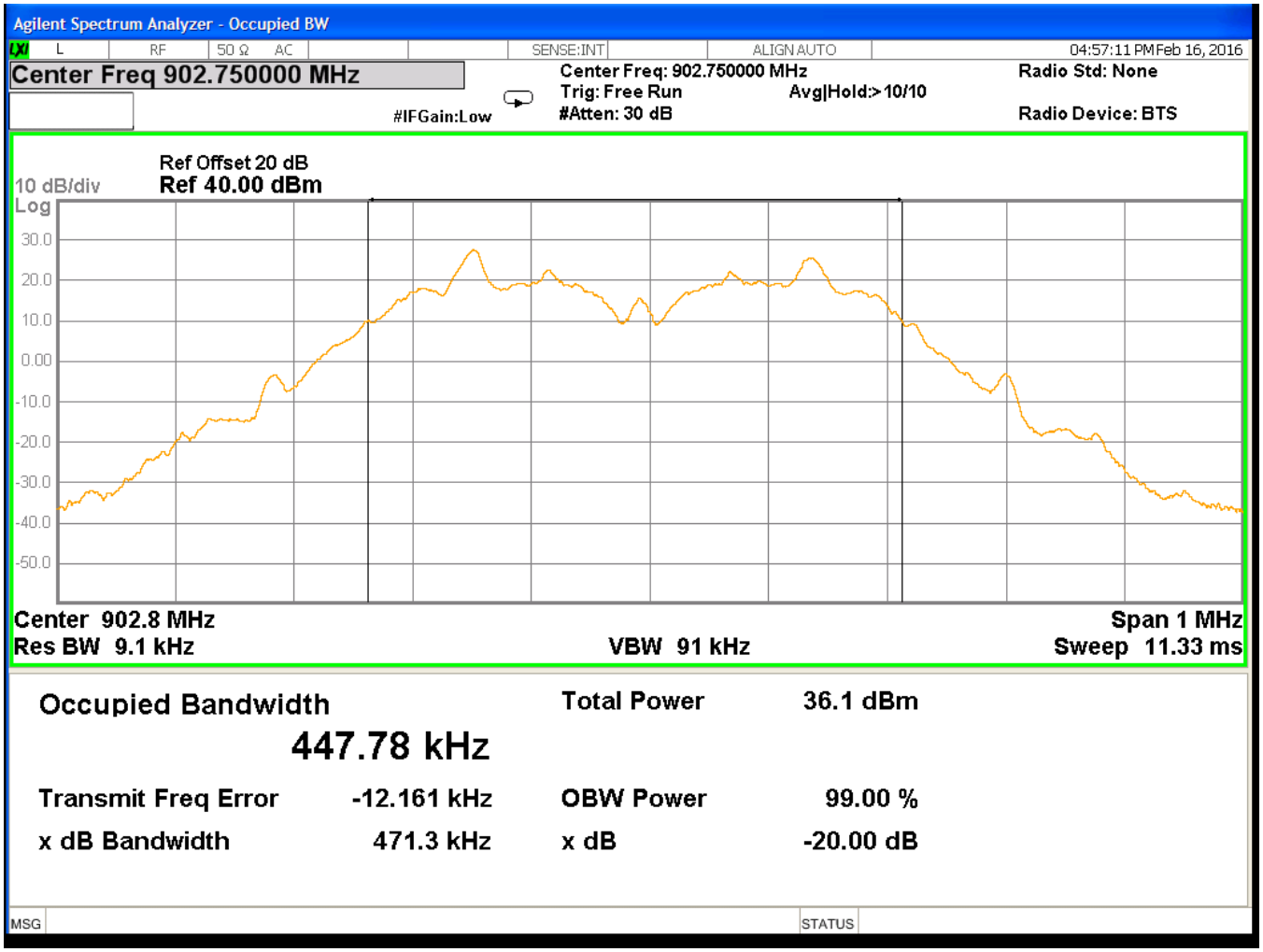

Figure 10: Occupied Bandwidth, Low Channel

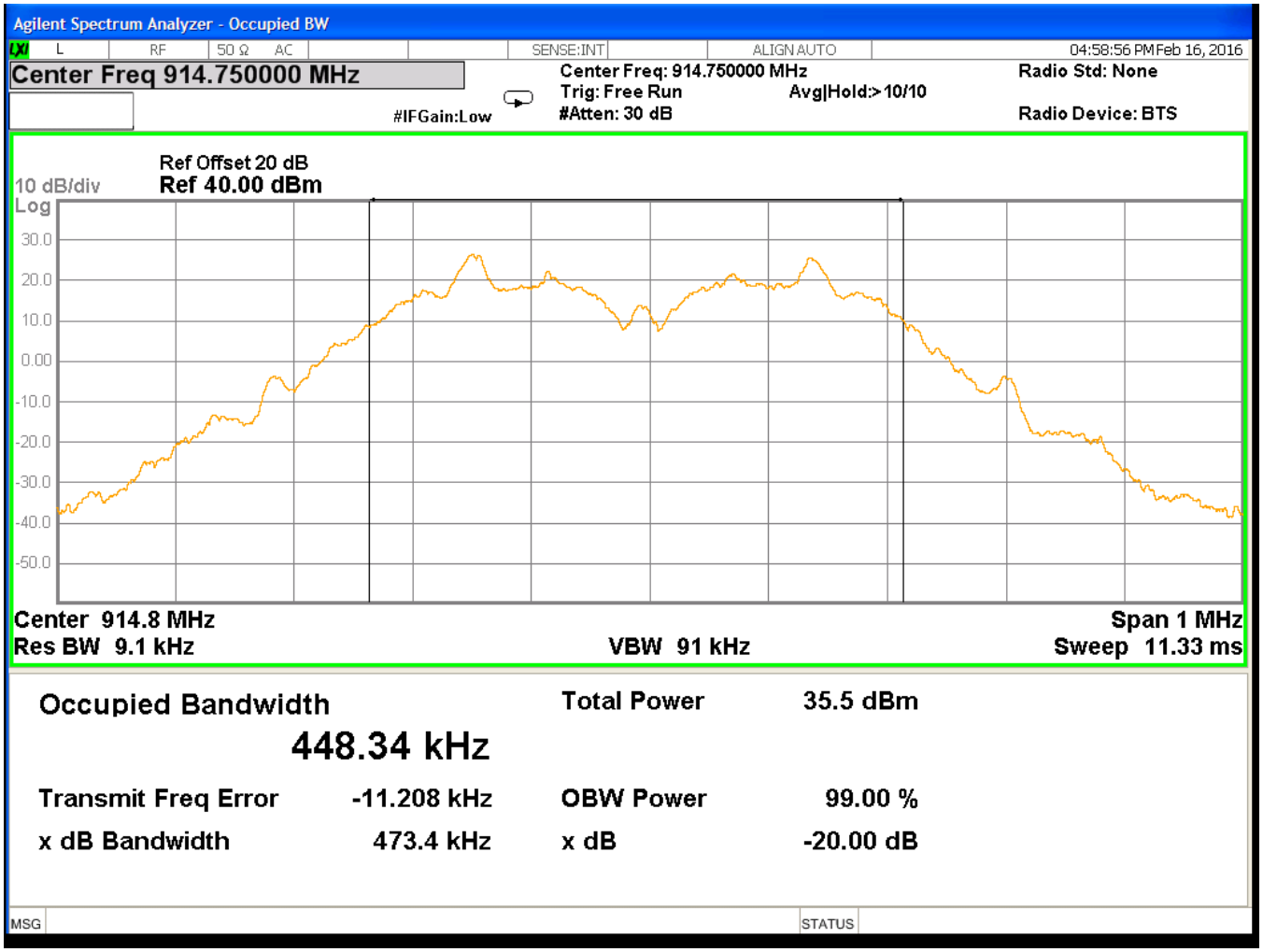

Figure 11: Occupied Bandwidth, Center Channel

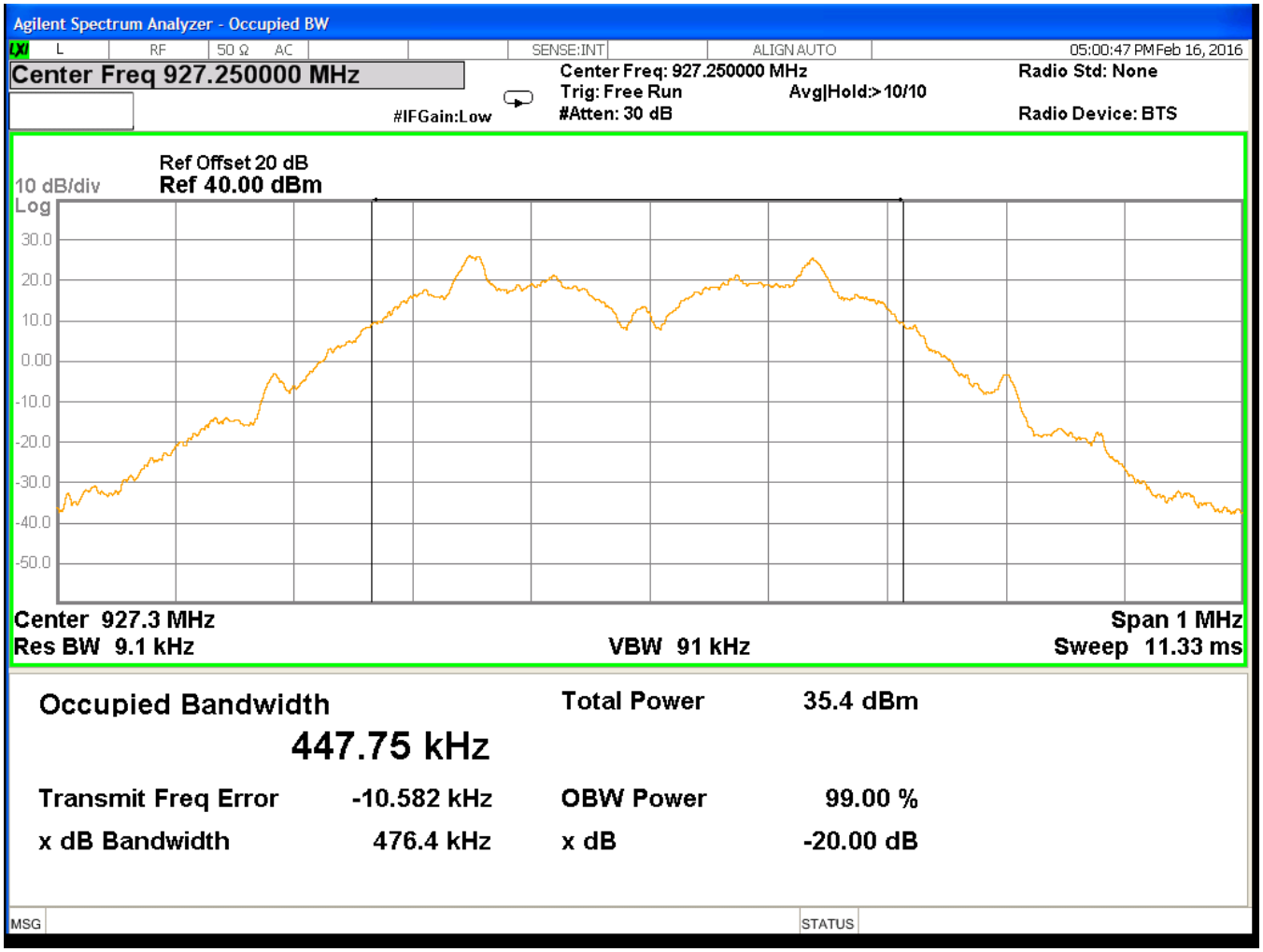

Figure 12: Occupied Bandwidth, High Channel

5.4 Channel Spacing and Number of Hop Channels (FCC Part §15.247(a)(1))

Per the FCC requirements, frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth, whichever is greater. The maximum 20dB bandwidth measured is 476.4 kHz so the channel spacing must be more than 476.4 kHz. In addition, for a 902-928MHz transmitter with an occupied bandwidth greater than 250 kHz the minimum number of hopping channels shall be 25.

The EUT antenna was removed and the cable was connected directly into a spectrum analyzer through a 20 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 30 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 100 kHz. Also, the number of hopping channels was measured from 902-928MHz using a RBW/VBW setting of 30/100 kHz.

The following are plots of the channel spacing and number of hopping channels data. The channel spacing was measured to be 492.4 kHz and the number of channels used is 50.

Note: In the following plots each channel is composed of 2 distinct peaks.

Table 8: Channel Spacing and Number of Channels Results

Frequency	Result	Limit	Pass/Fail
Channel Spacing	492.4kHz	476.4kHz Minimum	Pass
Number of channels	50 channels	25 Channels Minimum	Pass

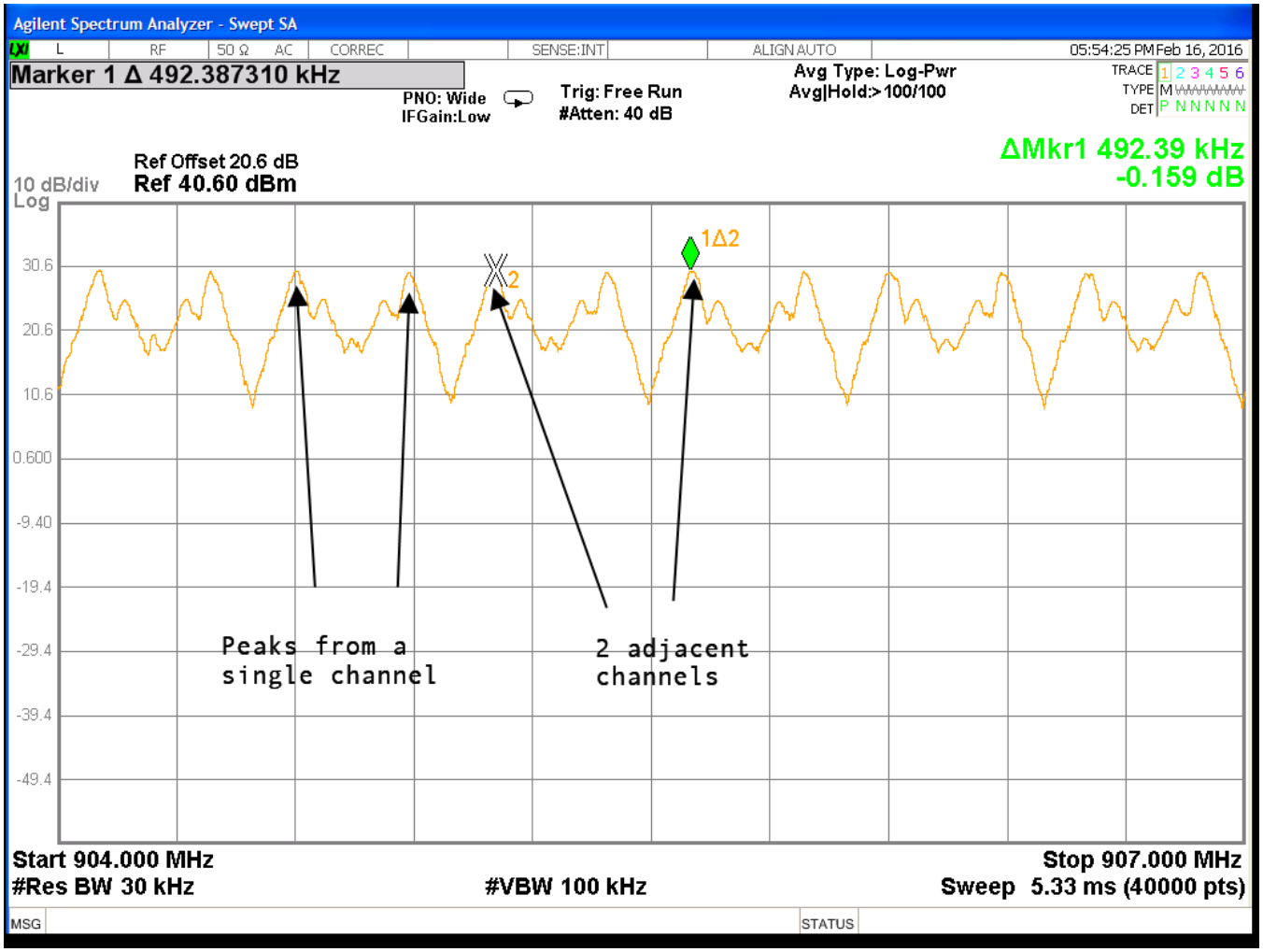

Figure 13: Channel Spacing

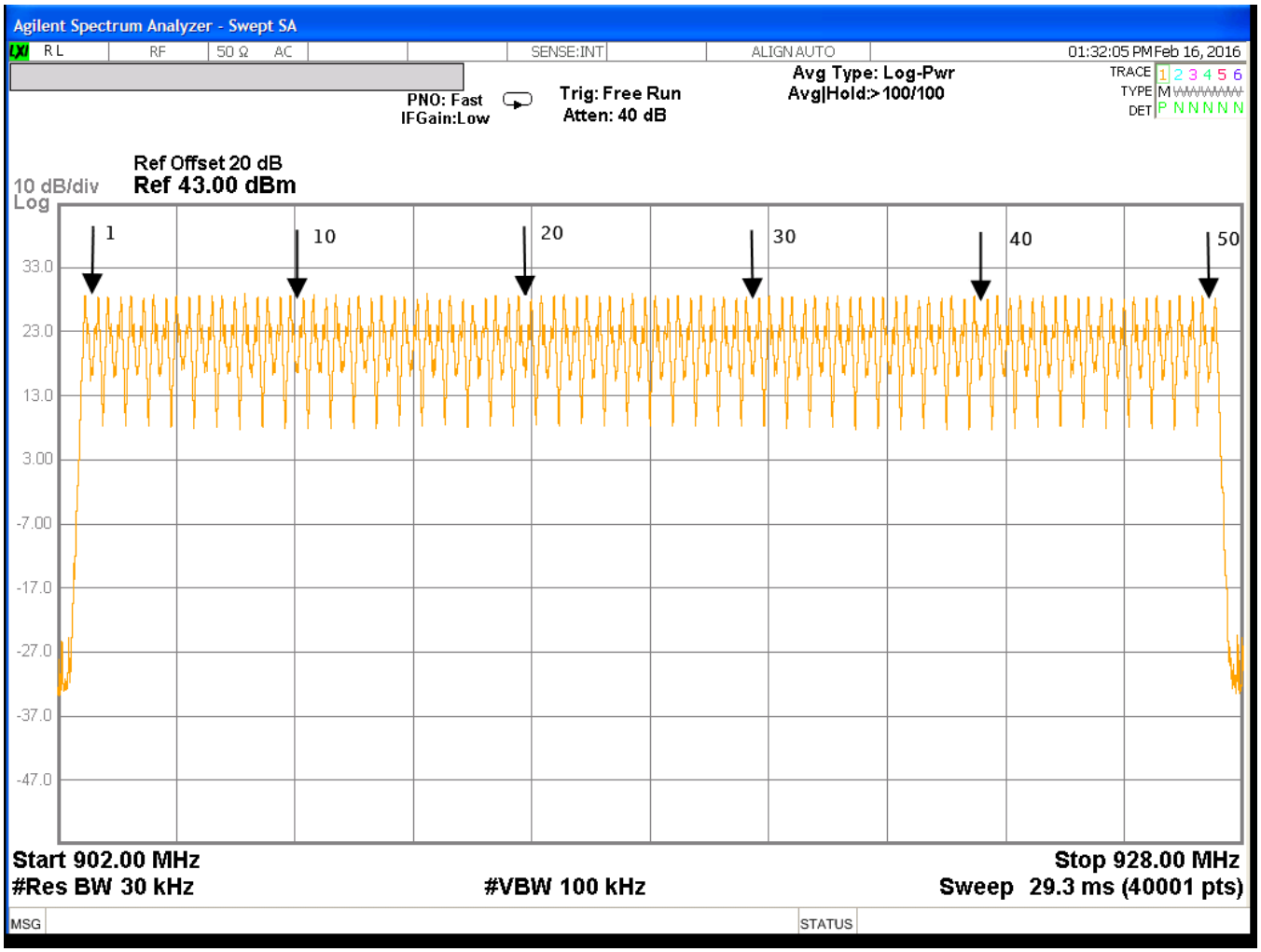

Figure 14: Number of Hopping Channels

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 300 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.

The following are plots of the conducted spurious emissions data.

