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FCC & Industry Canada Certification Test Report

For the

Lively Inc.

Lively Watch

FCC ID: R6N-0004

IC ID: 11045A-0004

WLL JOB# 13665-01 Rev 1
December 29, 2014

Prepared for:

LIVELY INC.
683 SCHOFIELD ROAD
SAN FRANCISCO, CA 94129

Prepared By:

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

ACCREDITED TESTING

Testing Certificate AT-1448

FCC & Industry Canada Certification Test Report
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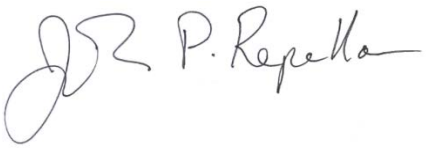
January 9, 2014

Prepared by:



John P. Repella
EMC Compliance Engineer

Reviewed by:

Steven D. Koster
Vice President

Abstract

This report has been prepared on behalf of Lively Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Digital Transmission System (DTS) Transmitter under Part 15.247 (10/2013) of the FCC Rules and Regulations and Spectrum Management and Telecommunications Policy RSS-210 issue 8 of Industry Canada. This Certification Test Report documents the test configuration and test results for the Lively Inc. Watch.

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 Lively Inc. Lively Watch complies with the limits for a Digital Transmission System (DTS) Transmitter device under FCC Part 15.247 and Industry Canada RSS-210.

Revision History	Description of Change	Date
Rev 0	Initial Release	December 29, 2014
Rev 1	Addition of Low power (Normal) mode	January 9, 2015

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1 Introduction

1.1 Compliance Statement

The Lively Inc. Lively Watch complies with the limits for a Digital Transmission System (DTS) Transmitter device under FCC Part 15.247 (10/2013) and Industry Canada RSS-210 issue 8 December 2010.

1.2 Test Scope

Tests for radiated and conducted (at antenna terminal) emissions were performed. All measurements were performed in accordance with "558074 D01 DTS Measurement Guidance v03r02" June 2014. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	TEM Consulting LP 140 River Road Georgetown, TX, 78628
On Behalf of:	Lively Inc. 682 Schofield Road San Francisco, Ca, 94129
Quotation Number:	68361A

1.4 Test Dates

Testing was performed on the following date(s):	10/24/2014 to 1/9/2015

1.5 Test and Support Personnel

Washington Laboratories, LTD	James Ritter, Steve Dovell John P. Repella
Customer Representative	Stephen Berger

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	**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 Lively Inc. Lively Watch is a personal emergency alert and response system in the form of a watch.

Table 1: Device Summary

ITEM	DESCRIPTION
Manufacturer:	Lively Inc.
FCC ID:	11045A-0004
IC:	R6N-0004
Model:	W1000
Serial Number:	EVT-031
FCC Rule Parts:	§15.247
Industry Canada:	RSS210
Frequency Range:	2402-2480MHz
Maximum Output Power:	45.71mW (16.60dBm)
Modulation:	GFSK
Occupied Bandwidth:	696.868kHz
Keying:	Automatic, Manual
Type of Information:	Data
Number of Channels:	40 total channels, 3 Advertising Channels, 37 Data Channels
Power Output Level	Fixed
Antenna Connector	N/A - antenna is part of the PCB
Antenna Type	Trace
Interface Cables:	None
Power Source & Voltage:	3VDC from a battery
Emission Designator	696KFXD
Highest TX spurious Emission	58.89dBuV/m @ 2483.5MHz@3m
Highest RX Spurious Emission	15.83dBuV/m @ 57.23MHz@3m

2.2 Test Configuration

The device was preprogrammed to transmit a one of 3 frequencies (2402, 2440, & 2480MHz). 2 total units were provided (one for radiated testing with antenna and one with a wired connect for conducted tests at each of the 3 frequencies above. The radiated started transmitting as soon as 3V was provided to the units; the radiated test units received 3 V from the EUT replaceable battery while the conducted units were powered from a lab 3VDC power supply. All units were tested in a stand-alone configuration. Two power modes were tested.

2.3 Testing Algorithm

The Lively Watch was pre-programmed for DTS operation by the manufacturer. The radiated units required a series of button presses to get the unit to transmit at the required test frequencies. For the conducted tests, the EUT was connected to a laptop via TTL to USB converter and controlled with nRFgo Studio. The software allowed the test personnel the ability tune the radio to the test frequency of interest and to control the type of signal that was produced. 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 ACLASS under Certificate AT-1448 as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

- 558074 DTS Measurement Guidance v03r01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247”
- 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 (R2012) 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

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

Parameter	Uncertainty	Actual (+/-)	Unit
Radio Frequency	$\pm 1 \times 10^{-7}$	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
Transmitter transient frequency (frequency difference)	±250 Hz	160.7	Hz
Transmitter transient time	±20 %	9.2	%

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:	**Conducted Antenna Tests**	Test Date:	**1/9/2015**
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
528	AGILENT - E4446A	ANALYZER SPECTRUM	4/23/2016
823	AGILENT - N9010A	EXA SPECTRUM ANALYZER	6/6/2015
807	UNITED MICROWAVE MICROFLEX	SMA-SMA CABLE	1/6/2015

Test Name:	**Radiated Emissions**	Test Date:	**12/01/2014**
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
522	HP - 8449B	PRE-AMPLIFIER 1-26.5GHZ	05/31/2016
528	AGILENT - E4446A	ANALYZER SPECTRUM	4/23/2016
4	ARA - DRG-118/A	ANTENNA DRG 1-18GHZ	2/20/2015
280	ITC - 21C-3A1	WAVEGUIDE 3.45-11.0GHZ	08/01/2016
281	ITC - 21A-3A1	WAVEGUIDE 4.51-10.0GHZ	08/01/2016
283	ITC - 21KU-3A1	WAVEGUIDE 9.8-20.5GHZ	10/22/2016
282	ITC - 21X-3A1	WAVEGUIDE 6.8-15GHZ	08/01/2016
382	SUNOL SCIENCES CORPORATION - JB1	ANTENNA BICONLOG	12/26/2014
68	HP - 85650A	ADAPTER QP	1/2/2015
72	HP - 8568B	ANALYZER SPECTRUM	1/2/2015
70	HP - 85685A	PRESELECTOR RF W/OPT 8ZE	1/2/2015

4 Test Summary

The Table Below shows the results of testing for compliance with a Digital Transmission System in accordance with FCC Part 15.247 10/2013 and RSS210 issue 8, 12/2010. Full results are shown in section 5.

Table 4: Test Summary Table

TX Test Summary (Digital Transmission System (DTS))			
FCC Rule Part	**IC Rule Part**	**Description**	**Result**
15.247 (2)	RSS-210 [A8. 2 (a)]	6dB Bandwidth	Pass
15.247 (2)(b)(3)	RSS-210 [A8.4 (4)]	Transmit Output Power	Pass
15.247 (e)	RSS-210 [A8.2 (b)]	Power Spectral Density	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 Sect.2.2 RSS-Gen 7.2.2	General Field Strength Limits (Restricted Bands & RE Limits)	Pass
15.207	RSS-Gen [7.2.4]	AC Conducted Emissions	NA
RX/Digital Test Summary (Digital Transmission System (DTS))			
FCC Rule Part	**IC Rule Part**	**Description**	**Result**
15.207	RSS-Gen [7.2.4]	AC Conducted Emissions	NA
15.209	RSS-210 sect 2.5 RSS-Gen [4.1]	General Field Strength Limits	Pass

5 Test Results

5.1 Occupied (DTS) Bandwidth:

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

For Direct Sequence Spread Spectrum Systems, FCC Part 15.247 requires the minimum 6 dB bandwidth be at least 500 kHz.