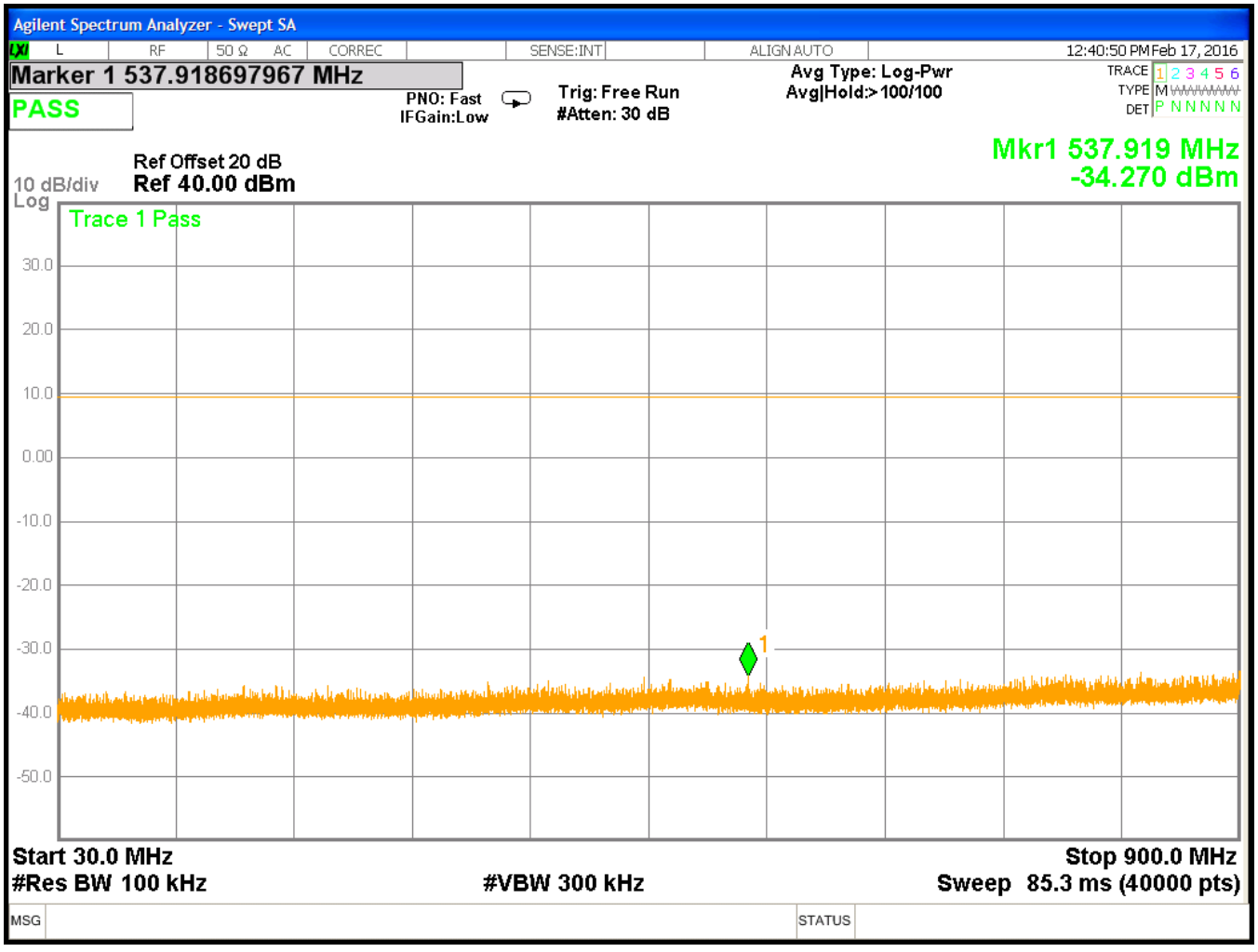

Figure 15: Conducted Spurious Emissions, High Power, Low Channel 30 - 900MHz

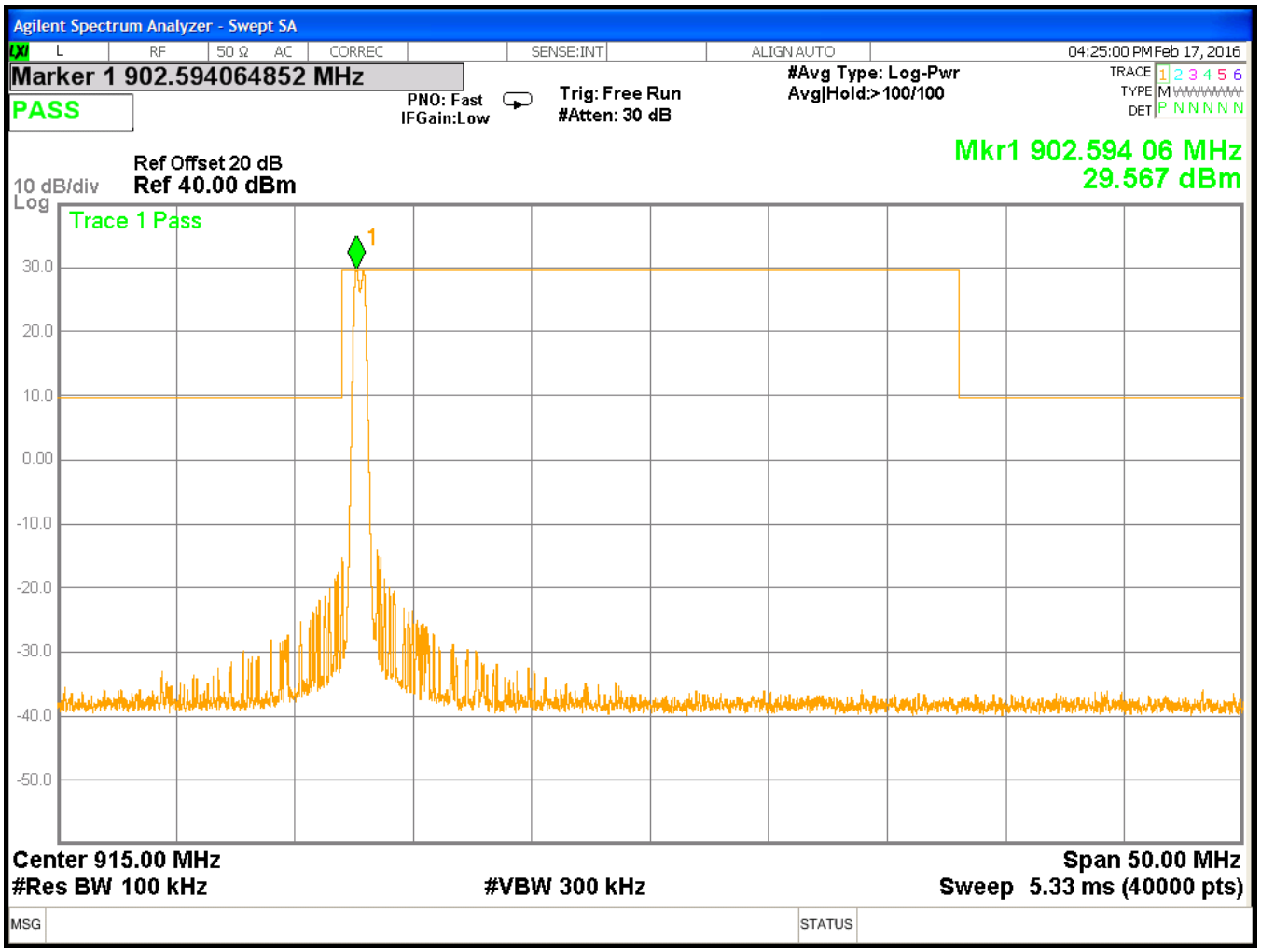

Figure 16: Conducted Spurious Emissions, High Power, Low Channel 900 – 930MHz

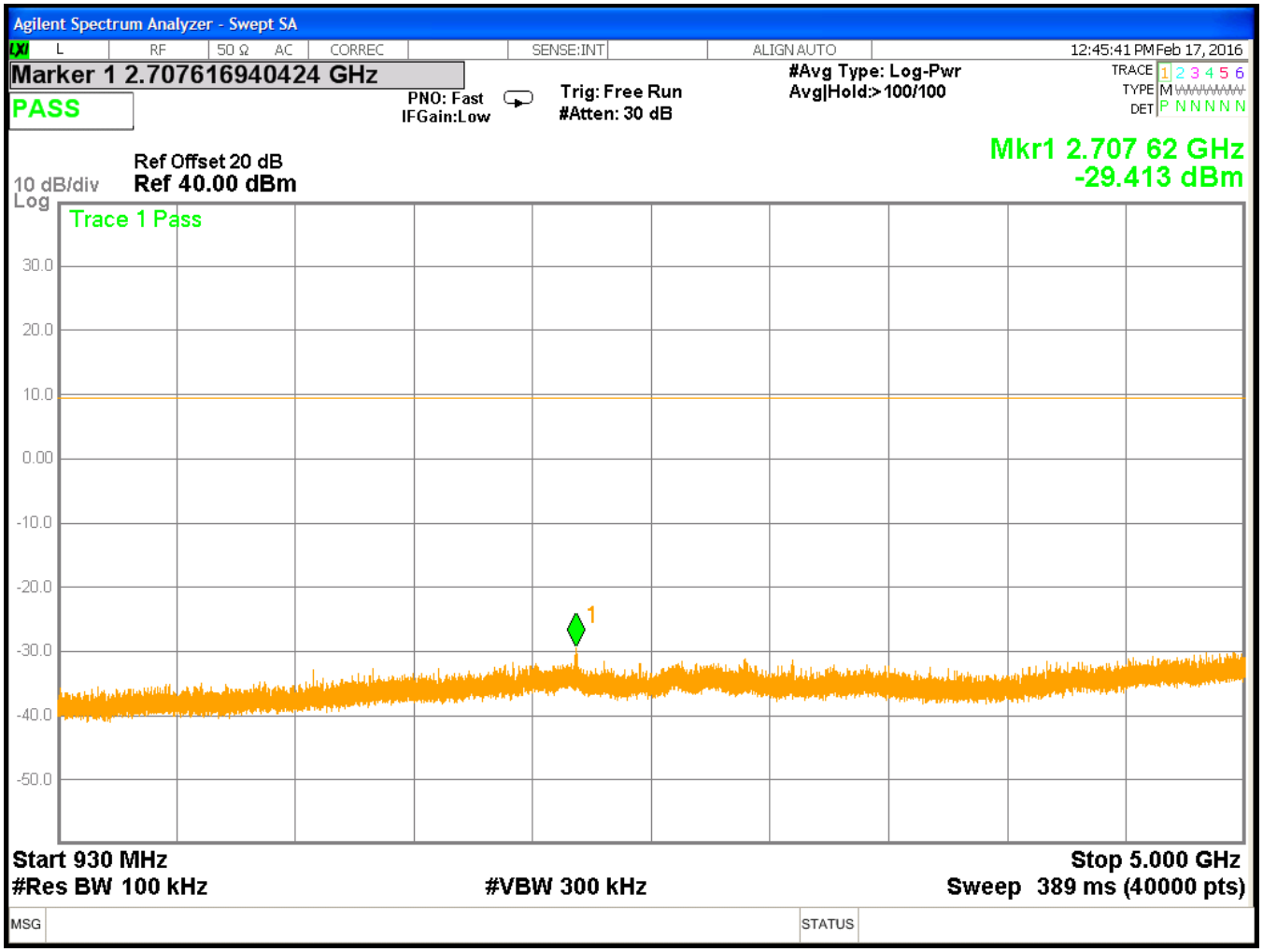

Figure 17: Conducted Spurious Emissions, High Power, Low Channel 930-5000MHz

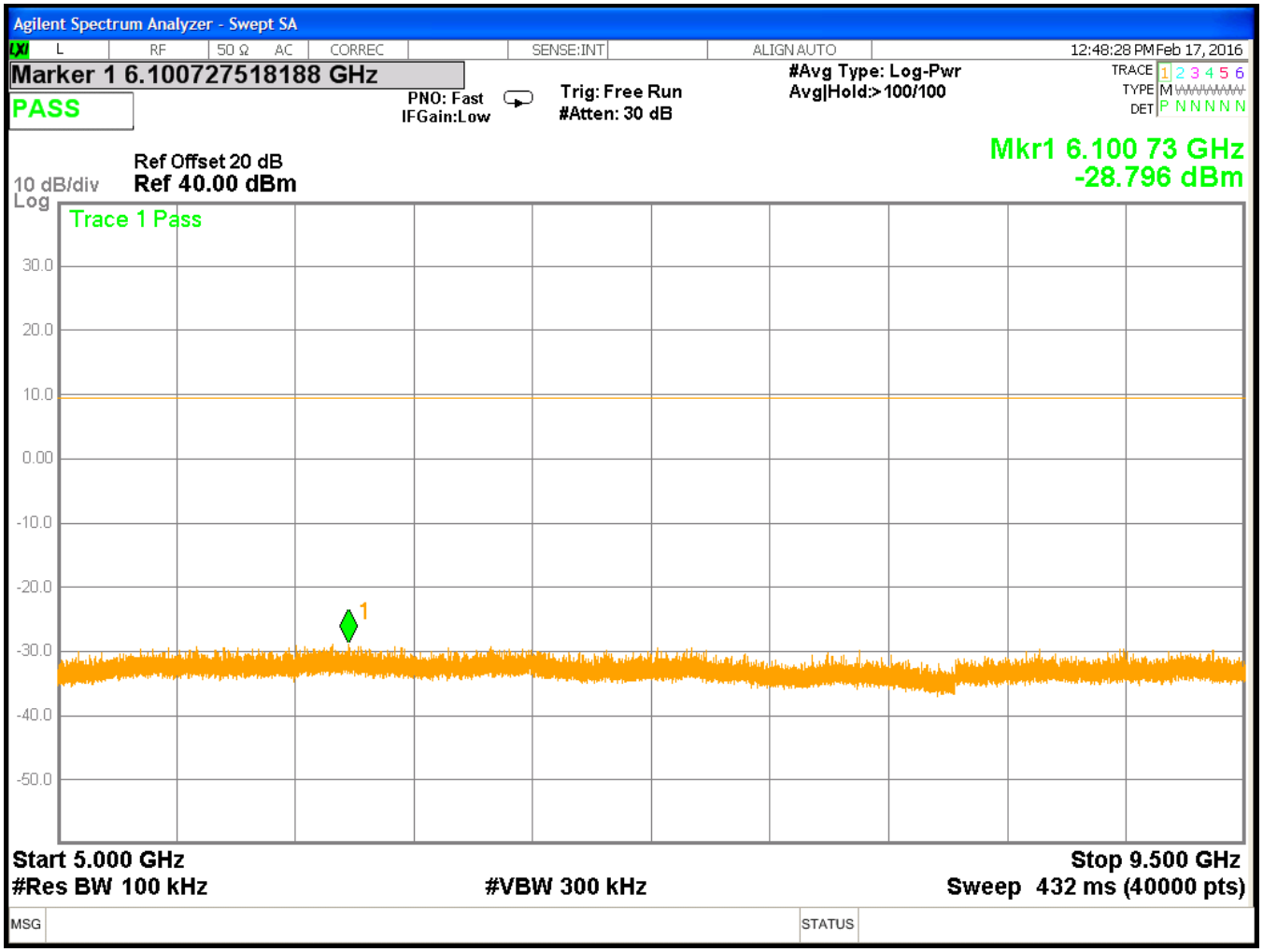

Figure 18: Conducted Spurious Emissions, High Power, Low Channel 5-9.5GHz

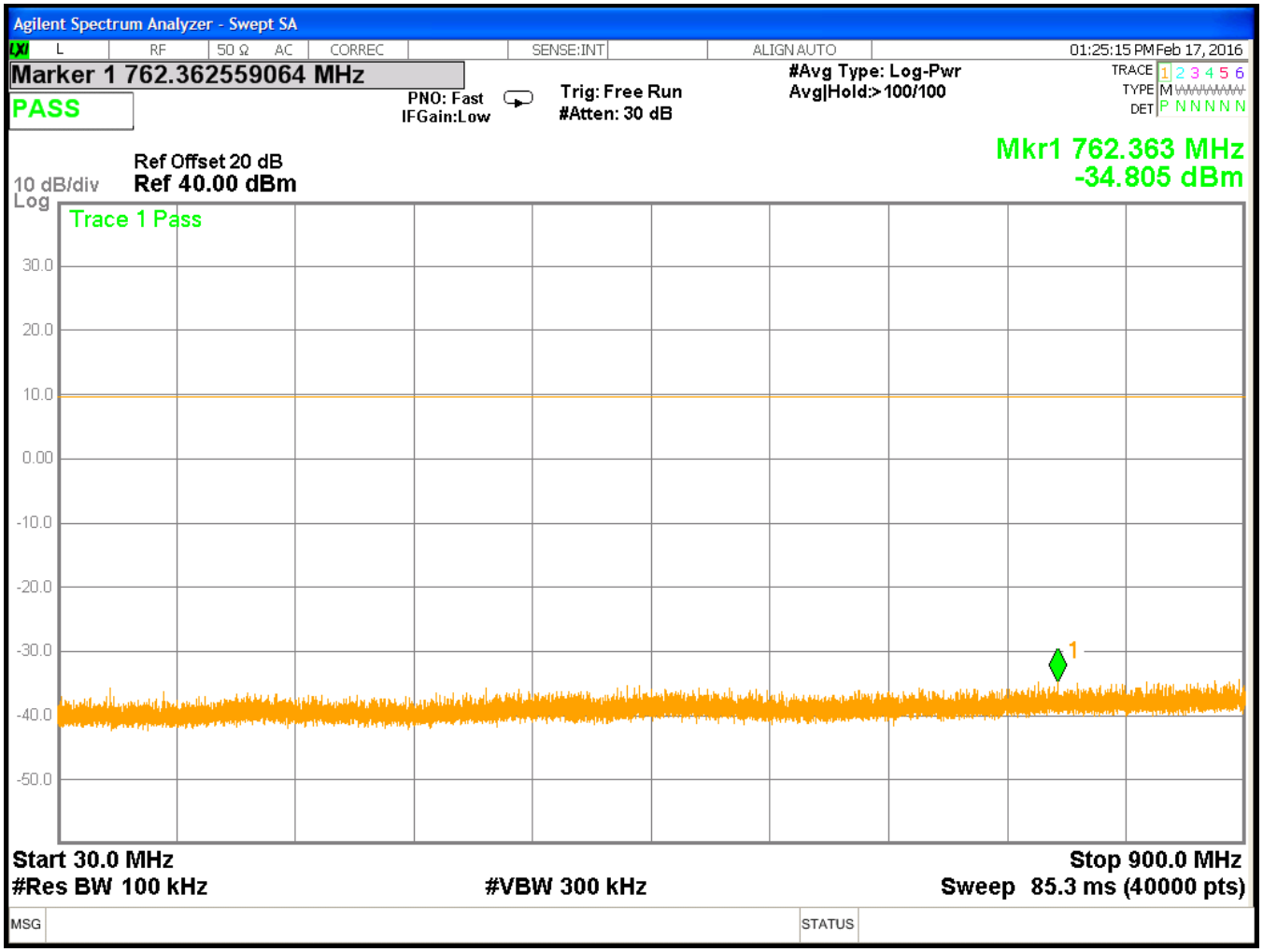

Figure 19: Conducted Spurious Emissions, High Power, Center Channel 30 - 900MHz

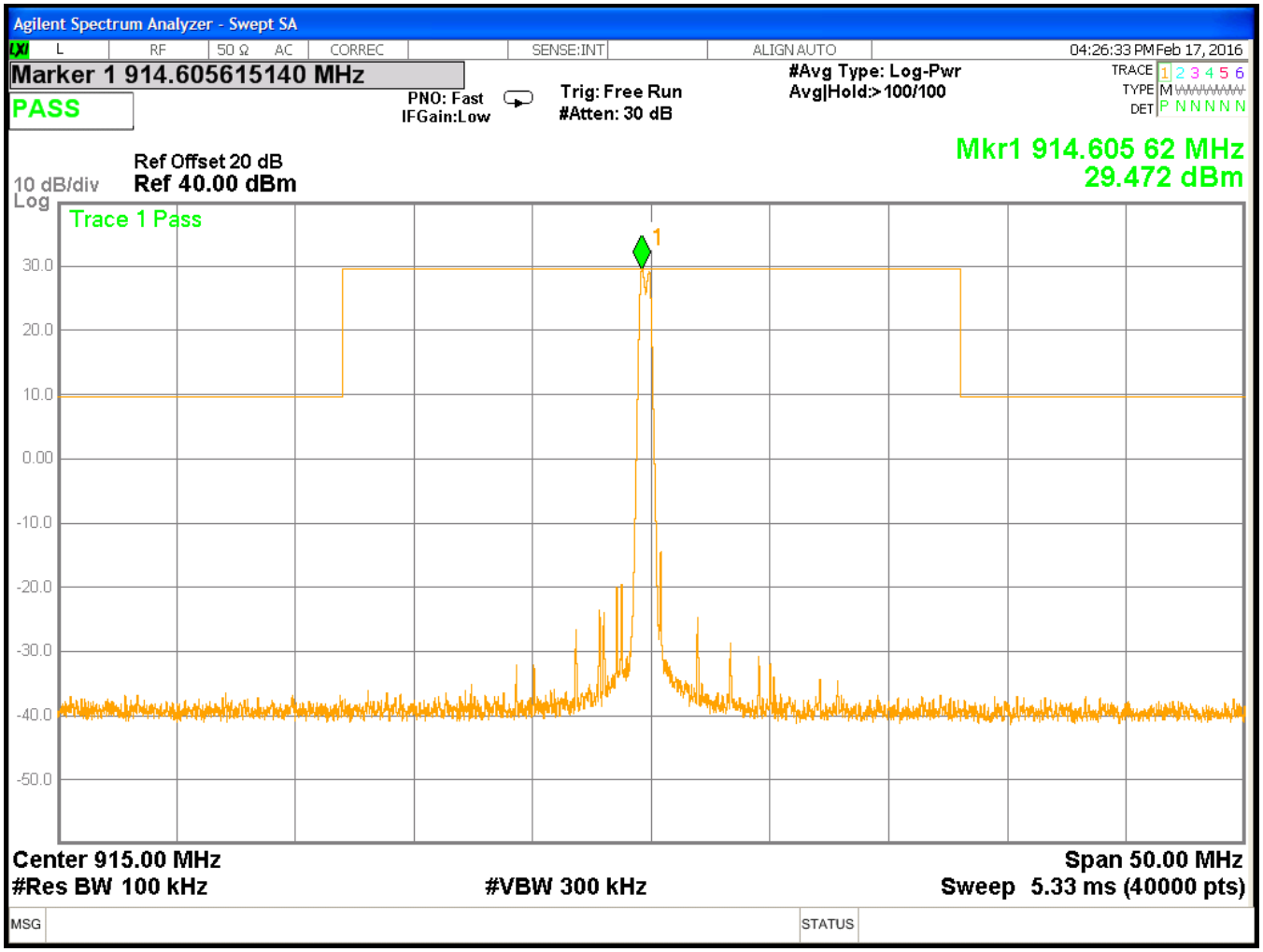

Figure 20: Conducted Spurious Emissions, High Power, Center Channel 900 – 930MHz

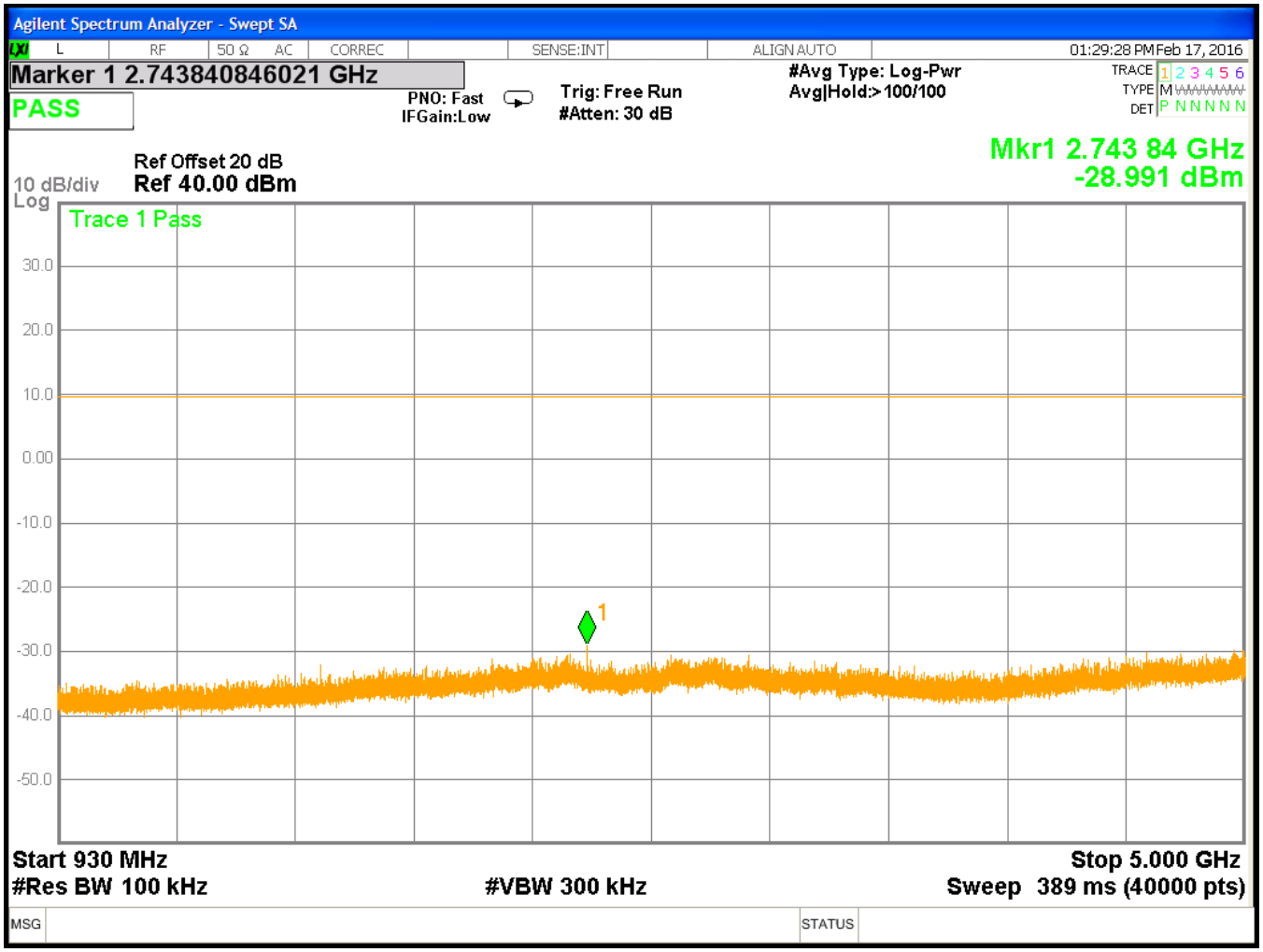

Figure 21: Conducted Spurious Emissions, High Power, Center Channel 930-5000MHz

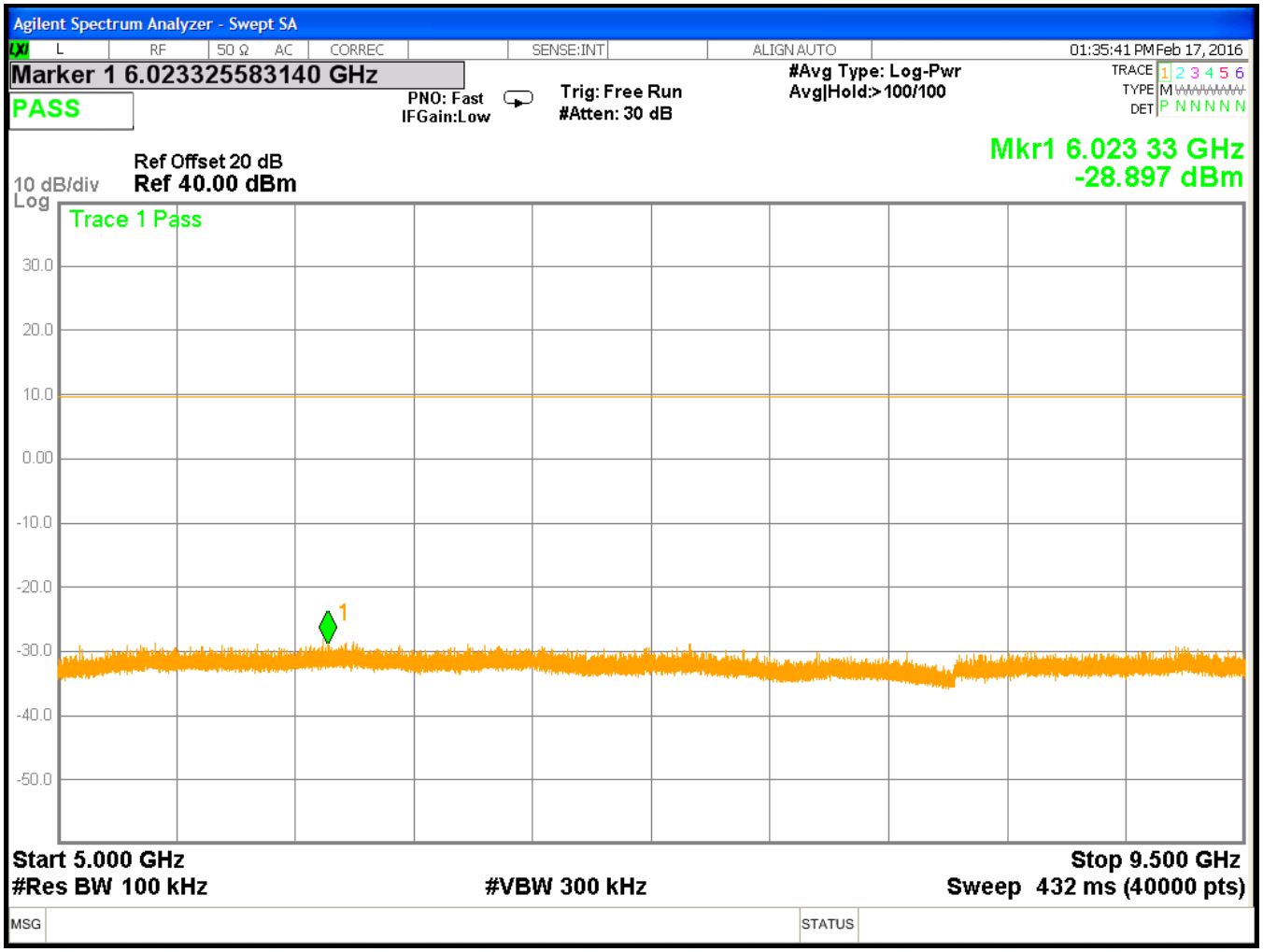

Figure 22: Conducted Spurious Emissions, High Power, Center Channel 5-9.5GHz

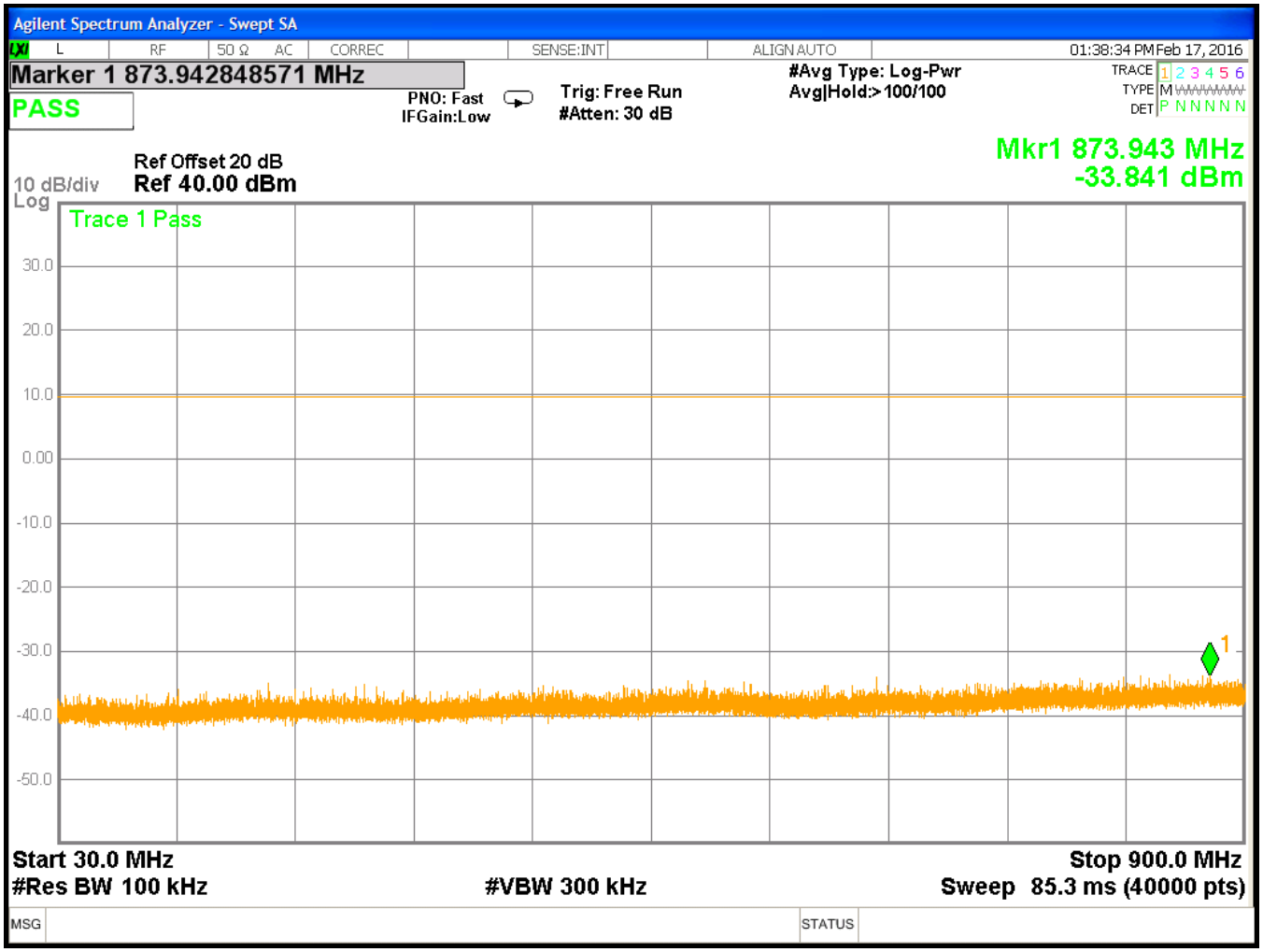

Figure 23: Conducted Spurious Emissions, High Power, High Channel 30 - 900MHz

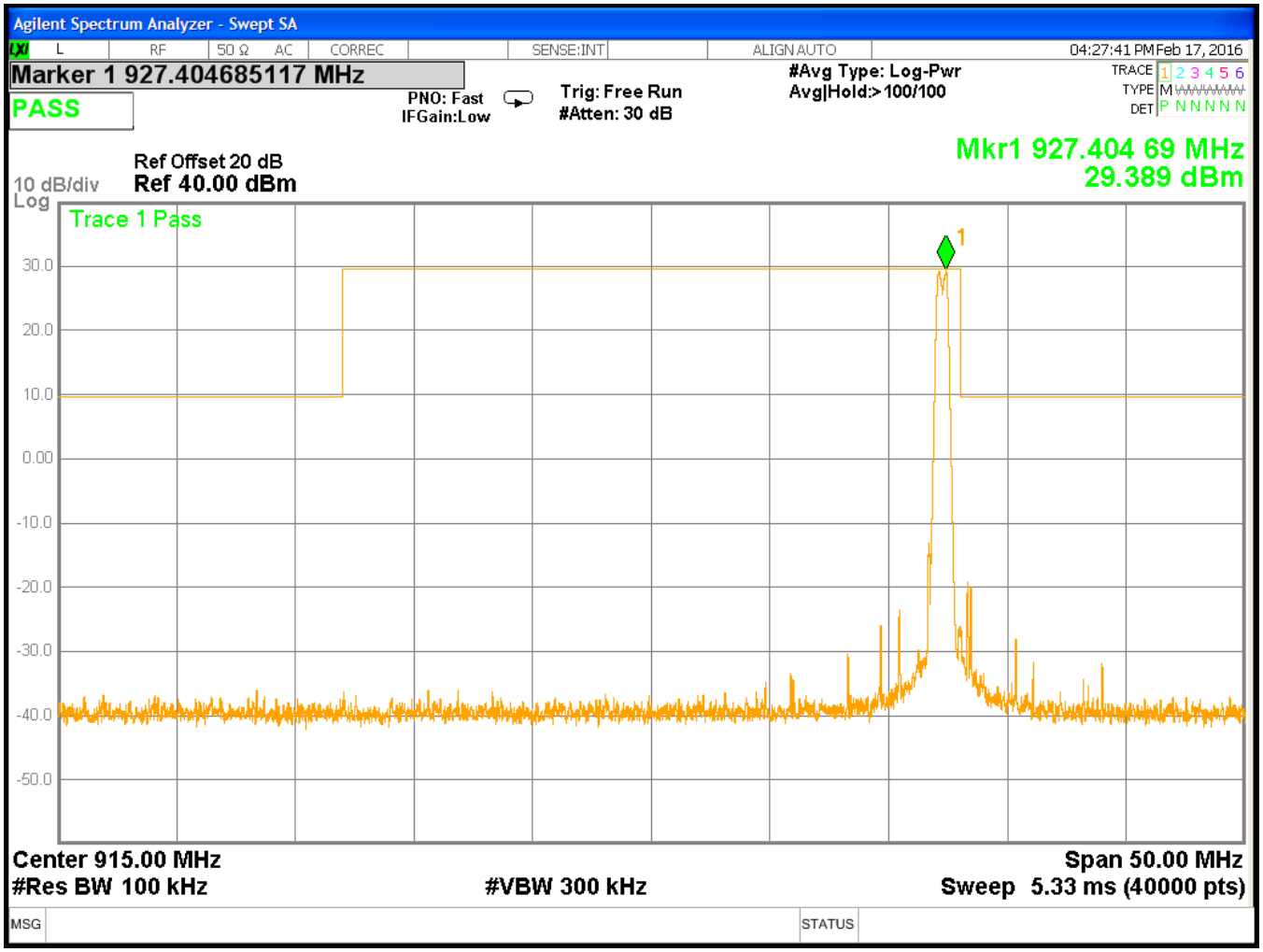

Figure 24: Conducted Spurious Emissions, High Power, High Channel 900 – 930MHz

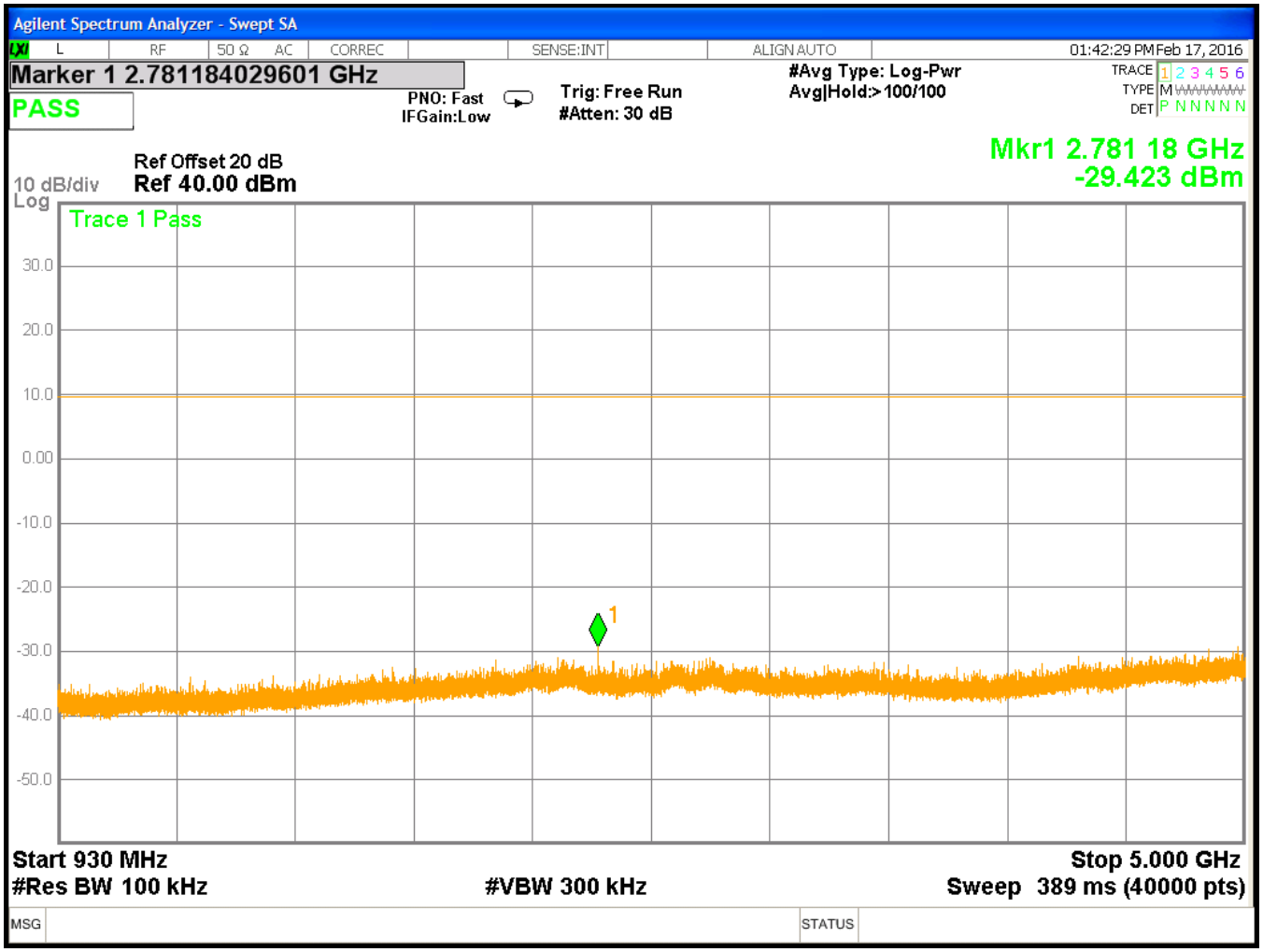

Figure 25: Conducted Spurious Emissions, High Power, High Channel 930-5000MHz

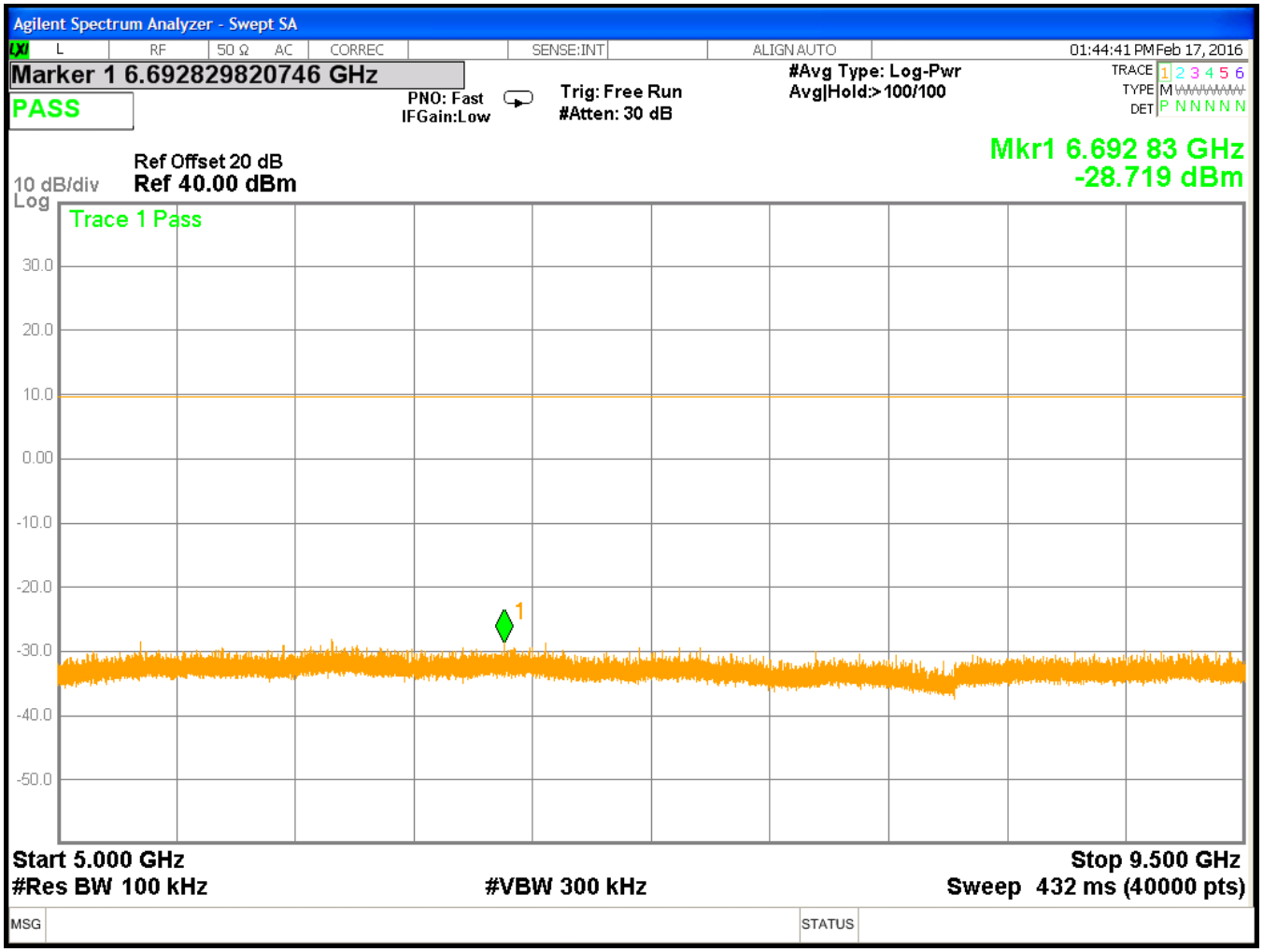

Figure 26: Conducted Spurious Emissions, High Power, High Channel 5-9.5GHz

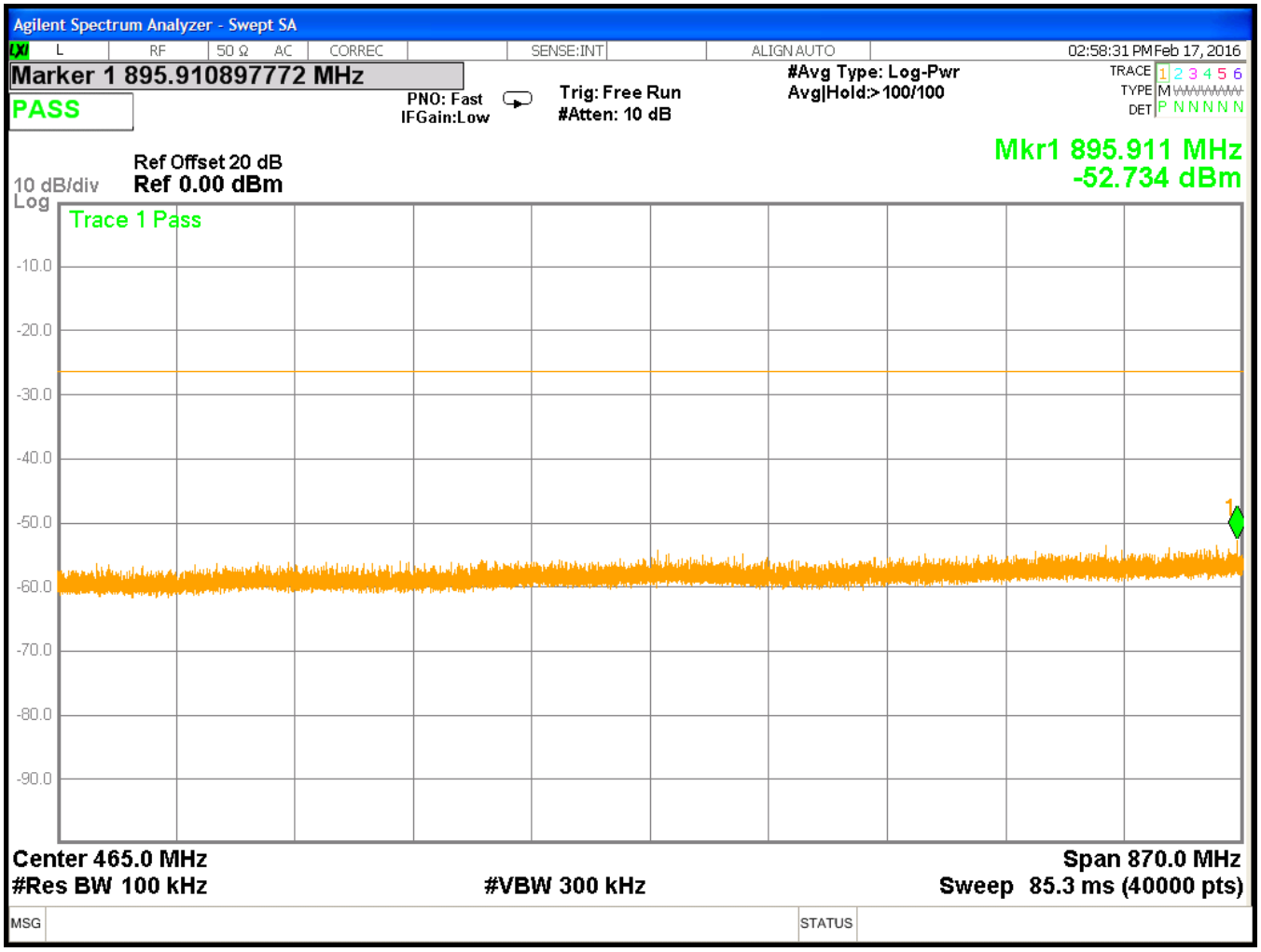

Figure 27: Conducted Spurious Emissions, Low Power, Low Channel 30 - 900MHz

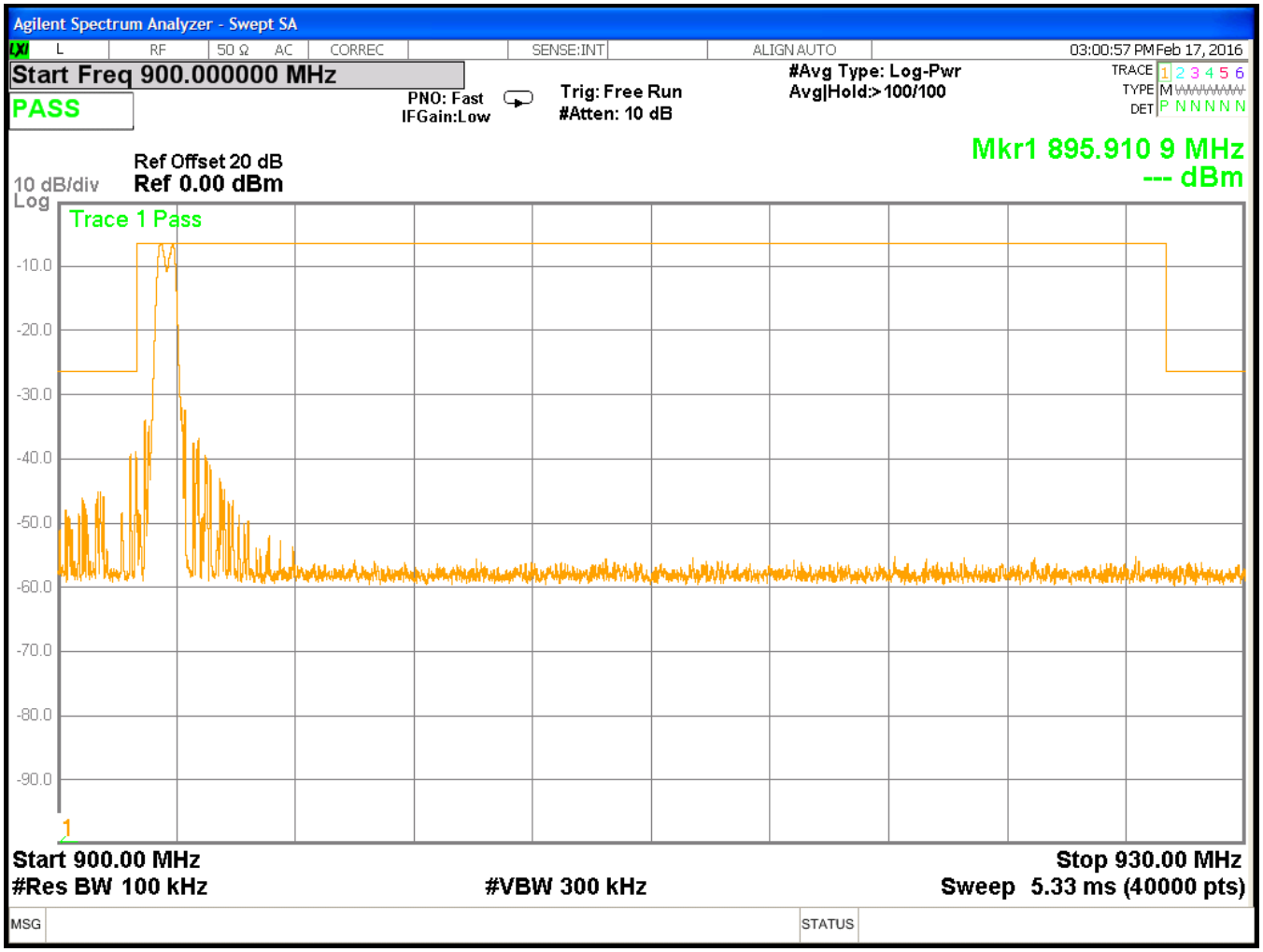