5.1.1 Measurement Method:

558074 D01 DTS Measurement Guidance v03r02
Section 8.1 Option 1

Table 5: Occupied Bandwidth Spectrum Analyzer Settings

Resolution Bandwidth	Video Bandwidth
100kHz	300kHz

At full modulation, the occupied bandwidth was measured as shown in Figures 1-3.

Table 6 provides a summary of the Occupied Bandwidth Results.

Table 6: Occupied Bandwidth Results-High Power Mode

Frequency	Bandwidth	Limit	Pass/Fail
Low Channel: 2402MHz	679.185kHz	≥500kHz	Pass
Center Channel: 2442MHz	676.876kHz	≥500kHz	Pass
High Channel: 2480MHz	686.410kHz	≥500kHz	Pass

Table 7: Occupied Bandwidth Results – Low Power Mode

Frequency	Bandwidth	Limit	Pass/Fail
Low Channel: 2402MHz	682.974kHz	≥500kHz	Pass
Center Channel: 2442MHz	696.868kHz	≥500kHz	Pass
High Channel: 2480MHz	686.888kHz	≥500kHz	Pass

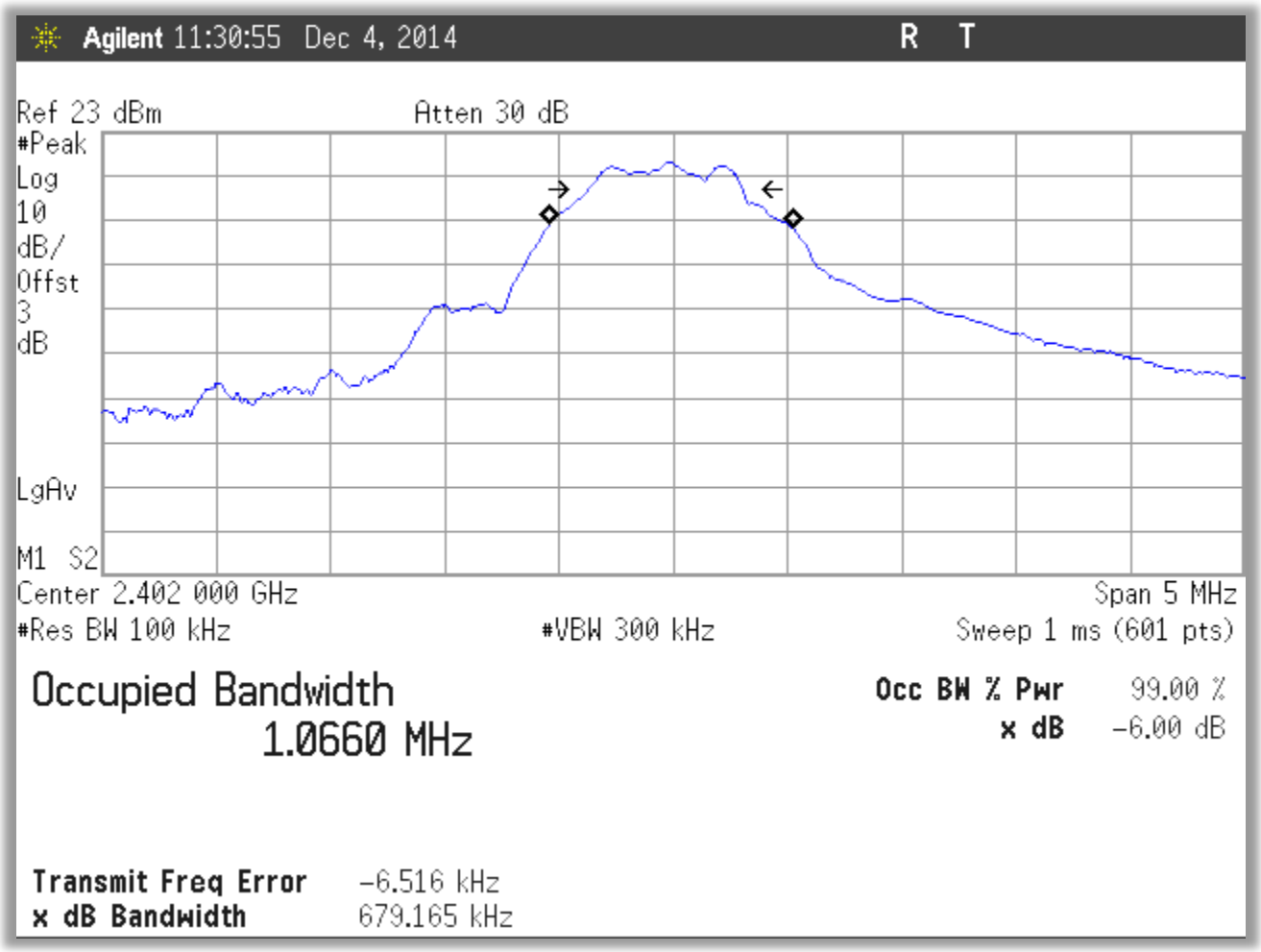

Figure 1: Occupied Bandwidth, Low Channel- High Power Mode

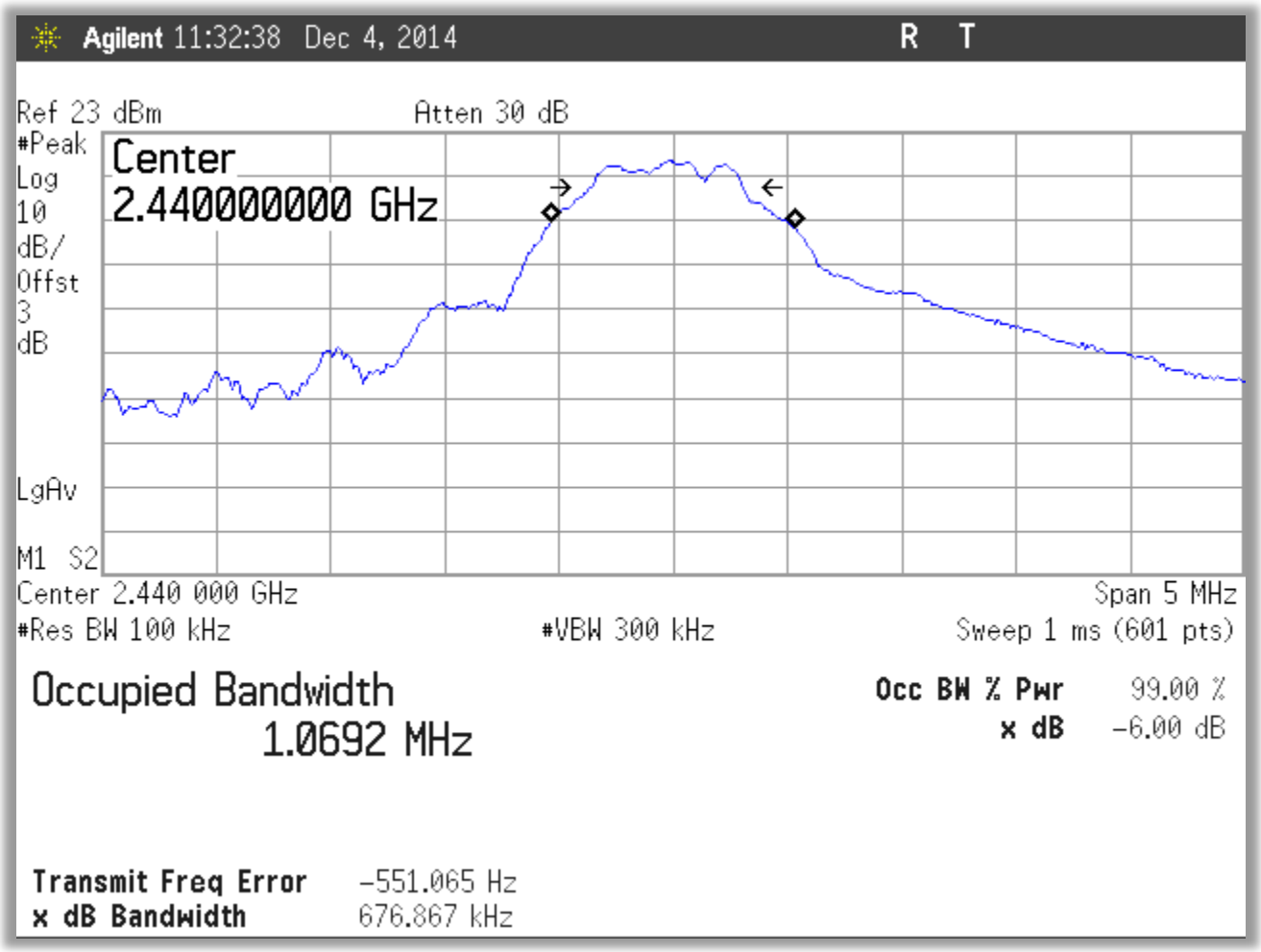

Figure 2: Occupied Bandwidth, Center Channel -High Power Mode

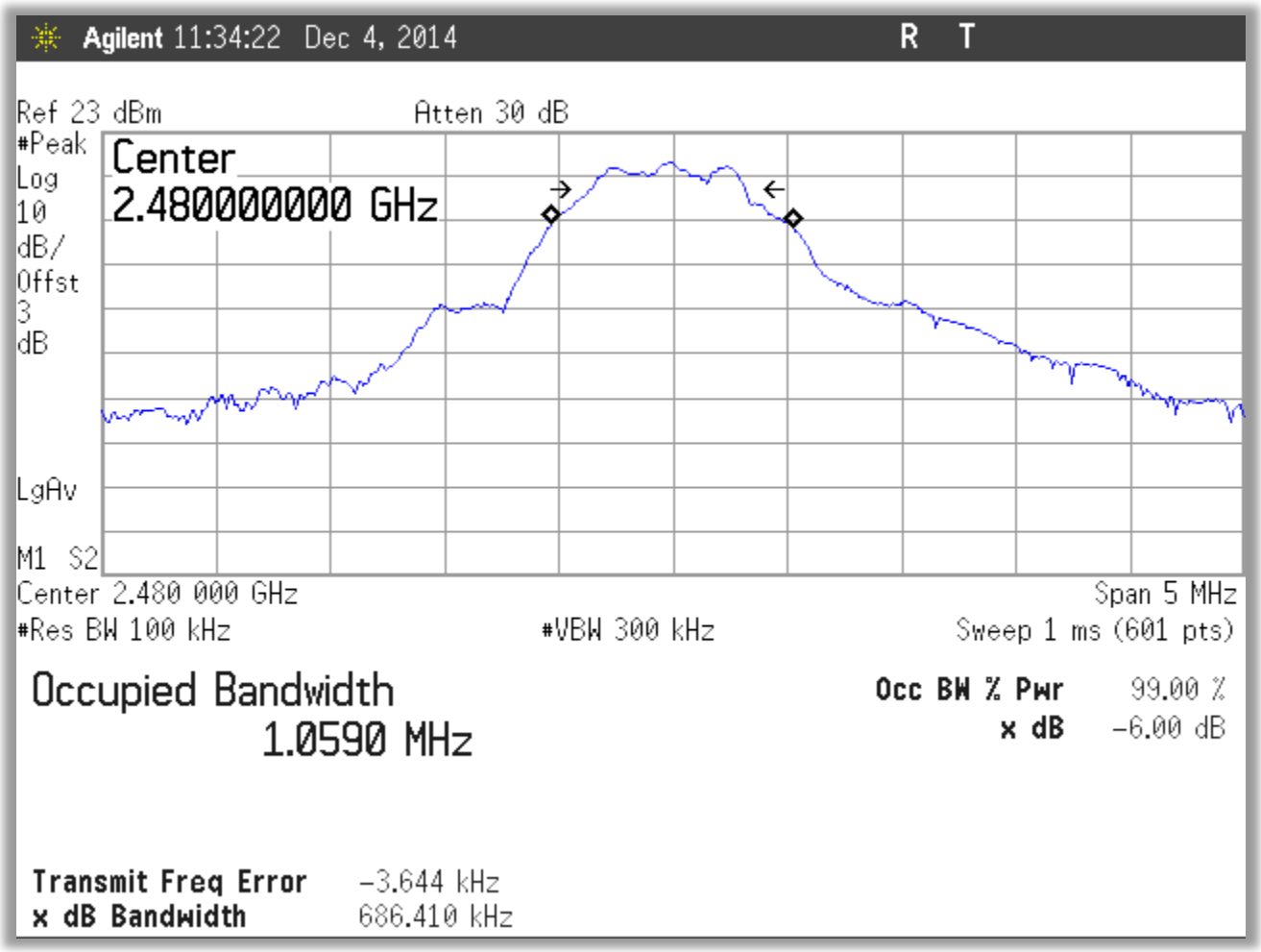

Figure 3: Occupied Bandwidth, High Channel- High Power Mode

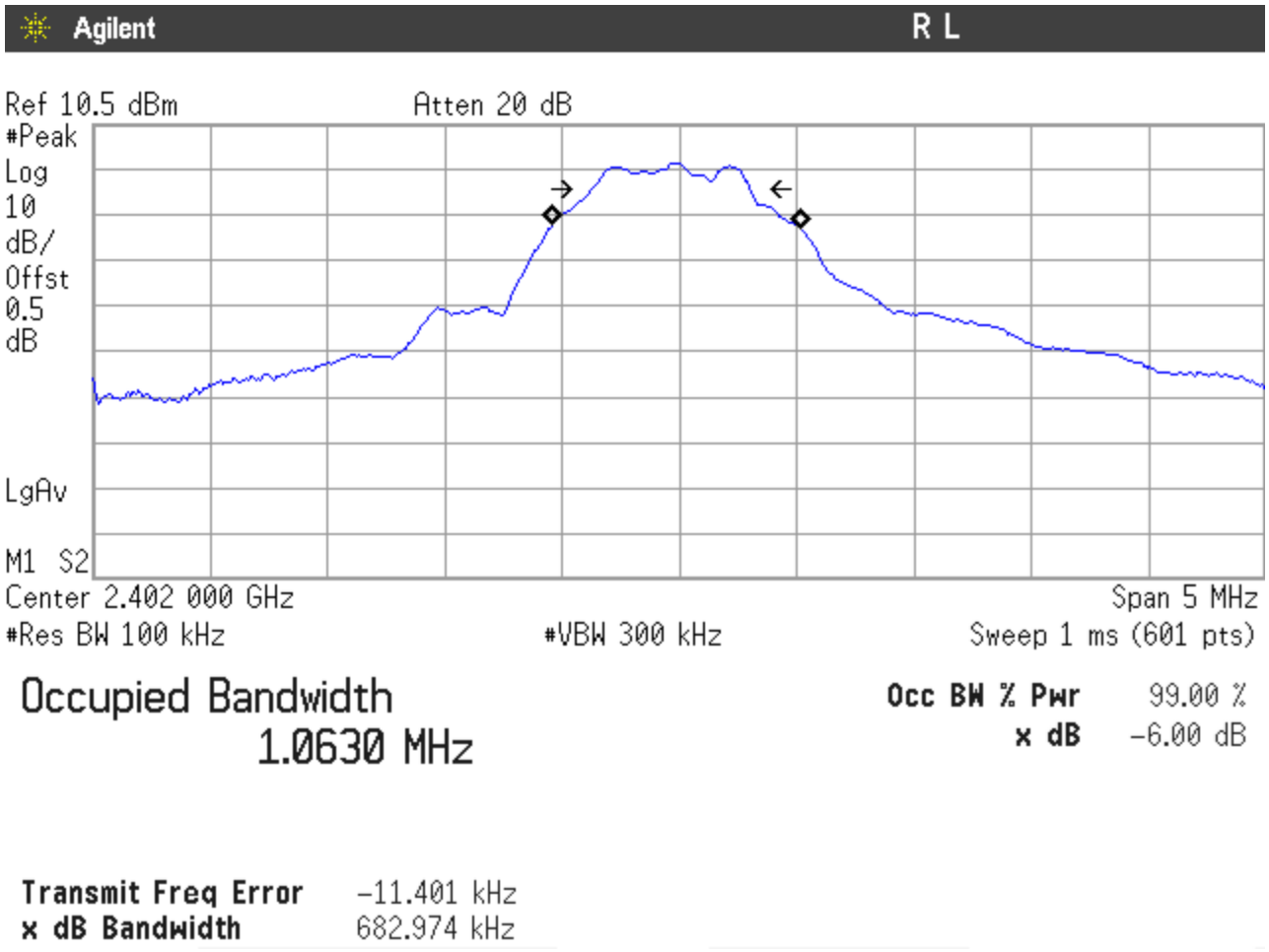

Figure 4: Occupied Bandwidth, Low Channel – Low Power mode

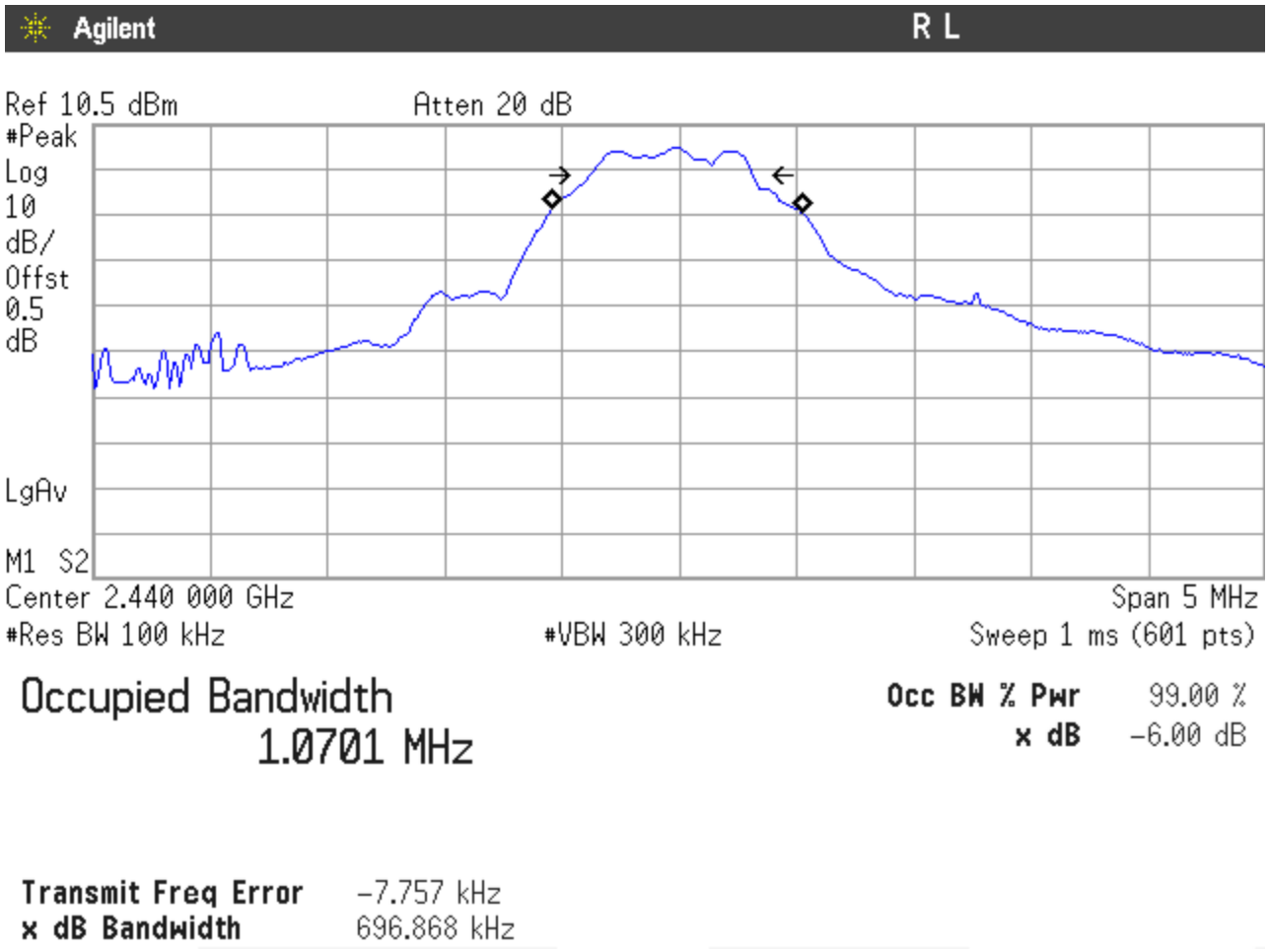

Figure 5: Occupied Bandwidth, Center Channel – Low Power mode

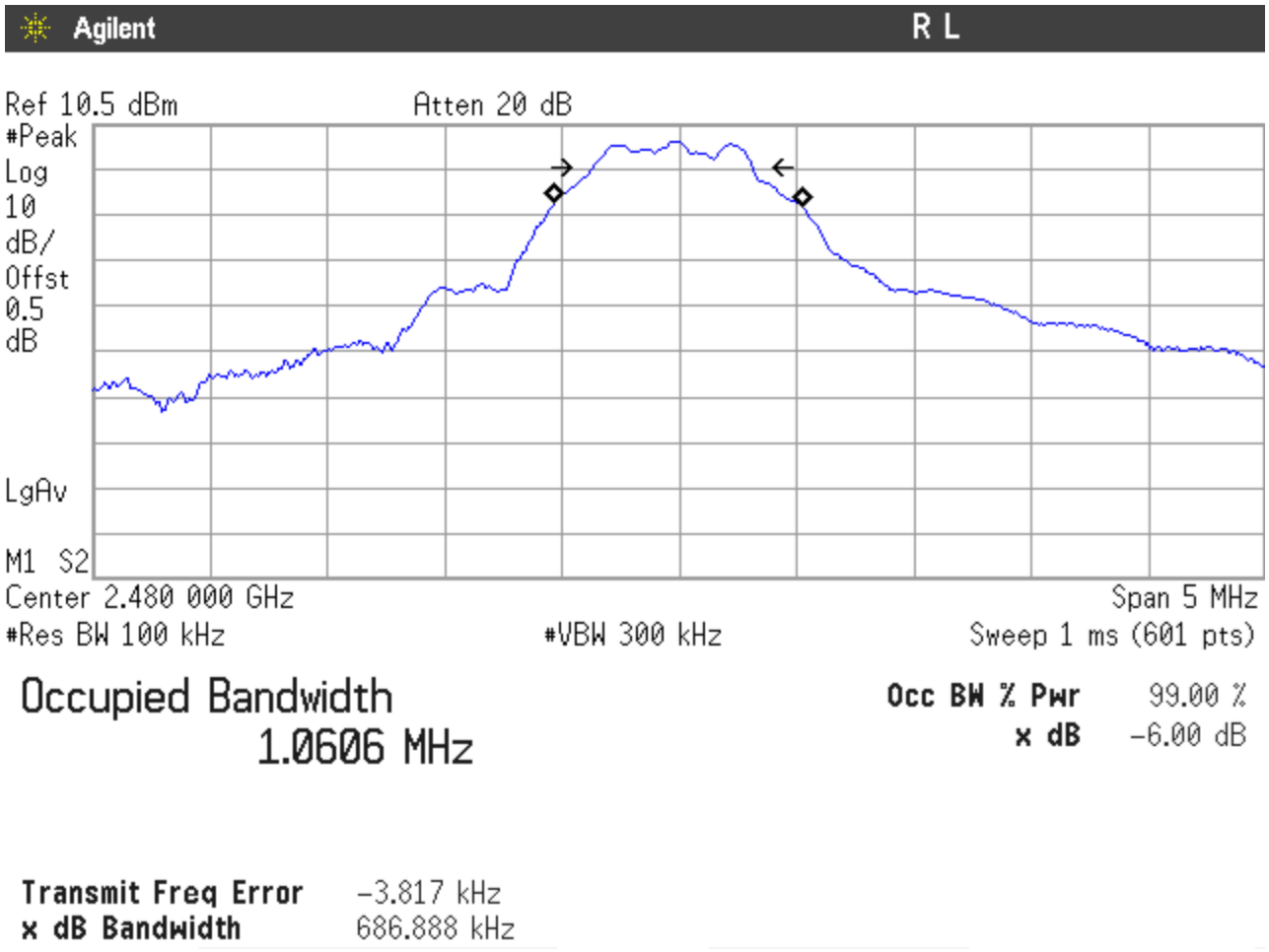

Figure 6: Occupied Bandwidth, High Channel – Low Power mode

5.2 RF Power Output:

To measure the output power the unit was set to dwelled on the 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.

5.2.1 Measurement Method:

558074 D01 DTS Measurement Guidance v03r02

Section 9.1.1 RBW $\geq$ DTS Bandwidth

Table 8: Spectrum Analyzer Settings

Resolution Bandwidth	Video Bandwidth
1MHz	3MHz

Table 9: RF Power Output- High Power Mode

Frequency	Level	Limit	Pass/Fail
Low Channel: 2402MHz	16.18dBm	30 dBm	Pass
Center Channel: 2442MHz	16.60dBm	30 dBm	Pass
High Channel: 2480MHz	16.18dBm	30 dBm	Pass

Table 10: RF Power Output – Low Power Mode

Frequency	Level	Limit	Pass/Fail
Low Channel: 2402MHz	2.01dBm	30 dBm	Pass
Center Channel: 2442MHz	5.37dBm	30 dBm	Pass
High Channel: 2480MHz	6.82dBm	30 dBm	Pass