Figure 28: Conducted Spurious Emissions, Low Power, Low Channel 900 – 930MHz

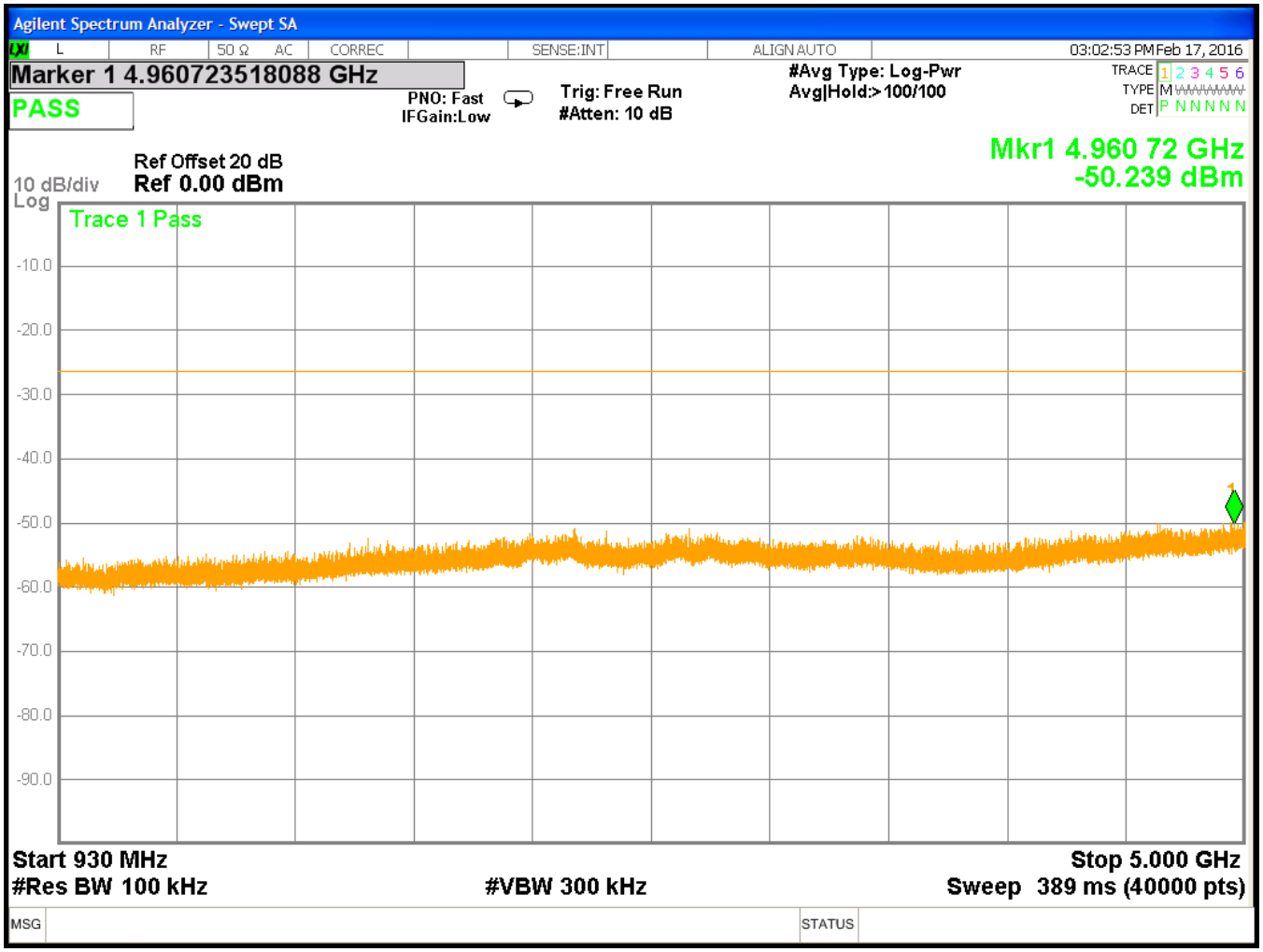

Figure 29: Conducted Spurious Emissions, Low Power, Low Channel 930-5000MHz

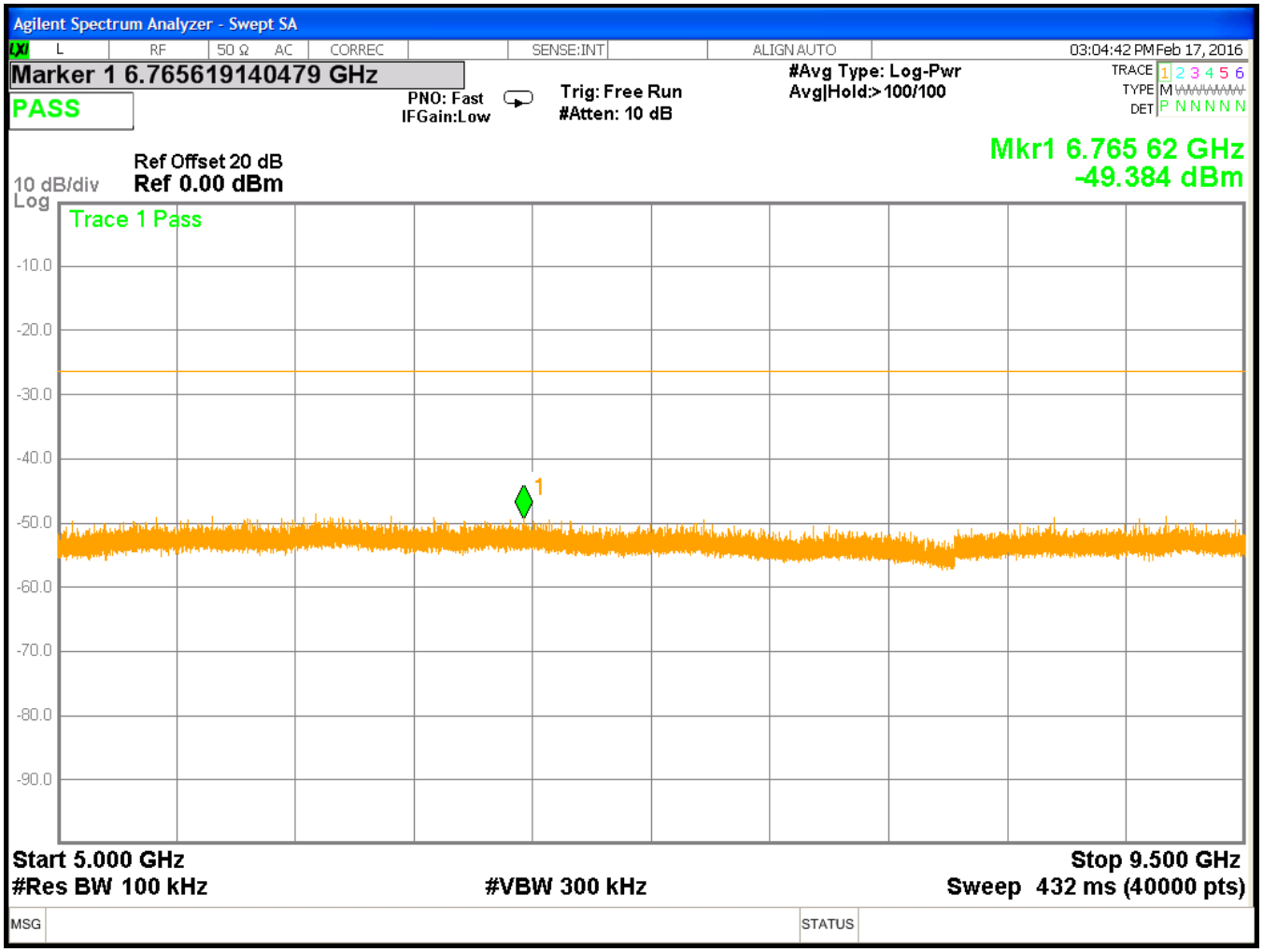

Figure 30: Conducted Spurious Emissions, Low Power, Low Channel 5-9.5GHz

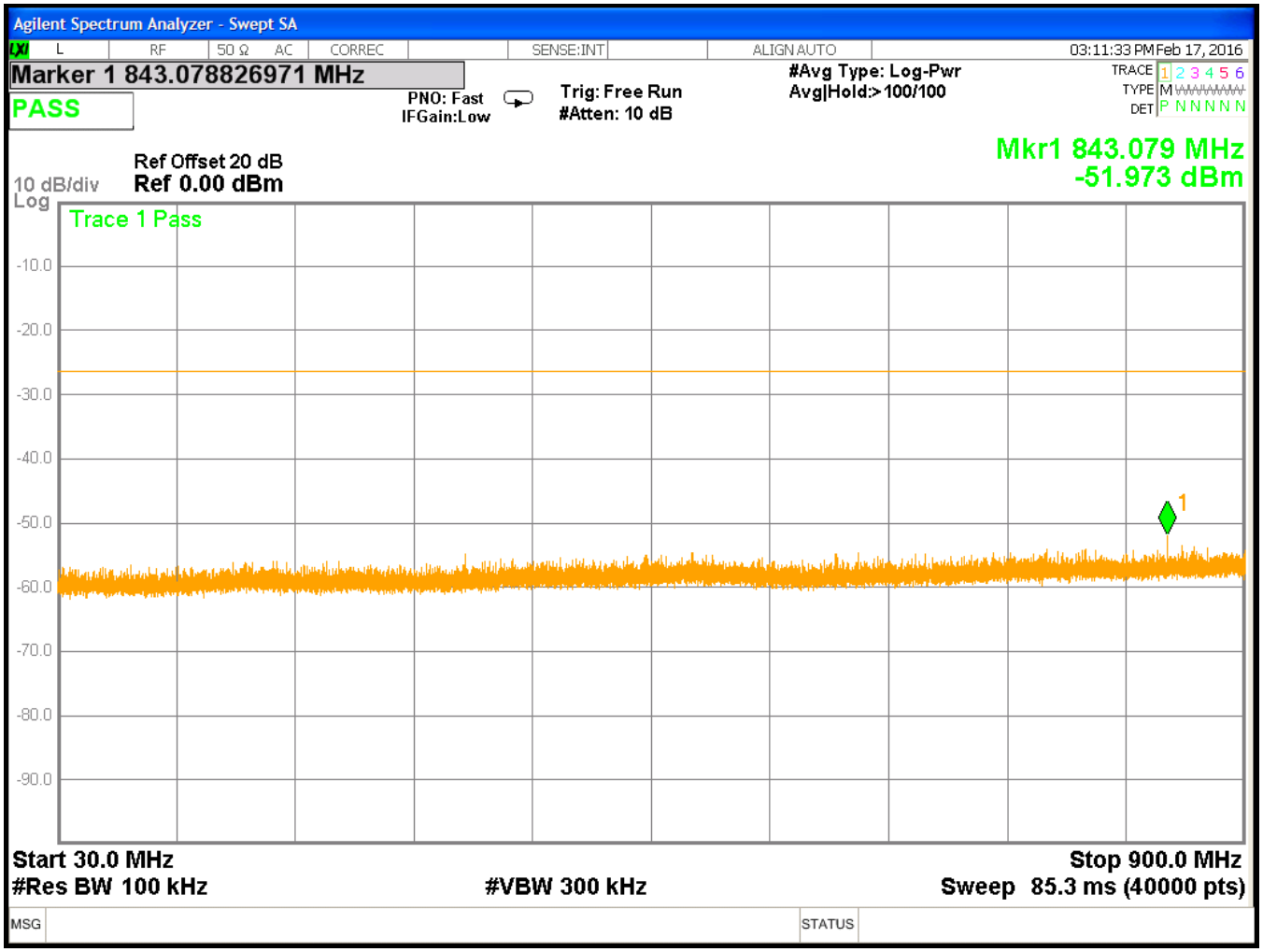

Figure 31: Conducted Spurious Emissions, Low Power, Center Channel 30 - 900MHz

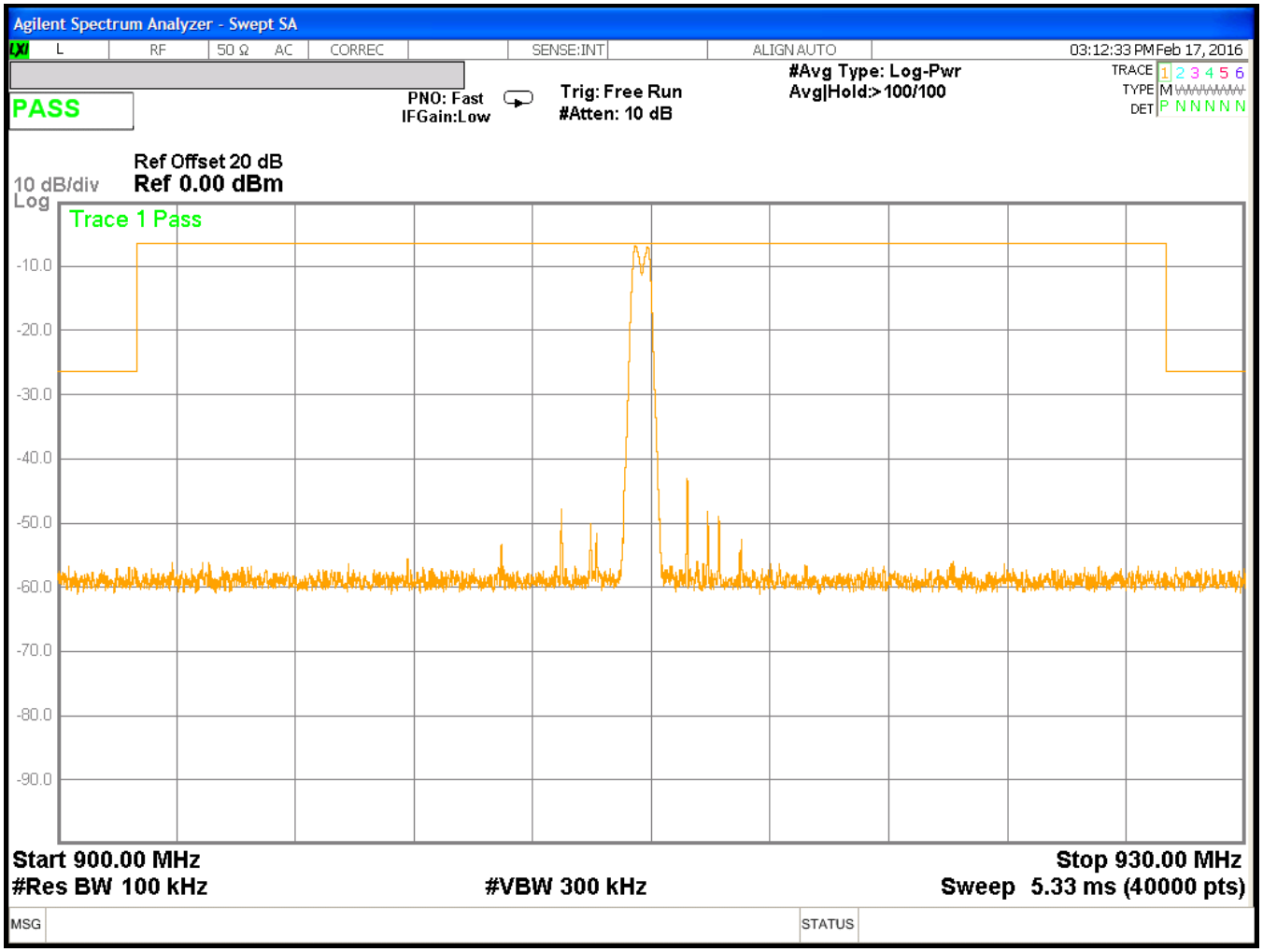

Figure 32: Conducted Spurious Emissions, Low Power, Center Channel 900 – 930MHz

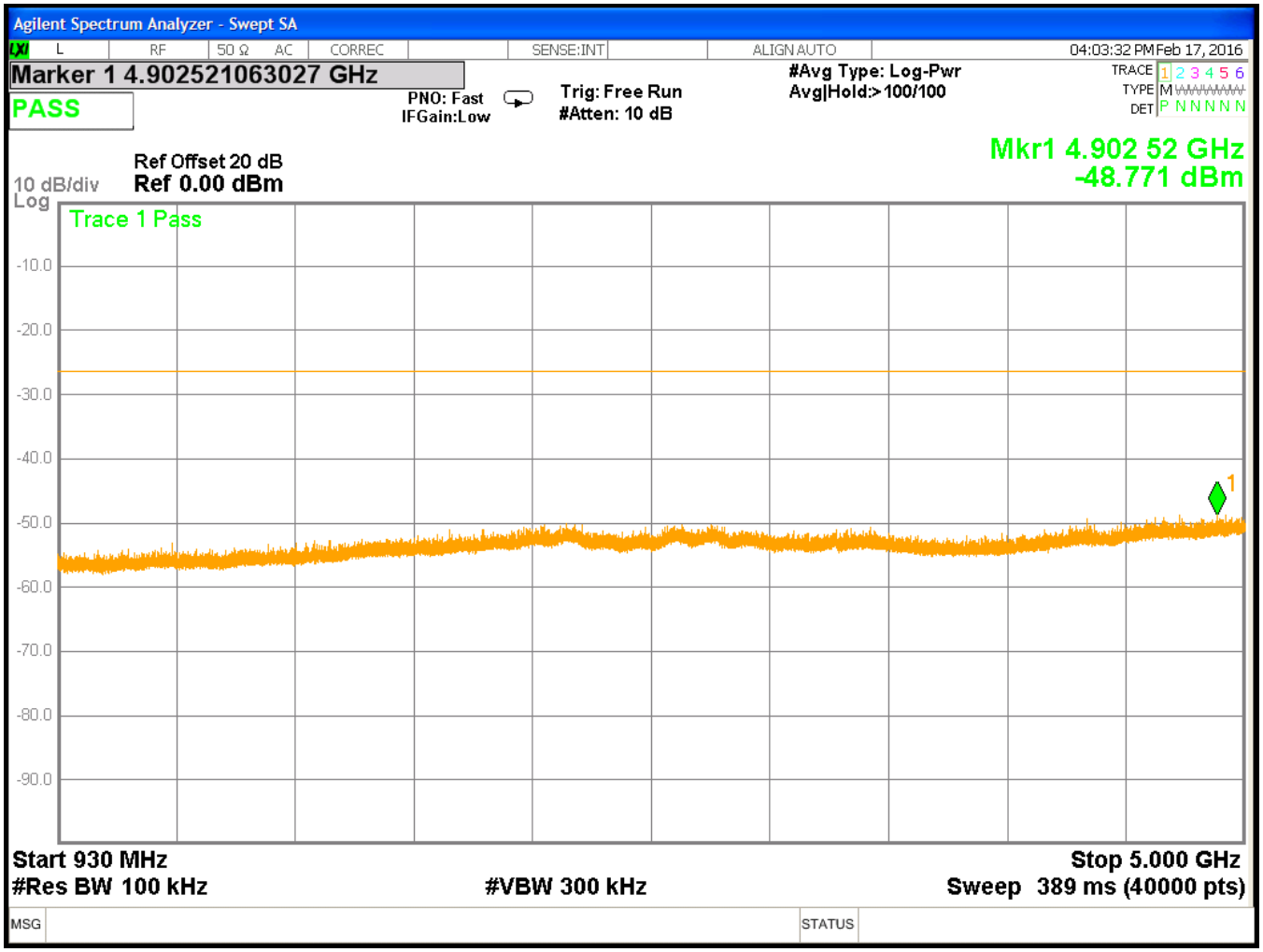

Figure 33: Conducted Spurious Emissions, Low Power, Center Channel 930-5000MHz

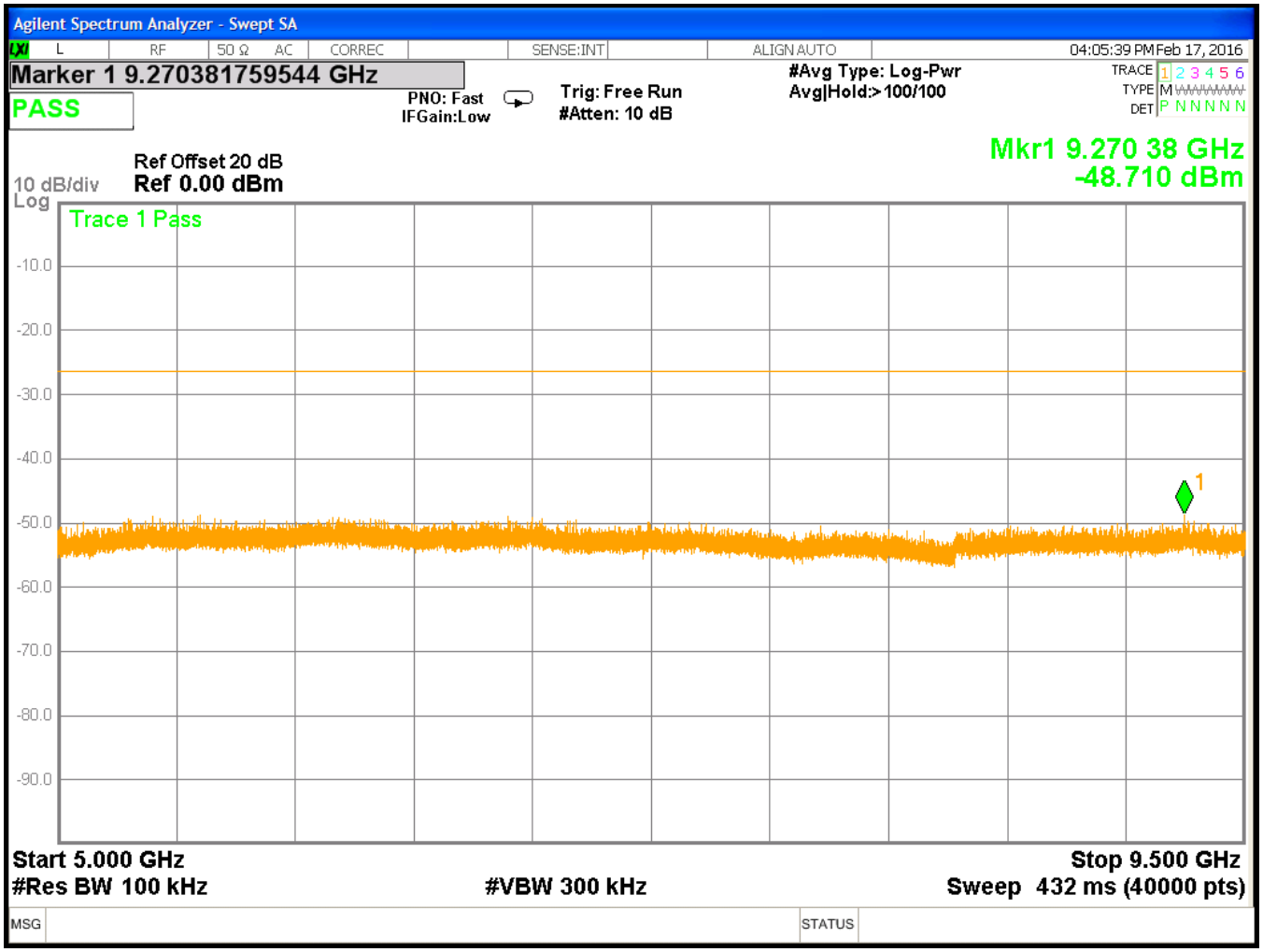

Figure 34: Conducted Spurious Emissions, Low Power, Center Channel 5-9.5GHz

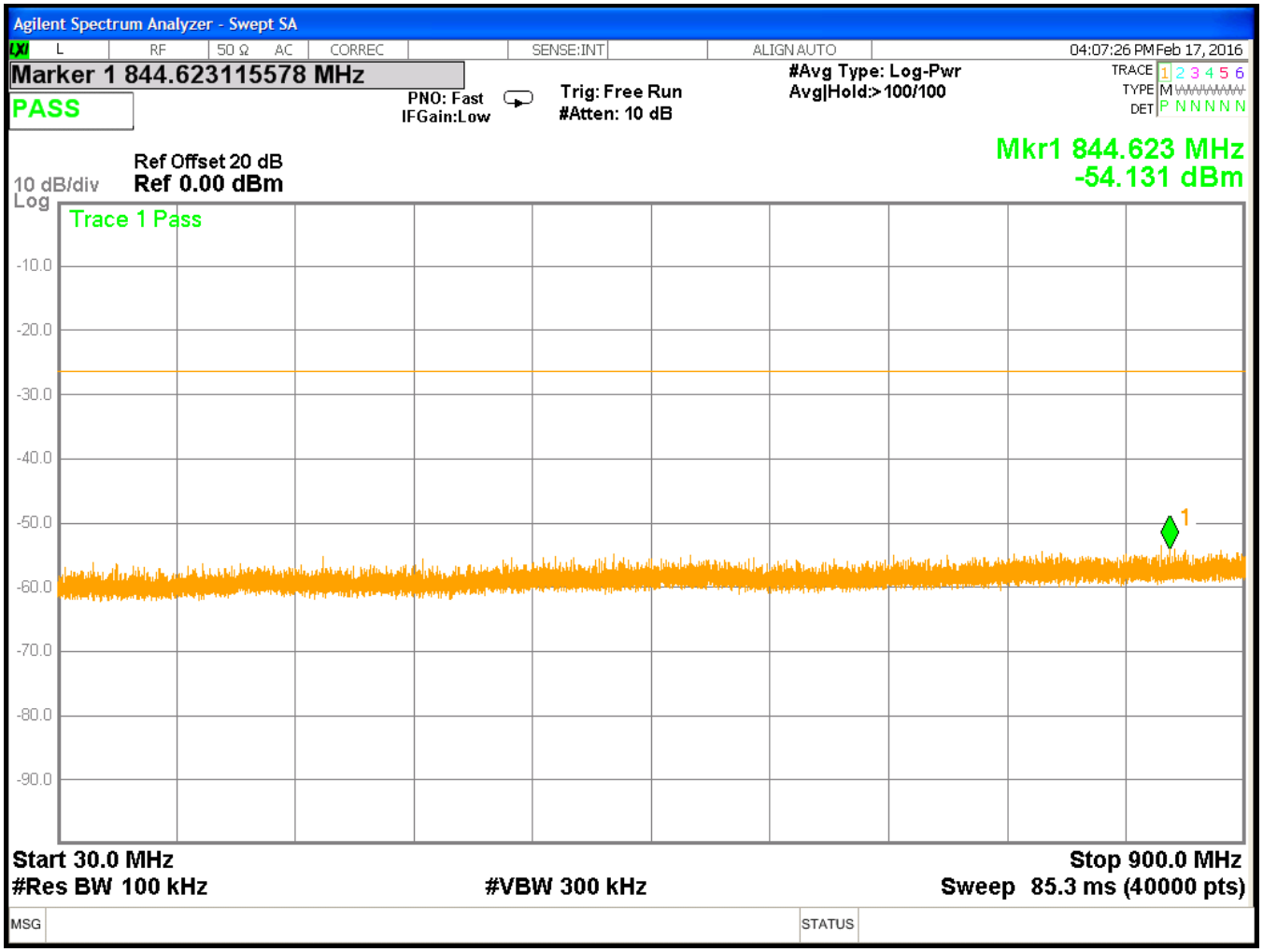

Figure 35: Conducted Spurious Emissions, Low Power, High Channel 30 - 900MHz

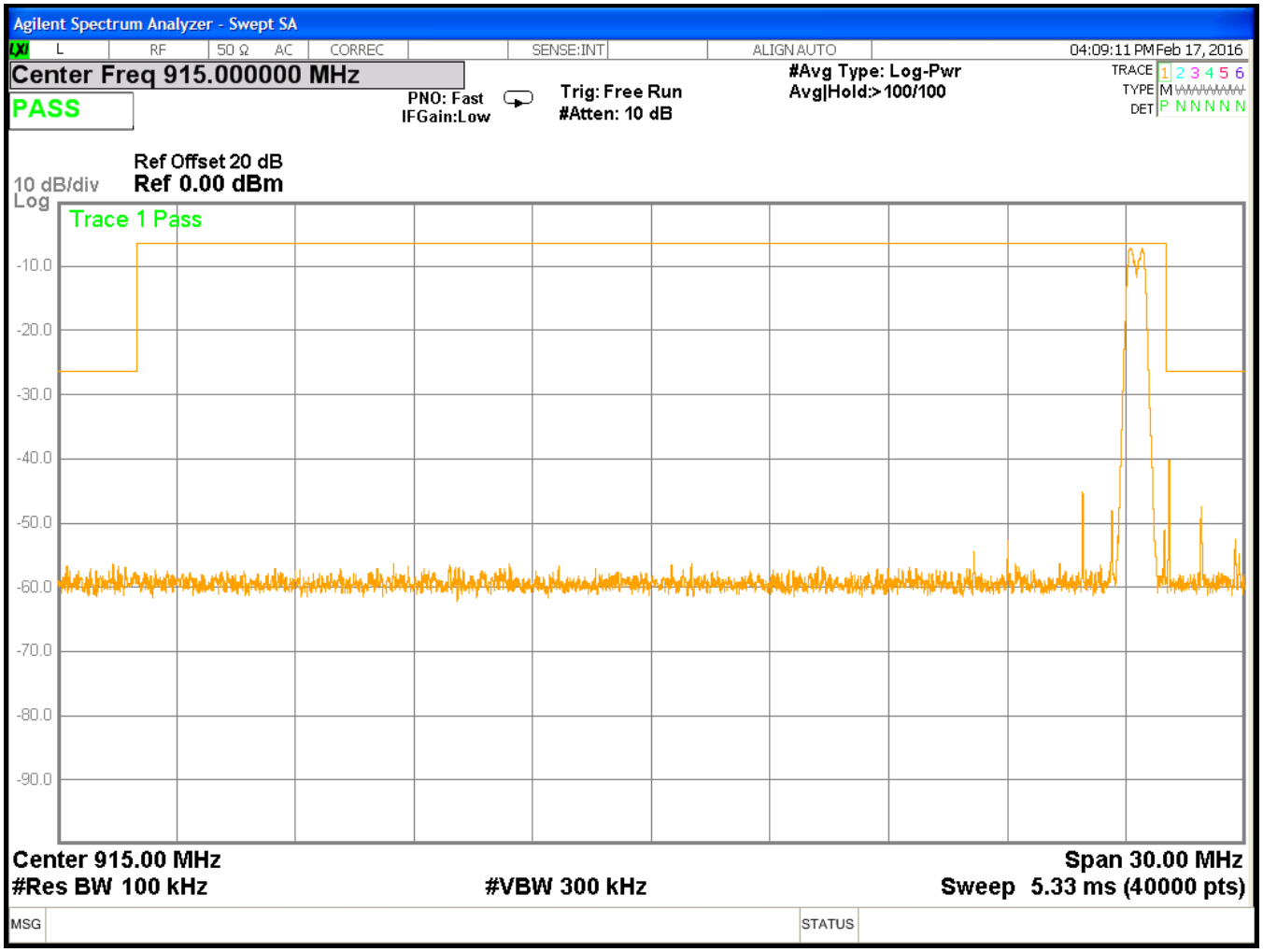

Figure 36: Conducted Spurious Emissions, Low Power, High Channel 900 – 930MHz

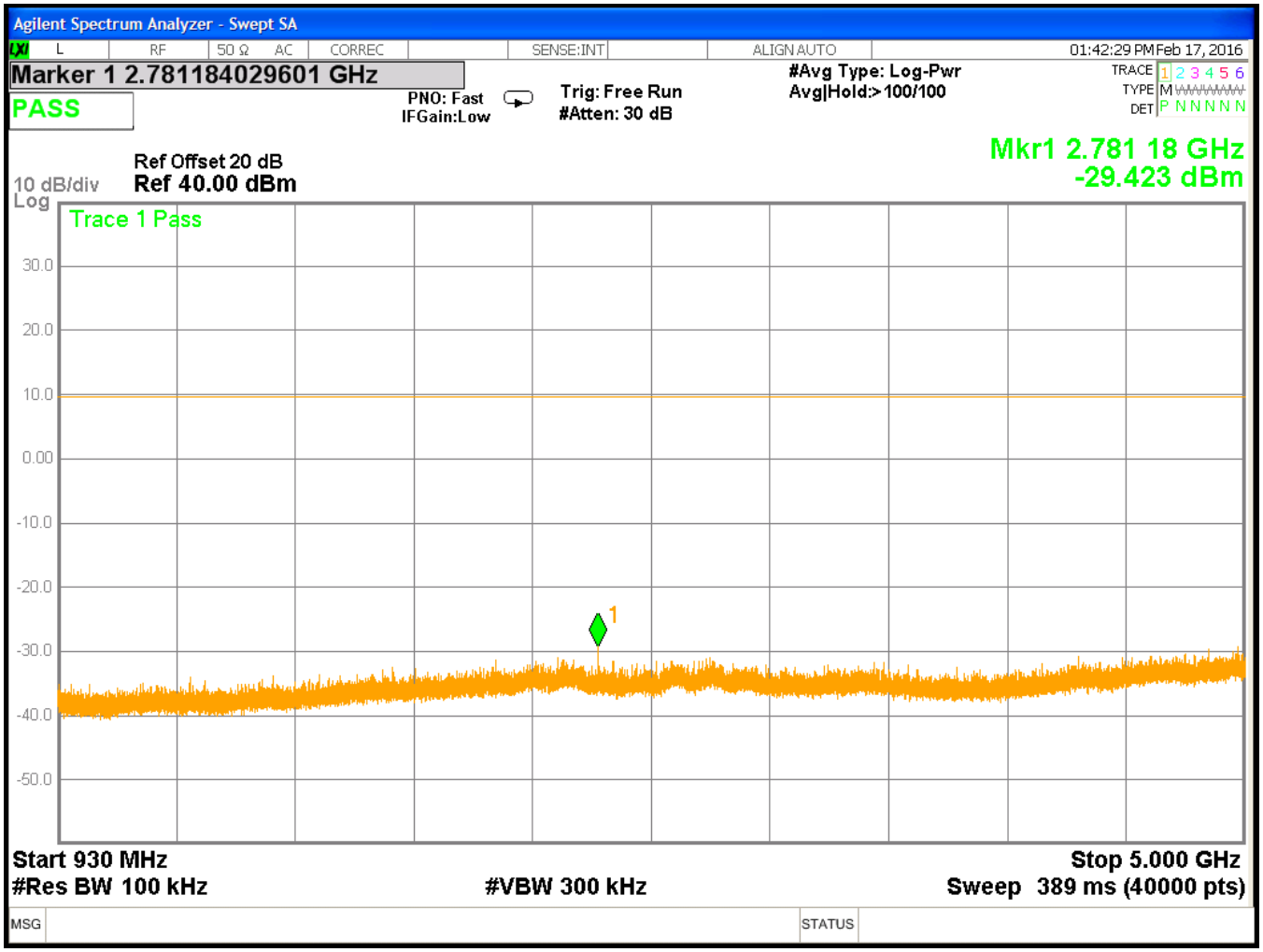

Figure 37: Conducted Spurious Emissions, Low Power, High Channel 930-5000MHz

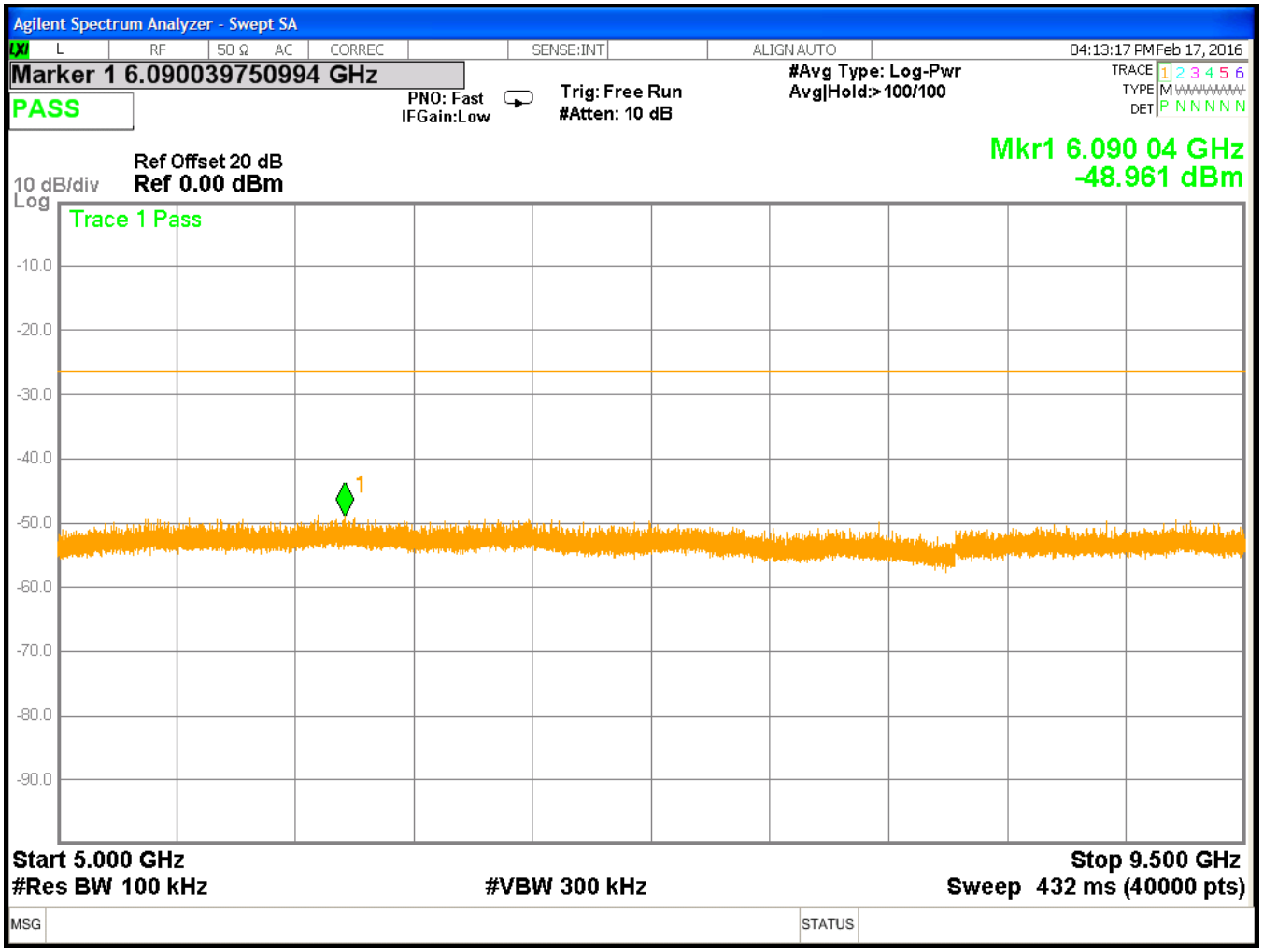

Figure 38: Conducted Spurious Emissions, Low Power, High Channel 5-9.5GHz

5.5.1 Band Edge Compliance

In accordance with FCC Public Notice DA-00-705 close-up plots of the upper and lower channels in both hopping and non-hopping modes with respect to the nearest authorized band-edges are provided below. The tests were performed in the same manner as the above conducted spurious emissions tests.

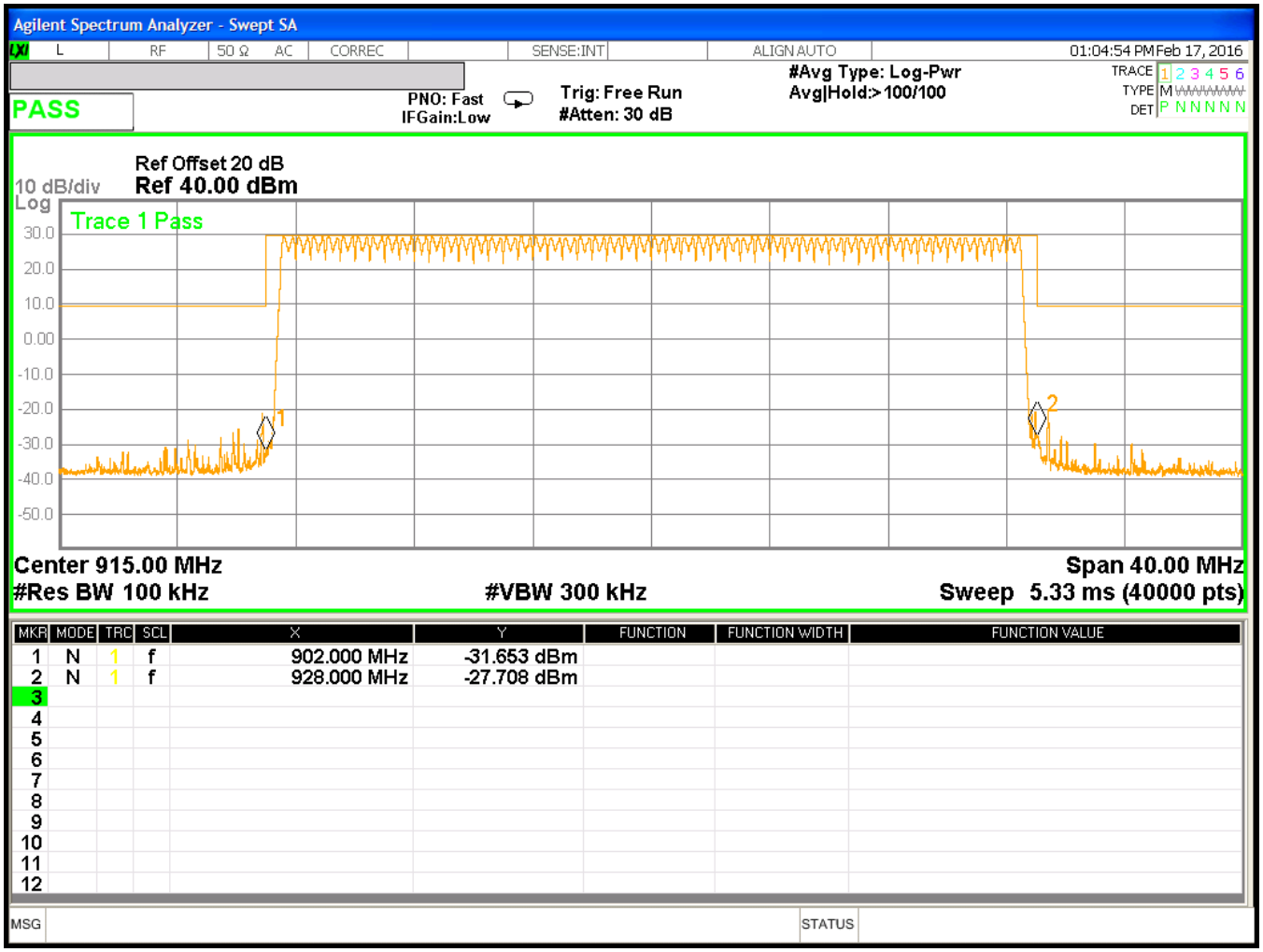

Figure 39: Band-edge, Hopping Mode, High Power Setting

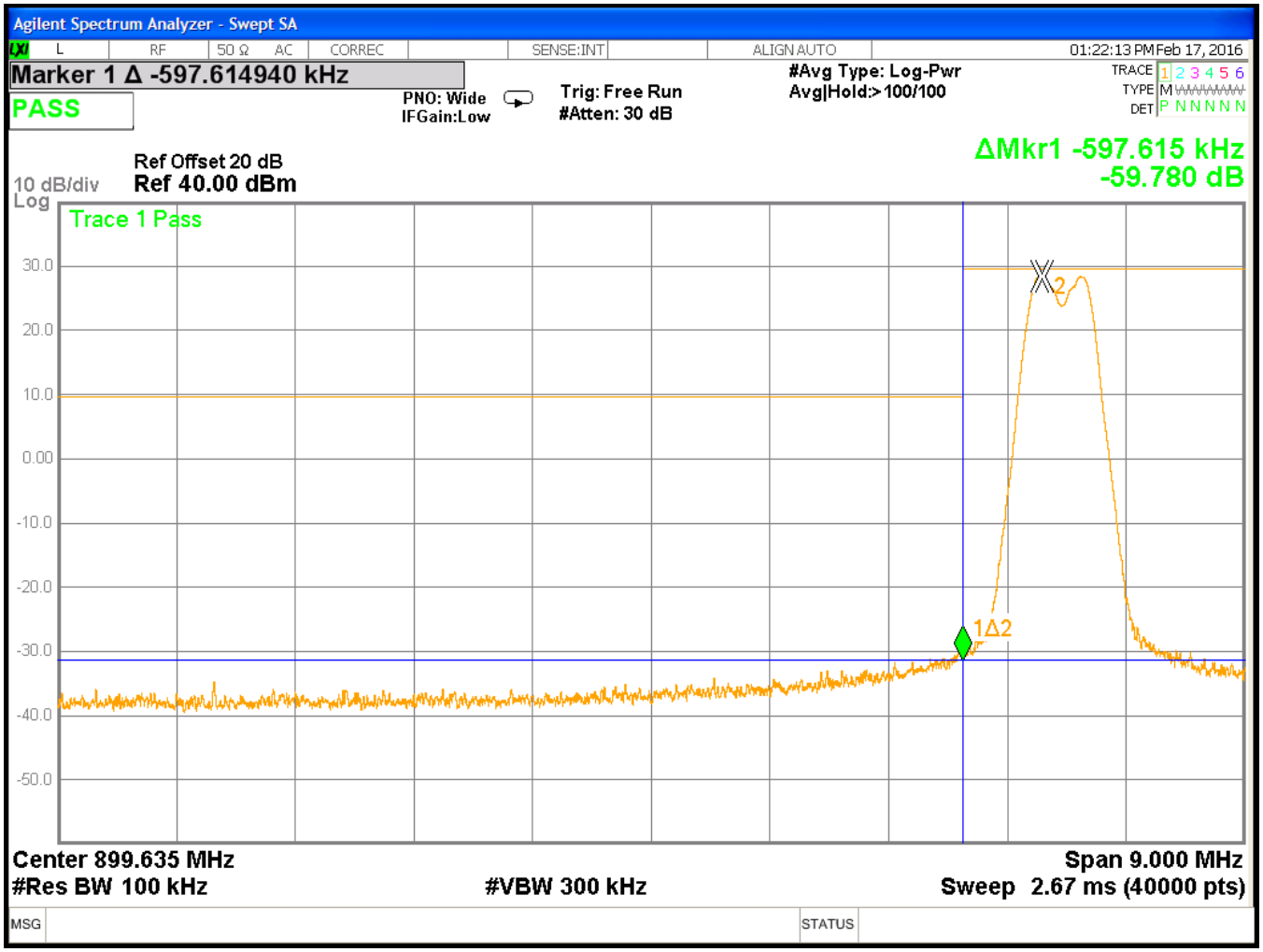

Figure 40: Low Channel, Lower Band-edge, High Power Setting

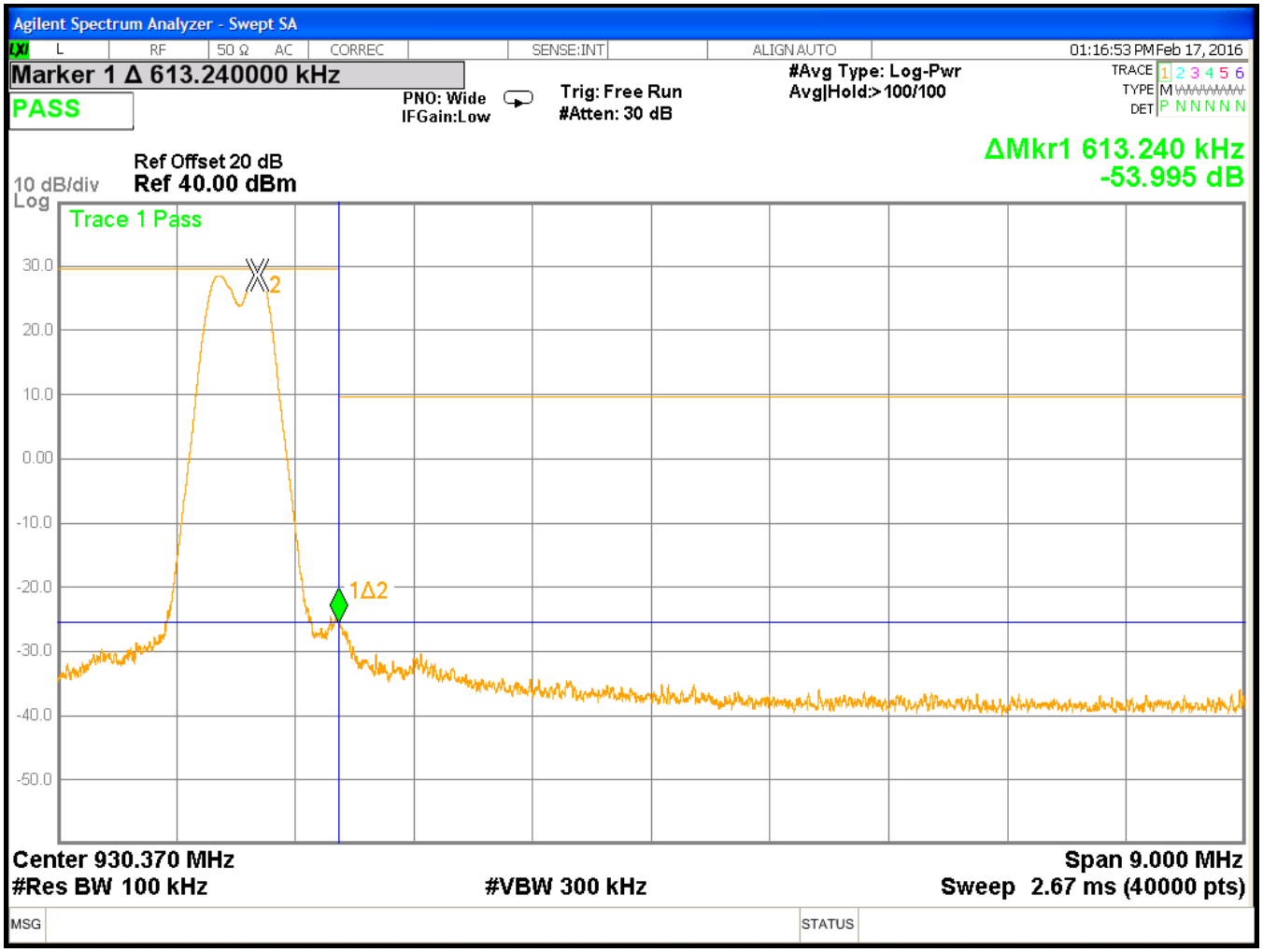

Figure 41: High Channel, Upper Band-edge, High Power Setting

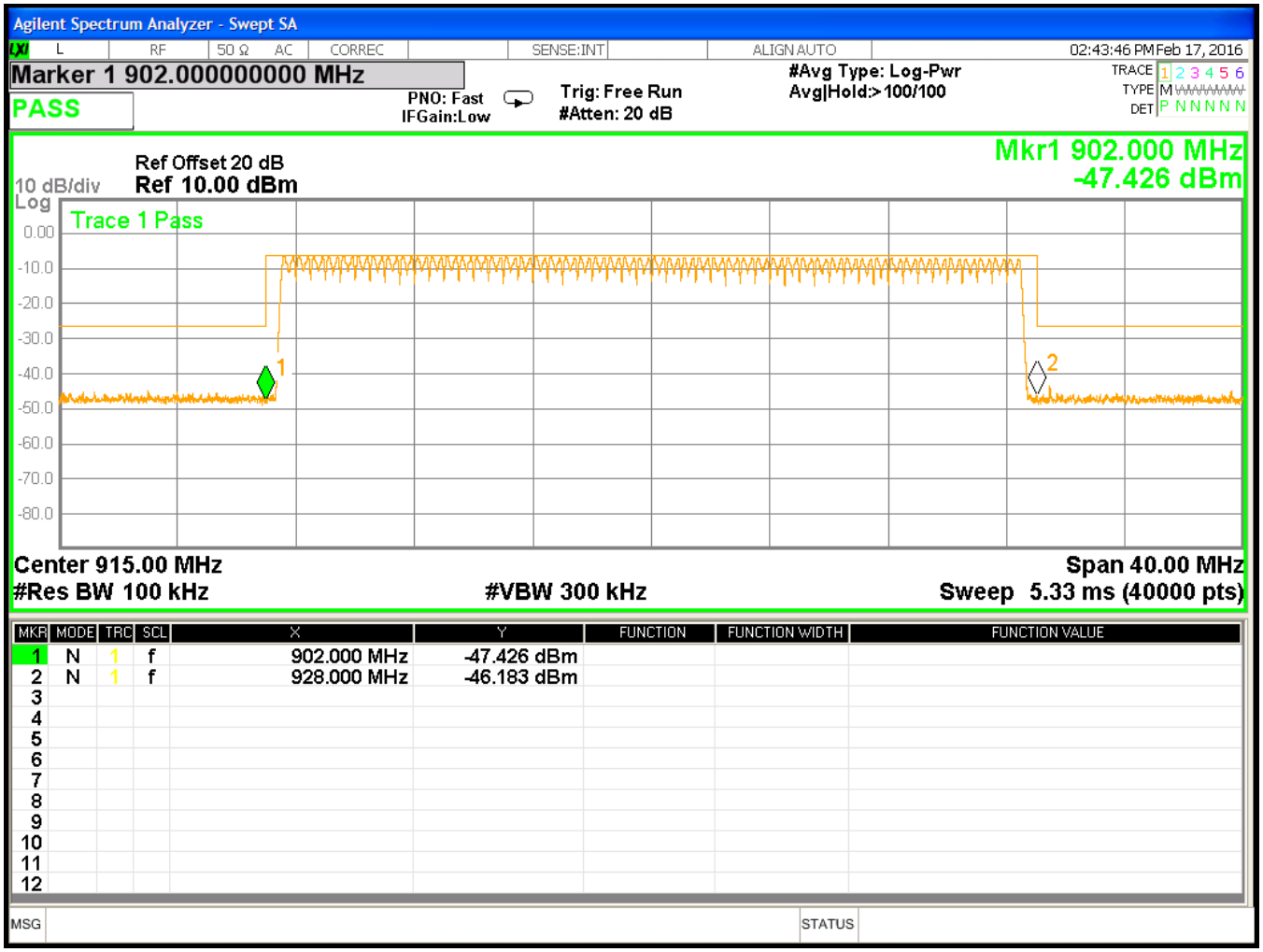

Figure 42: Band-edge, Hopping Mode, Low Power Setting

Figure 43: Low Channel, Lower Band-edge, Low Power Setting

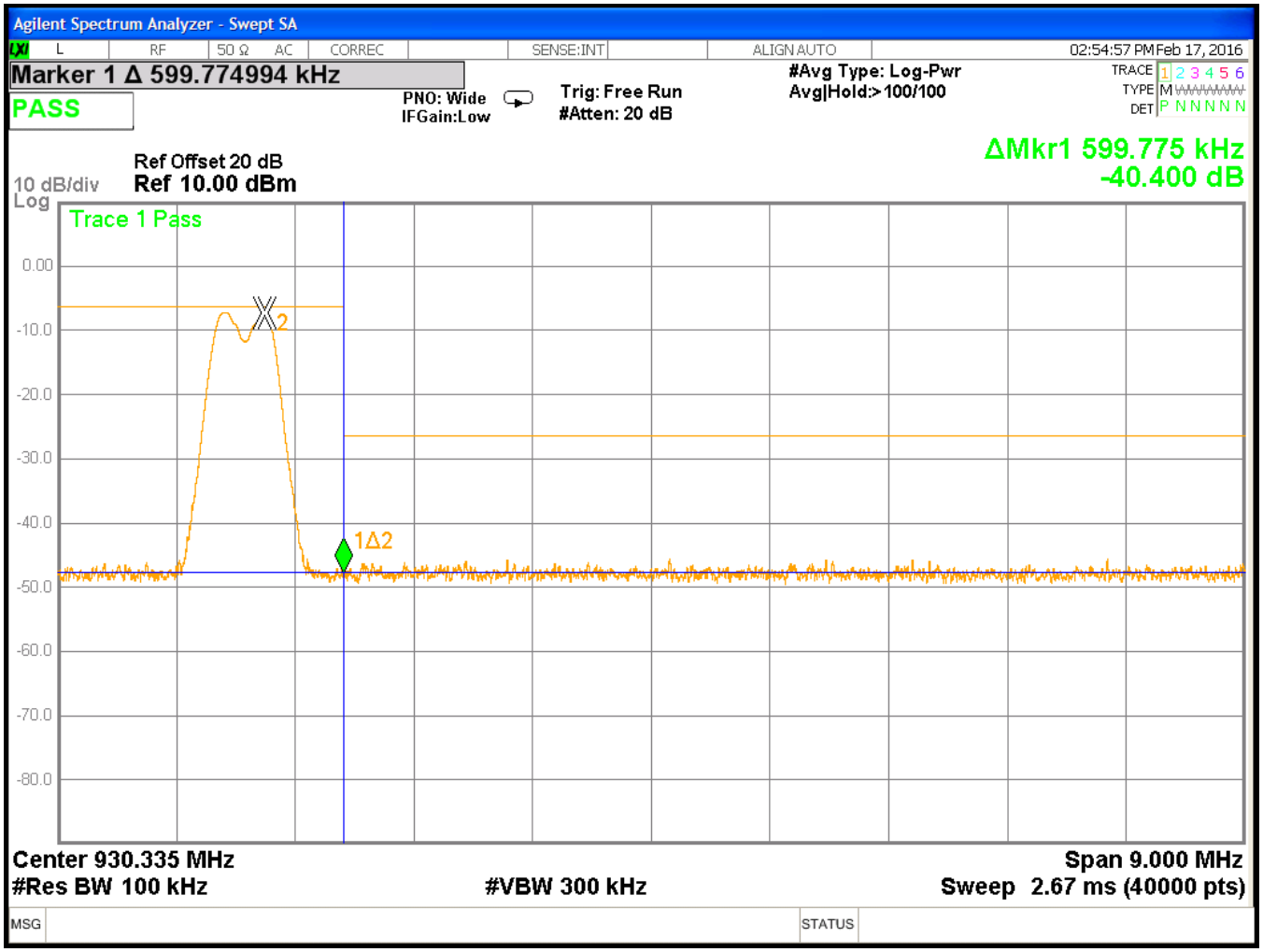

Figure 44: High Channel, Upper Band-edge, Low Power Setting

5.6 Radiated Spurious Emissions: (FCC Part §2.1053)

The EUT must comply with the requirements for radiated spurious emissions that fall within the restricted bands. These emissions must meet the limits specified in §15.209 and §15.35(b) for peak measurements.

5.6.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-2014. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The emissions were measured using the following resolution bandwidths:

Table 9: Spectrum Analyzer Settings

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	120kHz	>100 kHz
>1000 MHz	1 MHz	<10 Hz (Avg.), 1MHz (Peak)

Table 10: Radiated Emission Test Data < 1GHz
(Covers all antenna configurations)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
38.23	V	180.00	1.00	42.85	-11.3	38.0	100.0	-8.4	
42.19	V	180.00	1.00	42.07	-14.2	24.8	100.0	-12.1	
46.99	V	180.00	1.00	43.65	-17.3	20.8	100.0	-13.6	
49.94	V	180.00	1.00	43.02	-18.6	16.7	100.0	-15.5	
52.02	V	180.00	1.00	46.24	-19.1	22.9	100.0	-12.8	
61.02	V	225.00	1.00	43.93	-18.8	18.0	100.0	-14.9	
142.62	V	225.00	1.00	41.35	-12.7	27.0	150.0	-14.9	
143.22	V	225.00	1.00	39.63	-12.8	22.0	150.0	-16.7	
167.61	V	225.00	1.00	42.93	-13.5	29.8	150.0	-14.1	
177.50	V	135.00	1.00	40.50	-13.8	21.5	150.0	-16.9	
192.01	V	135.00	1.00	35.40	-13.7	12.1	150.0	-21.8	
204.40	V	135.00	1.00	42.40	-13.3	28.4	150.0	-14.4	
215.90	V	180.00	1.00	38.10	-14.3	15.5	150.0	-19.7	
240.41	V	180.00	1.30	39.90	-13.1	21.8	200.0	-19.3	
448.20	V	180.00	1.80	38.60	-6.5	40.5	200.0	-13.9	
38.23	H	180.00	4.00	36.73	-11.3	18.8	100.0	-14.5	
42.19	H	180.00	4.00	39.84	-14.2	19.2	100.0	-14.3	
46.99	H	180.00	4.00	47.40	-17.3	32.0	100.0	-9.9	
49.94	H	180.00	4.00	41.99	-18.6	14.9	100.0	-16.6	
52.02	H	180.00	4.00	41.37	-19.1	13.1	100.0	-17.7	
61.02	H	225.00	4.00	35.03	-18.8	6.4	100.0	-23.8	
142.62	H	135.00	4.00	39.26	-12.7	21.2	150.0	-17.0	
143.22	H	135.00	4.00	38.77	-12.8	19.9	150.0	-17.5	
167.61	H	135.00	4.00	49.18	-13.5	61.1	150.0	-7.8	
177.50	H	180.00	4.00	37.90	-13.8	16.0	150.0	-19.5	
192.01	H	180.00	4.00	40.50	-13.7	21.8	150.0	-16.7	
204.40	H	180.00	3.80	41.20	-13.3	24.8	150.0	-15.6	
215.90	H	180.00	3.80	39.50	-14.3	18.3	150.0	-18.3	
240.41	H	180.00	3.80	36.10	-13.1	14.1	200.0	-23.1	
448.20	H	180.00	3.20	37.30	-6.5	34.9	200.0	-15.2	

Same for all channels

Table 11: Radiated Emission Test Data >1GHz, Low Channel

(Linx ¼ Wave Helical)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2708.25	V	0.00	1.00	54.12	-12.1	126.0	5000.0	-32.0	
3611.00	V	190.00	1.00	49.47	-9.2	103.5	5000.0	-33.7	
4513.75	V	290.00	1.00	48.61	-6.3	130.7	5000.0	-31.7	
5416.50	V	90.00	1.00	49.51	-2.8	217.1	5000.0	-27.2	
8124.80	V	190.00	1.00	46.29	6.9	455.2	5000.0	-20.8	
2708.25	V	0.00	1.00	45.01	-12.1	44.1	500.0	-21.1	
3611.00	V	190.00	1.00	37.40	-9.2	25.8	500.0	-25.8	
4513.75	V	290.00	1.00	36.44	-6.3	32.2	500.0	-23.8	
5416.50	V	90.00	1.00	34.79	-2.8	39.9	500.0	-22.0	
8124.80	V	190.00	1.00	33.47	6.9	104.1	500.0	-13.6	
2708.25	H	90.00	2.20	54.05	-12.1	125.0	5000.0	-32.0	
3611.00	H	180.00	2.20	48.14	-9.2	88.8	5000.0	-35.0	
4513.75	H	270.00	2.20	46.03	-6.3	97.1	5000.0	-34.2	
5416.50	H	180.00	2.20	47.65	-2.8	175.2	5000.0	-29.1	
8124.80	H	190.00	2.20	46.35	6.9	458.4	5000.0	-20.8	
2708.25	H	90.00	2.20	43.74	-12.1	38.1	500.0	-22.4	
3611.00	H	180.00	2.20	38.10	-9.2	28.0	500.0	-25.1	
4513.75	H	270.00	2.20	35.40	-6.3	28.6	500.0	-24.9	
5416.50	H	180.00	2.20	35.69	-2.8	44.2	500.0	-21.1	
8124.80	H	190.00	2.20	35.40	6.9	129.9	500.0	-11.7	

Table 12: Radiated Emission Test Data >1GHz, Low Channel

(Laird OD9-5 900MHz Omnidirectional Antenna, 5dBi Gain)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2708.25	V	180.00	1.00	49.41	-12.1	73.2	5000.0	-36.7	
3611.00	V	180.00	1.00	48.17	-9.2	89.1	5000.0	-35.0	
4513.75	V	290.00	1.00	46.57	-6.3	103.4	5000.0	-33.7	
5416.50	V	180.00	1.00	47.38	-2.8	169.9	5000.0	-29.4	
8124.75	V	190.00	1.00	43.35	6.9	324.5	5000.0	-23.8	
9027.50	V	180.00	1.00	44.65	9.9	536.7	5000.0	-19.4	
2708.25	V	180.00	1.00	38.89	-12.1	21.8	500.0	-27.2	
3611.00	V	180.00	1.00	36.62	-9.2	23.6	500.0	-26.5	
4513.75	V	290.00	1.00	32.52	-6.3	20.5	500.0	-27.7	
5416.50	V	180.00	1.00	33.32	-2.8	33.7	500.0	-23.4	
8124.75	V	190.00	1.00	32.24	6.9	90.3	500.0	-14.9	
9027.50	V	180.00	1.00	32.64	9.9	134.7	500.0	-11.4	
2708.25	H	120.00	2.20	52.14	-12.1	100.3	5000.0	-34.0	
3611.00	H	180.00	2.20	47.58	-9.2	83.3	5000.0	-35.6	
4513.75	H	180.00	2.20	45.59	-6.3	92.3	5000.0	-34.7	
5416.50	H	90.00	2.20	43.95	-2.8	114.5	5000.0	-32.8	
8124.75	H	180.00	2.20	43.45	6.9	328.3	5000.0	-23.7	
9027.50	H	150.00	2.20	45.28	9.9	577.1	5000.0	-18.8	
2708.25	H	120.00	2.20	42.61	-12.1	33.5	500.0	-23.5	
3611.00	H	180.00	2.20	34.62	-9.2	18.7	500.0	-28.5	
4513.75	H	180.00	2.20	33.38	-6.3	22.6	500.0	-26.9	
5416.50	H	90.00	2.20	33.66	-2.8	35.0	500.0	-23.1	
8124.75	H	180.00	2.20	32.22	6.9	90.1	500.0	-14.9	
9027.50	H	150.00	2.20	32.62	9.9	134.4	500.0	-11.4	

Table 13: Radiated Emission Test Data >1GHz, Low Channel

(Laird B (B)8965CN 5/8 Wave Loaded Coil)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2708.25	V	200.00	1.00	49.61	-12.1	74.9	5000.0	-36.5	
3611.00	V	180.00	1.00	44.81	-9.2	60.5	5000.0	-38.3	
4513.75	V	270.00	1.00	45.61	-6.3	92.6	5000.0	-34.7	
5416.50	V	180.00	1.00	44.71	-2.8	124.9	5000.0	-32.0	
8124.75	V	180.00	1.00	42.41	6.9	291.2	5000.0	-24.7	
9027.50	V	190.00	1.00	42.51	9.9	419.5	5000.0	-21.5	
2708.25	V	200.00	1.00	39.01	-12.1	22.1	500.0	-27.1	
3611.00	V	180.00	1.00	34.49	-9.2	18.4	500.0	-28.7	
4513.75	V	270.00	1.00	32.03	-6.3	19.4	500.0	-28.2	
5416.50	V	180.00	1.00	32.41	-2.8	30.3	500.0	-24.3	
8124.75	V	180.00	1.00	33.11	6.9	99.8	500.0	-14.0	
9027.50	V	190.00	1.00	32.35	9.9	130.2	500.0	-11.7	
2708.25	H	180.00	2.20	48.71	-12.1	67.6	5000.0	-37.4	
3611.00	H	190.00	2.20	46.51	-9.2	73.6	5000.0	-36.6	
4513.75	H	180.00	2.20	43.61	-6.3	73.5	5000.0	-36.7	
5416.50	H	180.00	2.20	44.41	-2.8	120.7	5000.0	-32.3	
8124.75	H	180.00	2.20	44.01	6.9	350.1	5000.0	-23.1	
9027.50	H	170.00	2.20	43.51	9.9	470.7	5000.0	-20.5	
2708.25	H	180.00	2.20	37.61	-12.1	18.8	500.0	-28.5	
3611.00	H	190.00	2.20	35.71	-9.2	21.2	500.0	-27.4	
4513.75	H	180.00	2.20	32.61	-6.3	20.7	500.0	-27.7	
5416.50	H	180.00	2.20	32.61	-2.8	31.0	500.0	-24.1	
8124.75	H	180.00	2.20	32.41	6.9	92.1	500.0	-14.7	
9027.50	H	170.00	2.20	31.71	9.9	121.0	500.0	-12.3	

Table 14: Radiated Emission Test Data >1GHz, Low Channel

(Molex P-N 1052620003, Omnidirectional , 1.2dB Gain)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2708.25	V	190.00	2.60	52.38	-3.0	293.6	5000.0	-24.6	peak
3611.00	V	180.00	2.50	49.10	-0.4	271.0	5000.0	-25.3	peak
4513.75	V	90.00	2.50	46.51	1.6	253.4	5000.0	-25.9	peak
5416.50	V	190.00	3.00	46.88	5.0	392.2	5000.0	-22.1	peak
8124.75	V	270.00	2.80	41.73	9.7	370.8	5000.0	-22.6	peak
9027.50	V	0.00	3.20	40.44	10.7	359.5	5000.0	-22.9	peak
2708.25	V	190.00	2.60	41.88	-3.0	87.7	500.0	-15.1	Average
3611.00	V	180.00	2.50	39.14	-0.4	86.1	500.0	-15.3	Average
4513.75	V	90.00	2.50	35.25	1.6	69.4	500.0	-17.2	Average
5416.50	V	190.00	3.00	36.56	5.0	119.6	500.0	-12.4	Average
8124.75	V	270.00	2.80	31.40	9.7	112.9	500.0	-12.9	Average
9027.50	V	0.00	3.20	31.16	10.7	123.5	500.0	-12.1	Average
2708.25	H	160.00	2.40	51.01	-3.0	250.9	5000.0	-26.0	peak
3611.00	H	45.00	2.70	47.57	-0.4	227.3	5000.0	-26.8	peak
4513.75	H	90.00	2.80	44.45	1.6	199.9	5000.0	-28.0	peak
5416.50	H	300.00	2.60	46.13	5.0	359.9	5000.0	-22.9	peak
8124.75	H	10.00	3.00	42.13	9.7	388.3	5000.0	-22.2	peak
9027.50	H	190.00	2.80	40.86	10.7	377.3	5000.0	-22.4	peak
2708.25	H	160.00	2.40	45.11	-3.0	127.2	500.0	-11.9	Average
3611.00	H	45.00	2.70	38.32	-0.4	78.4	500.0	-16.1	Average
4513.75	H	90.00	2.80	33.74	1.6	58.3	500.0	-18.7	Average
5416.50	H	300.00	2.60	36.55	5.0	119.5	500.0	-12.4	Average
8124.75	H	10.00	3.00	31.55	9.7	114.9	500.0	-12.8	Average
9027.50	H	190.00	2.80	31.16	10.7	123.5	500.0	-12.1	Average

Table 15: Radiated Emission Test Data >1GHz, Center Channel

(Linx ¼ Wave Helical)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2744.25	V	180.00	1.00	56.98	-12.1	175.3	5000.0	-29.1	
3659.00	V	190.00	1.00	56.15	-9.1	224.7	5000.0	-26.9	
4573.75	V	180.00	1.00	51.91	-6.0	198.3	5000.0	-28.0	
7318.00	V	0.00	1.00	48.91	5.4	516.8	5000.0	-19.7	
8232.75	V	180.00	1.00	49.25	7.2	664.4	5000.0	-17.5	
2744.25	V	180.00	1.00	48.98	-12.1	69.8	500.0	-17.1	
3659.00	V	190.00	1.00	45.93	-9.1	69.3	500.0	-17.2	
4573.75	V	180.00	1.00	40.00	-6.0	50.3	500.0	-19.9	
7318.00	V	0.00	1.00	39.30	5.4	170.9	500.0	-9.3	
8232.75	V	180.00	1.00	36.80	7.2	158.5	500.0	-10.0	
2744.25	H	270.00	2.20	56.95	-12.1	174.7	5000.0	-29.1	
3659.00	H	165.00	2.20	55.11	-9.1	199.4	5000.0	-28.0	
4573.75	H	270.00	2.20	50.54	-6.0	169.4	5000.0	-29.4	
7318.00	H	90.00	2.20	49.08	5.4	527.0	5000.0	-19.5	
8232.75	H	170.00	2.20	48.99	7.2	644.8	5000.0	-17.8	
2744.25	H	270.00	2.20	47.83	-12.1	61.1	500.0	-18.3	
3659.00	H	165.00	2.20	43.71	-9.1	53.7	500.0	-19.4	
4573.75	H	270.00	2.20	38.07	-6.0	40.3	500.0	-21.9	
7318.00	H	90.00	2.20	36.46	5.4	123.3	500.0	-12.2	
8232.75	H	170.00	2.20	36.88	7.2	159.9	500.0	-9.9	

Table 16: Radiated Emission Test Data >1GHz, Center Channel

(Laird OD9-5 900MHz Omnidirectional Antenna, 5dBi Gain)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2744.25	V	290.00	1.00	49.06	-12.1	70.4	5000.0	-37.0	
3659.00	V	190.00	1.00	46.62	-9.1	75.0	5000.0	-36.5	
4573.75	V	180.00	1.00	47.06	-6.0	113.4	5000.0	-32.9	
7318.00	V	180.00	1.00	45.23	5.4	338.3	5000.0	-23.4	
8232.75	V	180.00	1.00	44.06	7.2	365.5	5000.0	-22.7	
9147.50	V	190.00	1.00	44.81	10.9	611.5	5000.0	-18.3	
2744.25	V	290.00	1.00	36.00	-12.1	15.7	500.0	-30.1	
3659.00	V	190.00	1.00	36.23	-9.1	22.7	500.0	-26.9	
4573.75	V	180.00	1.00	33.43	-6.0	23.6	500.0	-26.5	
7318.00	V	180.00	1.00	32.22	5.4	75.7	500.0	-16.4	
8232.75	V	180.00	1.00	32.75	7.2	99.4	500.0	-14.0	
9147.50	V	190.00	1.00	32.60	10.9	149.9	500.0	-10.5	
2744.25	H	190.00	2.20	50.18	-12.1	80.1	5000.0	-35.9	
3659.00	H	90.00	2.20	48.22	-9.1	90.2	5000.0	-34.9	
4573.75	H	190.00	2.20	44.51	-6.0	84.6	5000.0	-35.4	
7318.00	H	180.00	2.20	41.58	5.4	222.2	5000.0	-27.0	
8232.75	H	180.00	2.20	43.75	7.2	352.7	5000.0	-23.0	
9147.50	H	190.00	2.20	43.08	10.9	501.1	5000.0	-20.0	
2744.25	H	190.00	2.20	37.32	-12.1	18.2	500.0	-28.8	
3659.00	H	90.00	2.20	37.26	-9.1	25.5	500.0	-25.8	
4573.75	H	190.00	2.20	33.33	-6.0	23.3	500.0	-26.6	
7318.00	H	180.00	2.20	35.12	5.4	105.6	500.0	-13.5	
8232.75	H	180.00	2.20	32.75	7.2	99.4	500.0	-14.0	
9147.50	H	190.00	2.20	32.55	10.9	149.1	500.0	-10.5	

Table 17: Radiated Emission Test Data >1GHz, Center Channel

(Laird B (B)8965CN 5/8 Wave Loaded Coil)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2744.25	V	190.00	1.00	50.31	-12.1	81.3	5000.0	-35.8	Peak
3659.00	V	180.00	1.00	46.11	-9.1	70.7	5000.0	-37.0	Peak
4573.75	V	290.00	1.00	45.31	-6.0	92.7	5000.0	-34.6	Peak
7318.00	V	160.00	1.00	44.71	5.4	318.7	5000.0	-23.9	Peak
8232.75	V	180.00	1.00	41.81	7.2	282.1	5000.0	-25.0	Peak
9147.50	V	180.00	1.00	42.41	10.9	463.9	5000.0	-20.7	Peak
2744.25	V	190.00	1.00	40.33	-12.1	25.8	500.0	-25.8	Ave
3659.00	V	180.00	1.00	34.01	-9.1	17.6	500.0	-29.1	Ave
4573.75	V	290.00	1.00	31.73	-6.0	19.4	500.0	-28.2	Ave
7318.00	V	160.00	1.00	31.41	5.4	68.9	500.0	-17.2	Ave
8232.75	V	180.00	1.00	32.31	7.2	94.5	500.0	-14.5	Ave
9147.50	V	180.00	1.00	32.11	10.9	141.7	500.0	-11.0	Ave
2744.25	H	200.00	2.20	49.31	-12.1	72.5	5000.0	-36.8	Peak
3659.00	H	270.00	2.20	46.71	-9.1	75.8	5000.0	-36.4	Peak
4573.75	H	180.00	2.20	44.11	-6.0	80.8	5000.0	-35.8	Peak
7318.00	H	180.00	2.20	44.11	5.4	297.4	5000.0	-24.5	Peak
8232.75	H	190.00	2.20	43.31	7.2	335.3	5000.0	-23.5	Peak
9147.50	H	190.00	2.20	43.31	10.9	514.6	5000.0	-19.8	Peak
2744.25	H	200.00	2.20	38.11	-12.1	20.0	500.0	-28.0	Ave
3659.00	H	270.00	2.20	36.11	-9.1	22.4	500.0	-27.0	Ave
4573.75	H	180.00	2.20	32.01	-6.0	20.1	500.0	-27.9	Ave
7318.00	H	180.00	2.20	32.31	5.4	76.4	500.0	-16.3	Ave
8232.75	H	190.00	2.20	31.41	7.2	85.2	500.0	-15.4	Ave
9147.50	H	190.00	2.20	31.81	10.9	136.9	500.0	-11.3	Ave

Table 18: Radiated Emission Test Data >1GHz, Center Channel

(Molex P-N 1052620003, Omnidirectional, 1.2dB Gain)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2744.25	V	10.00	3.20	49.08	-3.0	201.2	5000.0	-27.9	peak
3659.00	V	160.00	3.20	47.94	-0.3	241.0	5000.0	-26.3	peak
4573.75	V	90.00	2.80	43.22	1.7	176.4	5000.0	-29.0	peak
7318.00	V	45.00	2.60	43.37	9.8	456.7	5000.0	-20.8	peak
8232.75	V	180.00	2.80	42.89	9.7	425.3	5000.0	-21.4	peak
2744.25	V	10.00	3.20	39.62	-3.0	67.7	500.0	-17.4	Average
3659.00	V	160.00	3.20	37.98	-0.3	76.6	500.0	-16.3	Average
4573.75	V	90.00	2.80	34.17	1.7	62.3	500.0	-18.1	Average
7318.00	V	45.00	2.60	31.90	9.8	121.9	500.0	-12.3	Average
8232.75	V	180.00	2.80	32.08	9.7	122.5	500.0	-12.2	Average
2744.25	H	0.00	2.50	48.82	-3.0	195.2	5000.0	-28.2	peak
3659.00	H	10.00	2.60	47.18	-0.3	221.0	5000.0	-27.1	peak
4573.75	H	90.00	2.50	45.19	1.7	221.3	5000.0	-27.1	peak
7318.00	H	180.00	2.80	43.28	9.8	452.2	5000.0	-20.9	peak
8232.75	H	45.00	3.00	43.61	9.7	461.7	5000.0	-20.7	peak
2744.25	H	0.00	2.50	38.46	-3.0	59.3	500.0	-18.5	Average
3659.00	H	10.00	2.60	35.99	-0.3	60.9	500.0	-18.3	Average
4573.75	H	90.00	2.50	33.88	1.7	60.2	500.0	-18.4	Average
7318.00	H	180.00	2.80	32.09	9.8	124.7	500.0	-12.1	Average
8232.75	H	45.00	3.00	32.12	9.7	123.0	500.0	-12.2	Average

Table 19: Radiated Emission Test Data >1GHz, High Channel

(Linx ¼ Wave Helical)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2781.75	V	270.00	1.00	53.92	-12.1	123.4	5000.0	-32.2	
3709.00	V	240.00	1.00	50.60	-9.1	119.5	5000.0	-32.4	
4636.25	V	90.00	1.00	46.28	-5.5	108.8	5000.0	-33.2	
7418.00	V	200.00	1.00	45.31	5.5	346.0	5000.0	-23.2	
8345.25	V	90.00	1.00	43.68	7.4	358.3	5000.0	-22.9	
2781.75	V	270.00	1.00	45.80	-12.1	48.5	500.0	-20.3	
3709.00	V	240.00	1.00	41.48	-9.1	41.8	500.0	-21.6	
4636.25	V	90.00	1.00	34.32	-5.5	27.4	500.0	-25.2	
7418.00	V	200.00	1.00	32.22	5.5	76.7	500.0	-16.3	
8345.25	V	90.00	1.00	31.75	7.4	90.7	500.0	-14.8	
2781.75	H	290.00	2.20	56.00	-12.1	156.8	5000.0	-30.1	
3709.00	H	90.00	2.20	48.80	-9.1	97.1	5000.0	-34.2	
4636.25	H	180.00	2.20	45.95	-5.5	104.7	5000.0	-33.6	
7418.00	H	190.00	2.20	44.60	5.5	318.9	5000.0	-23.9	
8345.25	H	180.00	2.20	43.32	7.4	343.8	5000.0	-23.3	
2781.75	H	290.00	2.20	48.86	-12.1	68.9	500.0	-17.2	
3709.00	H	90.00	2.20	39.33	-9.1	32.6	500.0	-23.7	
4636.25	H	180.00	2.20	32.36	-5.5	21.9	500.0	-27.2	
7418.00	H	190.00	2.20	32.02	5.5	74.9	500.0	-16.5	
8345.25	H	180.00	2.20	31.78	7.4	91.1	500.0	-14.8	

Table 20: Radiated Emission Test Data >1GHz, High Channel

(Laird OD9-5 900MHz Omnidirectional Antenna, 5dBi Gain)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2781.75	V	180.00	1.00	51.01	-12.1	88.3	5000.0	-35.1	
3709.00	V	170.00	1.00	45.47	-9.1	66.2	5000.0	-37.6	
4636.25	V	195.00	1.00	44.99	-5.5	93.8	5000.0	-34.5	
7418.00	V	180.00	1.00	44.21	5.5	304.9	5000.0	-24.3	
8345.25	V	180.00	1.00	44.53	7.4	395.2	5000.0	-22.0	
2781.75	V	180.00	1.00	42.85	-12.1	34.5	500.0	-23.2	
3709.00	V	170.00	1.00	34.55	-9.1	18.8	500.0	-28.5	
4636.25	V	195.00	1.00	33.23	-5.5	24.2	500.0	-26.3	
7418.00	V	180.00	1.00	32.53	5.5	79.4	500.0	-16.0	
8345.25	V	180.00	1.00	32.10	7.4	94.5	500.0	-14.5	
2781.75	H	90.00	2.20	50.78	-12.1	86.0	5000.0	-35.3	
3709.00	H	190.00	2.20	44.60	-9.1	59.9	5000.0	-38.4	
4636.25	H	220.00	2.20	43.19	-5.5	76.2	5000.0	-36.3	
7418.00	H	170.00	2.20	44.27	5.5	307.0	5000.0	-24.2	
8345.25	H	180.00	2.20	44.71	7.4	403.5	5000.0	-21.9	
2781.75	H	90.00	2.20	42.73	-12.1	34.0	500.0	-23.3	
3709.00	H	190.00	2.20	33.31	-9.1	16.3	500.0	-29.7	
4636.25	H	220.00	2.20	32.62	-5.5	22.6	500.0	-26.9	
7418.00	H	170.00	2.20	32.54	5.5	79.5	500.0	-16.0	
8345.25	H	180.00	2.20	32.18	7.4	95.3	500.0	-14.4	

Table 21: Radiated Emission Test Data >1GHz, High Channel

(Laird B(B)8965CN 5/8 Wave Loaded Coil)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2781.75	V	180.00	1.00	49.94	-12.1	78.0	5000.0	-36.1	Peak
3709.00	V	180.00	1.00	46.75	-9.1	76.7	5000.0	-36.3	Peak
4636.25	V	250.00	1.00	46.58	-5.5	112.6	5000.0	-32.9	Peak
7418.00	V	170.00	1.00	45.53	5.5	354.9	5000.0	-23.0	Peak
8345.25	V	190.00	1.00	41.72	7.4	286.0	5000.0	-24.9	Peak
2781.75	V	180.00	1.00	39.78	-12.1	24.2	500.0	-26.3	Ave
3709.00	V	180.00	1.00	34.86	-9.1	19.5	500.0	-28.2	Ave
4636.25	V	250.00	1.00	32.61	-5.5	22.5	500.0	-26.9	Ave
7418.00	V	170.00	1.00	32.51	5.5	79.3	500.0	-16.0	Ave
8345.25	V	190.00	1.00	32.04	7.4	93.8	500.0	-14.5	Ave
2781.75	H	250.00	2.20	49.41	-12.1	73.4	5000.0	-36.7	Peak
3709.00	H	90.00	2.20	47.01	-9.1	79.0	5000.0	-36.0	Peak
4636.25	H	160.00	2.20	44.89	-5.5	92.7	5000.0	-34.6	Peak
7418.00	H	180.00	2.20	43.76	5.5	289.5	5000.0	-24.7	Peak
8345.25	H	200.00	2.20	45.95	7.4	465.4	5000.0	-20.6	Peak
2781.75	H	250.00	2.20	38.30	-12.1	20.4	500.0	-27.8	Ave
3709.00	H	90.00	2.20	36.09	-9.1	22.5	500.0	-26.9	Ave
4636.25	H	160.00	2.20	32.60	-5.5	22.5	500.0	-26.9	Ave
7418.00	H	180.00	2.20	32.38	5.5	78.1	500.0	-16.1	Ave
8345.25	H	200.00	2.20	32.31	7.4	96.8	500.0	-14.3	Ave

Table 22: Radiated Emission Test Data >1GHz, Low Channel

(Molex P-N 1052620003, Omnidirectional , 1.2dB Gain)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2781.75	V	180.00	2.60	49.86	-3.0	220.7	5000.0	-27.1	peak
3709.00	V	270.00	2.80	49.63	-0.1	298.0	5000.0	-24.5	peak
4636.25	V	270.00	3.80	45.39	1.9	231.4	5000.0	-26.7	peak
7418.00	V	180.00	2.80	41.82	9.6	371.9	5000.0	-22.6	peak
8345.25	V	10.00	3.00	41.69	9.7	371.9	5000.0	-22.6	peak
2781.75	V	180.00	2.60	41.92	-3.0	88.5	500.0	-15.0	Average
3709.00	V	270.00	2.80	42.81	-0.1	135.8	500.0	-11.3	Average
4636.25	V	270.00	3.80	33.57	1.9	59.3	500.0	-18.5	Average
7418.00	V	180.00	2.80	32.91	9.6	133.4	500.0	-11.5	Average
8345.25	V	10.00	3.00	31.92	9.7	120.8	500.0	-12.3	Average
2781.75	H	190.00	2.60	47.09	-3.0	160.4	5000.0	-29.9	peak
3709.00	H	180.00	2.80	46.08	-0.1	198.0	5000.0	-28.0	peak
4636.25	H	180.00	2.60	44.80	1.9	216.2	5000.0	-27.3	peak
7418.00	H	90.00	3.00	40.20	9.6	308.7	5000.0	-24.2	peak
8345.25	H	0.00	3.20	39.90	9.7	302.6	5000.0	-24.4	peak
2781.75	H	190.00	2.60	37.13	-3.0	51.0	500.0	-19.8	Average
3709.00	H	180.00	2.80	35.53	-0.1	58.8	500.0	-18.6	Average
4636.25	H	180.00	2.60	32.90	1.9	54.9	500.0	-19.2	Average
7418.00	H	90.00	3.00	41.80	9.6	371.2	500.0	-2.6	Average
8345.25	H	0.00	3.20	32.10	9.7	123.3	500.0	-12.2	Average

5.7 Receiver Radiated Spurious Emissions: (RSS-210 sect 2.6)

The EUT must comply with the requirements for radiated spurious emissions that fall within the restricted bands. These emissions must meet the limits specified in §15.109 for peak measurements.

5.7.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-2014. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The emissions were measured using the following resolution bandwidths:

Table 23: Spectrum Analyzer Settings

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	120kHz	>100 kHz
>1000 MHz	1 MHz	10 Hz (Avg.), 1MHz (Peak)

Table 24: Radiated Emission Test Data, Receiver

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
38.23	V	180.00	1.00	42.85	-11.3	38.0	100.0	-8.4	
42.19	V	180.00	1.00	42.07	-14.2	24.8	100.0	-12.1	
46.99	V	180.00	1.00	43.65	-17.3	20.8	100.0	-13.6	
49.94	V	180.00	1.00	43.02	-18.6	16.7	100.0	-15.5	
52.02	V	180.00	1.00	46.24	-19.1	22.9	100.0	-12.8	
61.02	V	225.00	1.00	43.93	-18.8	18.0	100.0	-14.9	
142.62	V	225.00	1.00	41.35	-12.7	27.0	150.0	-14.9	
143.22	V	225.00	1.00	39.63	-12.8	22.0	150.0	-16.7	
167.61	V	225.00	1.00	42.93	-13.5	29.8	150.0	-14.1	
177.50	V	135.00	1.00	40.50	-13.8	21.5	150.0	-16.9	
192.01	V	135.00	1.00	35.40	-13.7	12.1	150.0	-21.8	
204.40	V	135.00	1.00	42.40	-13.3	28.4	150.0	-14.4	
215.90	V	180.00	1.00	38.10	-14.3	15.5	150.0	-19.7	
240.41	V	180.00	1.30	39.90	-13.1	21.8	200.0	-19.3	
448.20	V	180.00	1.80	38.60	-6.5	40.5	200.0	-13.9	
38.23	H	180.00	4.00	36.73	-11.3	18.8	100.0	-14.5	
42.19	H	180.00	4.00	39.84	-14.2	19.2	100.0	-14.3	
46.99	H	180.00	4.00	47.40	-17.3	32.0	100.0	-9.9	
49.94	H	180.00	4.00	41.99	-18.6	14.9	100.0	-16.6	
52.02	H	180.00	4.00	41.37	-19.1	13.1	100.0	-17.7	
61.02	H	225.00	4.00	35.03	-18.8	6.4	100.0	-23.8	
142.62	H	135.00	4.00	39.26	-12.7	21.2	150.0	-17.0	
143.22	H	135.00	4.00	38.77	-12.8	19.9	150.0	-17.5	
167.61	H	135.00	4.00	49.18	-13.5	61.1	150.0	-7.8	
177.50	H	180.00	4.00	37.90	-13.8	16.0	150.0	-19.5	
192.01	H	180.00	4.00	40.50	-13.7	21.8	150.0	-16.7	
204.40	H	180.00	3.80	41.20	-13.3	24.8	150.0	-15.6	
215.90	H	180.00	3.80	39.50	-14.3	18.3	150.0	-18.3	
240.41	H	180.00	3.80	36.10	-13.1	14.1	200.0	-23.1	
448.20	H	180.00	3.20	37.30	-6.5	34.9	200.0	-15.2	

No frequencies noted above 1GHz

5.8 AC Conducted Emissions (FCC Part §15.207)

5.8.1 Requirements

Test Arrangement: Table Top

Compliance Standard: FCC Class B

FCC Compliance Limits		
Frequency	**Quasi-peak**	**Average**
0.15 - 0.5MHz	66 to 56dBµV	56 to 46dBµV
0.5 - 5MHz	56dBµV	46dBµV
5 - 30MHz	60dBµV	50dBµV

5.8.2 Test Procedure

The EUT was placed on an 80 cm high 1 X 1.5 m non-conductive table above a ground plane. Power to the EUT was provided through a Solar Corporation 50 Ω/50 µH Line Impedance Stabilization Network bonded to a 3 X 2 meter ground plane. The LISN has its AC input supplied from a filtered AC power source. Power was supplied to the peripherals through a second LISN. The peripherals were placed on the table in accordance with ANSI C63.4-2003. Power and data cables were moved about to obtain maximum emissions.

The 50 Ω output of the LISN was connected to the input of the spectrum analyzer and the emissions in the frequency range of 150 kHz to 30 MHz were measured. The detector function was set to quasi-peak, peak, or average as appropriate, and the resolution bandwidth during testing was at least 9 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth. For average measurements the post-detector filter was set to 10 Hz.

At frequencies where quasi-peak or peak measurements comply with the average limit, no average measurements need be performed.

At frequencies where quasi-peak or peak measurements comply with the average limit, no average measurements need be performed. The Conducted emissions level to be compared to the FCC limit is calculated as shown in the following example.

Example:

Spectrum Analyzer Voltage: VdBµV

LISN Correction Factor: LISN dB

Cable Correction Factor: CF dB

Electric Field: EdBµV = V dBµV + LISN dB + CF dB

5.8.3 Test Data

The EUT complied with the Class B Conducted Emissions requirements. This system runs off of 120VAC or 230VAC. The following tables provide the test results for phase and neutral line power line conducted emissions.

Conducted Emissions was tested with the 915MHz radio in the "transmit on" state.

Table 25: Conducted Emissions Data 120VAC, Transmit On

NEUTRAL

Frequency (MHz)	Level QP (dBµV)	Level AVG (dBµV)	Cable Loss (dB)	LISN Corr (dB)	Level QP Corr (dBµV)	Level Corr Avg (dBµV)	Limit QP (dBµV)	Limit AVG (dBµV)	Margin QP (dB)	Margin AVG (dB)
0.177	38.3	23.6	10.2	0.3	48.8	34.1	64.6	54.6	-15.9	-20.5
0.213	38.6	21.9	10.2	0.2	49.0	32.2	63.1	53.1	-14.1	-20.8
0.289	31.3	16.8	10.2	0.3	41.8	27.2	60.5	50.5	-18.8	-23.3
0.325	24.8	13.9	10.2	0.3	35.2	24.3	59.6	49.6	-24.3	-25.3
0.978	25.4	20.3	10.3	0.2	36.0	30.8	56.0	46.0	-20.0	-15.2
11.579	22.1	17.9	11.2	0.3	33.7	29.4	60.0	50.0	-26.3	-20.6

PHASE

Frequency (MHz)	Level QP (dBµV)	Level AVG (dBµV)	Cable Loss (dB)	LISN Corr (dB)	Level QP Corr (dBµV)	Level Corr Avg (dBµV)	Limit QP (dBµV)	Limit AVG (dBµV)	Margin QP (dB)	Margin AVG (dB)
0.172	36.1	21.2	10.2	0.1	46.4	31.5	64.9	54.9	-18.5	-23.4
0.208	38.1	21.7	10.2	0.0	48.3	31.9	63.3	53.3	-15.0	-21.3
0.289	30.8	16.4	10.2	0.1	41.1	26.7	60.5	50.5	-19.5	-23.8
0.402	23.0	13.3	10.2	0.2	33.5	23.8	57.8	47.8	-24.4	-24.0
0.982	24.0	19.2	10.3	0.2	34.5	29.8	56.0	46.0	-21.5	-16.2
11.580	21.1	16.5	11.2	0.3	32.6	28.0	60.0	50.0	-27.4	-22.0

Table 26: Conducted Emissions Data 230VAC, Transmit On

NEUTRAL

Frequency (MHz)	Level QP (dBµV)	Level AVG (dBµV)	Cable Loss (dB)	LISN Corr (dB)	Level QP Corr (dBµV)	Level Corr Avg (dBµV)	Limit QP (dBµV)	Limit AVG (dBµV)	Margin QP (dB)	Margin AVG (dB)
0.164	31.3	19.1	10.2	0.3	41.7	29.5	65.3	55.3	-23.6	-25.8
0.200	35.6	19.4	10.2	0.2	45.9	29.7	63.6	53.6	-17.7	-23.9
0.276	26.3	14.1	10.2	0.3	36.7	24.5	60.9	50.9	-24.2	-26.4
0.303	29.5	15.5	10.2	0.3	40.0	26.0	60.2	50.2	-20.2	-24.2
0.330	23.0	12.4	10.2	0.3	33.4	22.8	59.5	49.5	-26.1	-26.6
0.483	19.3	10.6	10.2	0.3	29.8	21.0	56.3	46.3	-26.5	-25.3
12.006	18.4	11.2	11.2	0.4	29.9	22.7	60.0	50.0	-30.1	-27.3

PHASE

Frequency (MHz)	Level QP (dBµV)	Level AVG (dBµV)	Cable Loss (dB)	LISN Corr (dB)	Level QP Corr (dBµV)	Level Corr Avg (dBµV)	Limit QP (dBµV)	Limit AVG (dBµV)	Margin QP (dB)	Margin AVG (dB)
0.195	34.8	18.7	10.2	0.0	45.0	28.9	63.8	53.8	-18.8	-24.9
0.231	27.7	15.4	10.2	0.1	37.9	25.6	62.4	52.4	-24.5	-26.8
0.249	24.2	14.6	10.2	0.1	34.4	24.8	61.8	51.8	-27.4	-27.0
0.307	26.3	13.8	10.2	0.2	36.7	24.1	60.0	50.0	-23.4	-26.0
0.420	19.4	10.9	10.2	0.2	29.8	21.4	57.5	47.5	-27.7	-26.1
11.579	26.5	23.9	11.2	0.3	38.0	35.4	60.0	50.0	-22.0	-14.6