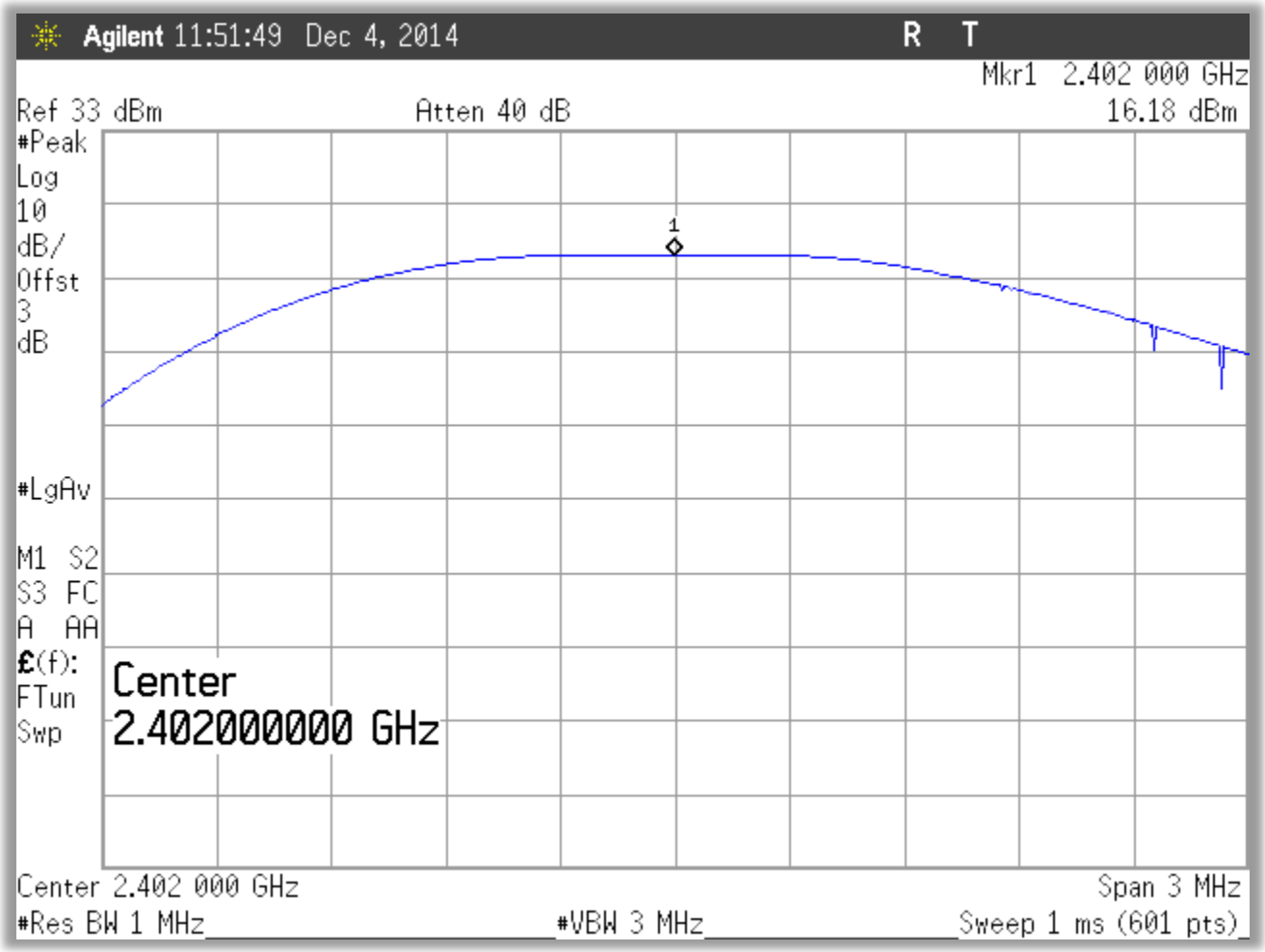

Figure 7: RF Peak Power, Low Channel -High Power Mode

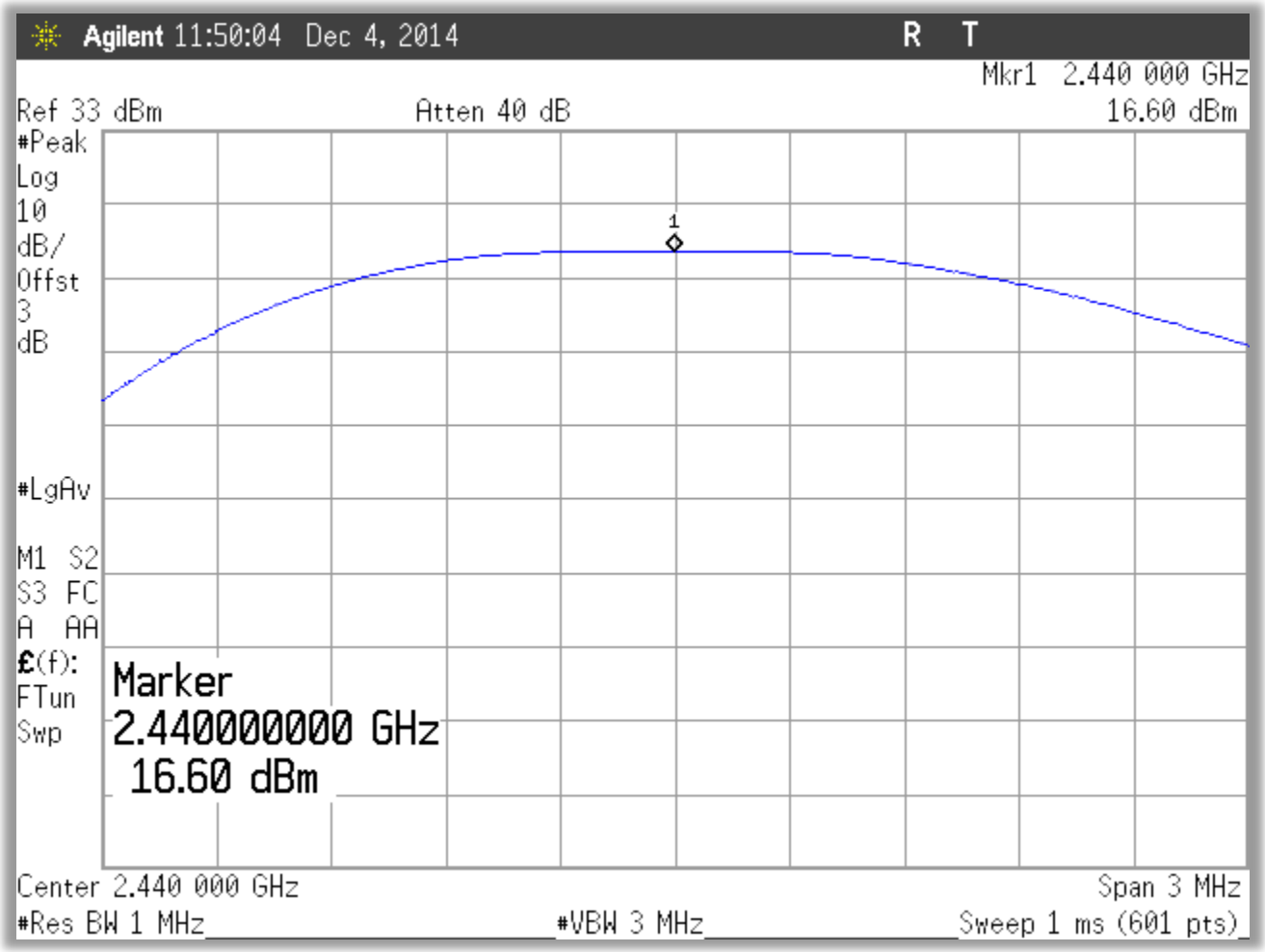

Figure 8: RF Peak Power, Center Channel - High Power Mode

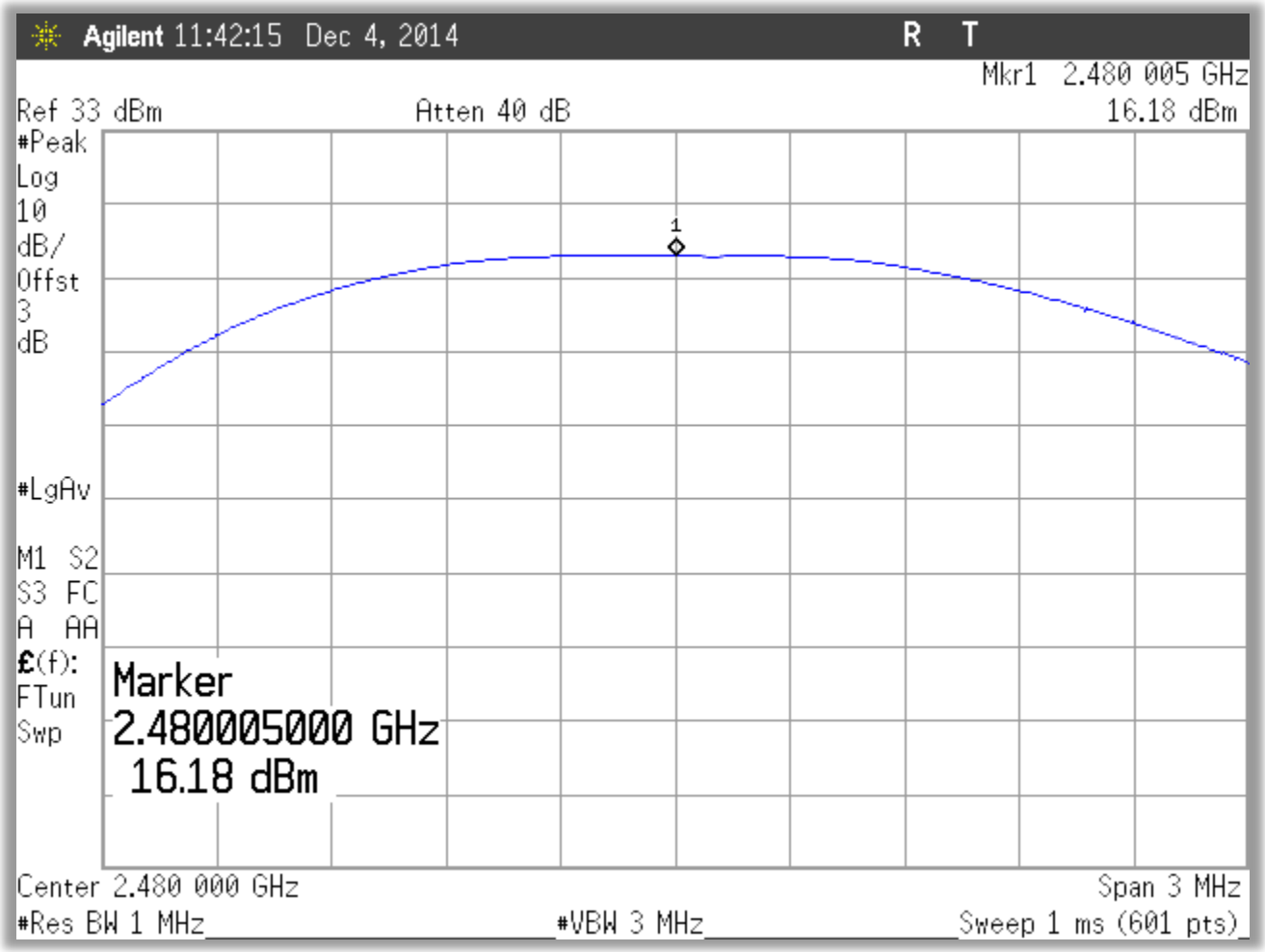

Figure 9: RF Peak Power, High Channel- High Power Mode

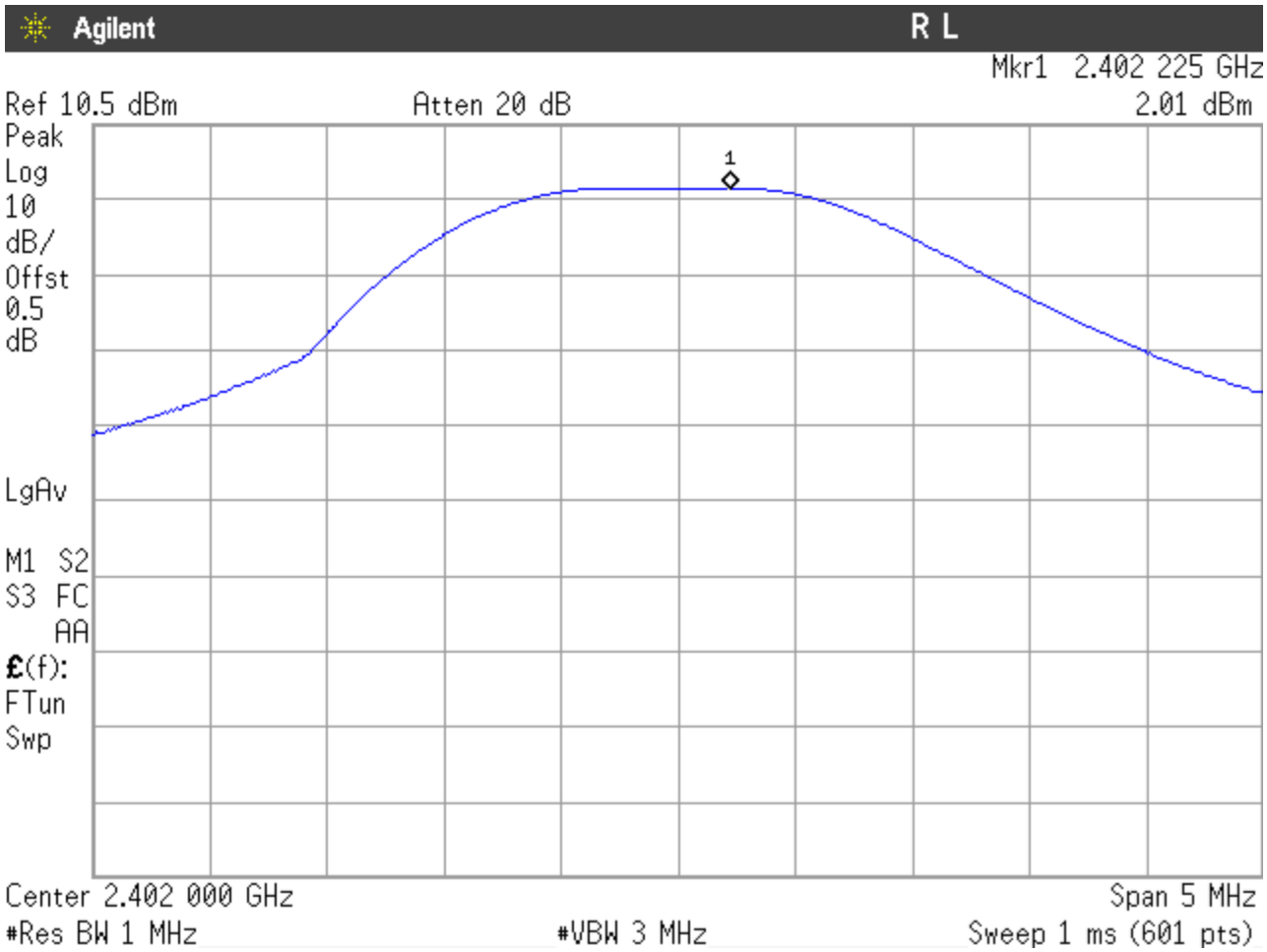

Figure 10: RF Peak Power, Low Channel – Low Power Mode

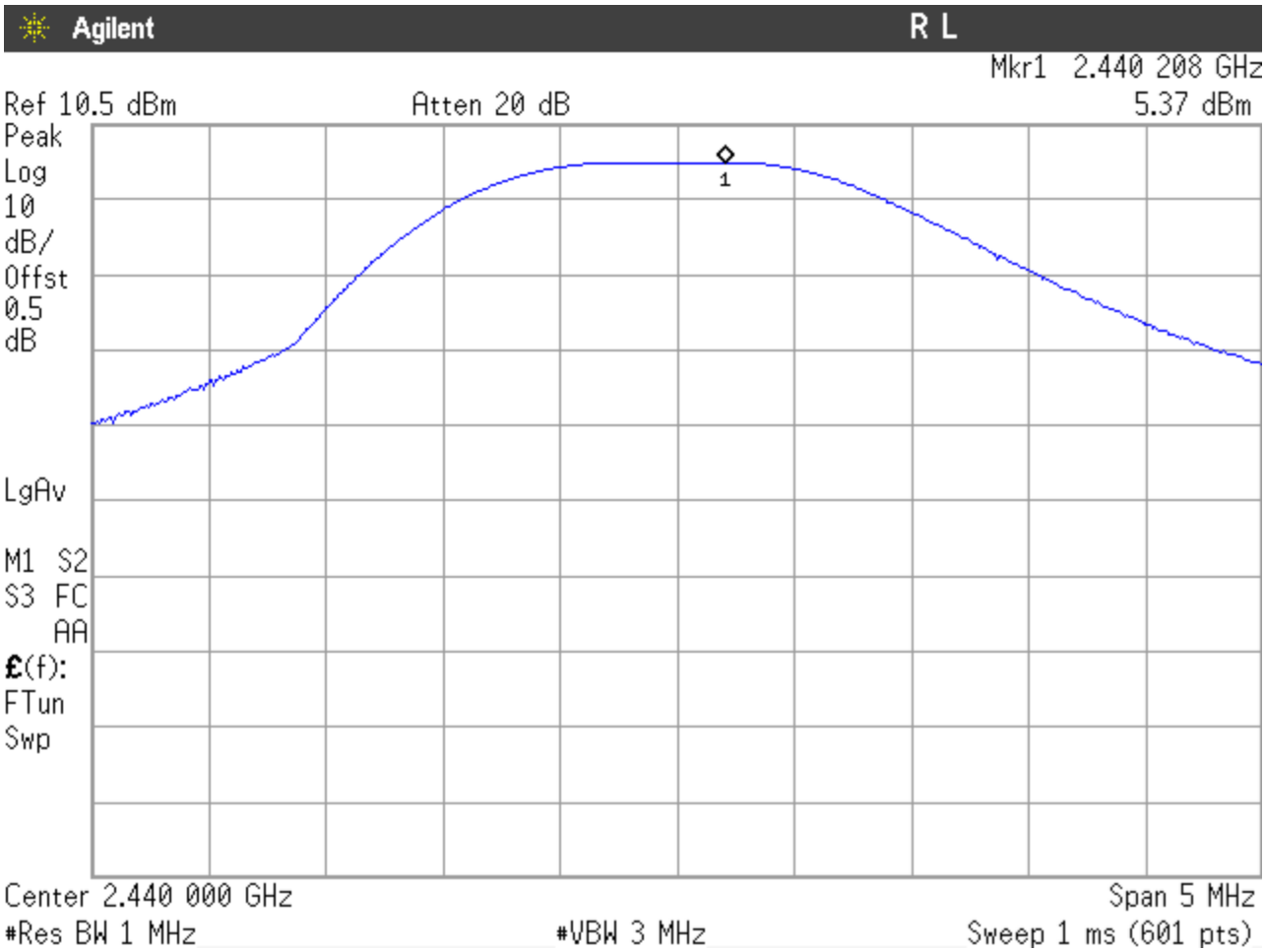

Figure 11: RF Peak Power, Center Channel– Low Power Mode

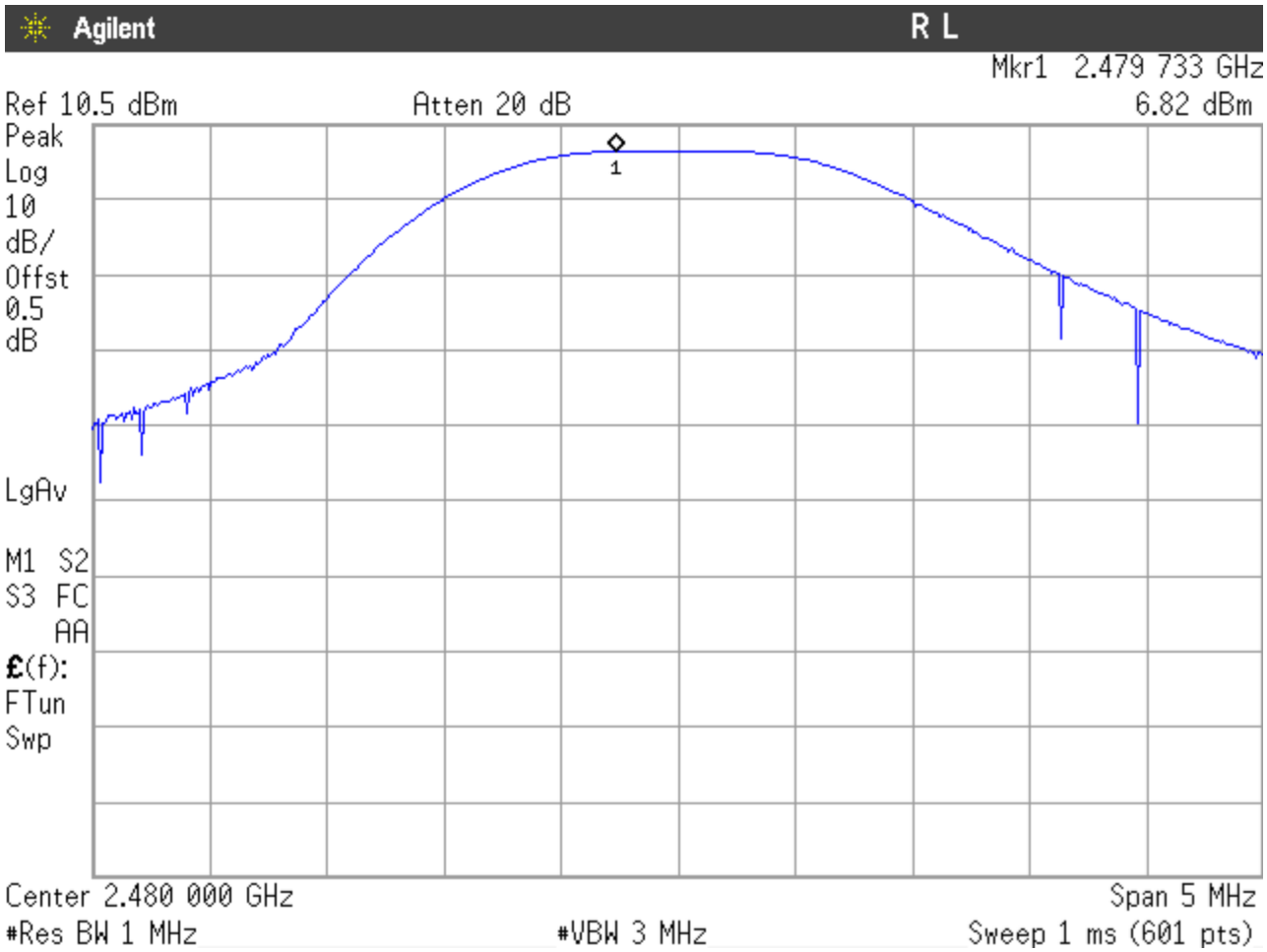

Figure 12: RF Peak Power, High Channel – Low Power Mode

5.3 Power Spectral Density

Measurements for power spectral density were taken in accordance with 15.247(e). The spectrum analyzer was set to peak detect mode with a RBW of 3kHz ,VBW of 10kHz across a 1.2MHz span using an auto sweep time.

5.3.1 Measurement Method:

558074 D01 DTS Measurement Guidance v03r02

Section 10.2 Peak PSD

The highest level detected across any 3 kHz band for continuous transmission was then recorded and compared to the limit 8dBm. The following table and plots give the results for power spectral density testing.

Table 11: Power Spectral Density- High Power Mode

Frequency	Peak Level	Limit	Pass/Fail
Low Channel: 2402MHz	2.35dBm	8 dBm	Pass
Center Channel: 2440MHz	3.51dBm	8 dBm	Pass
High Channel: 2480MHz	2.25dBm	8 dBm	Pass

Table 12: Power Spectral Density – Low Power Mode

Frequency	Peak Level	Limit	Pass/Fail
Low Channel: 2402MHz	-12.01dBm	8 dBm	Pass
Center Channel: 2440MHz	-8.73dBm	8 dBm	Pass
High Channel: 2480MHz	-7.03dBm	8 dBm	Pass

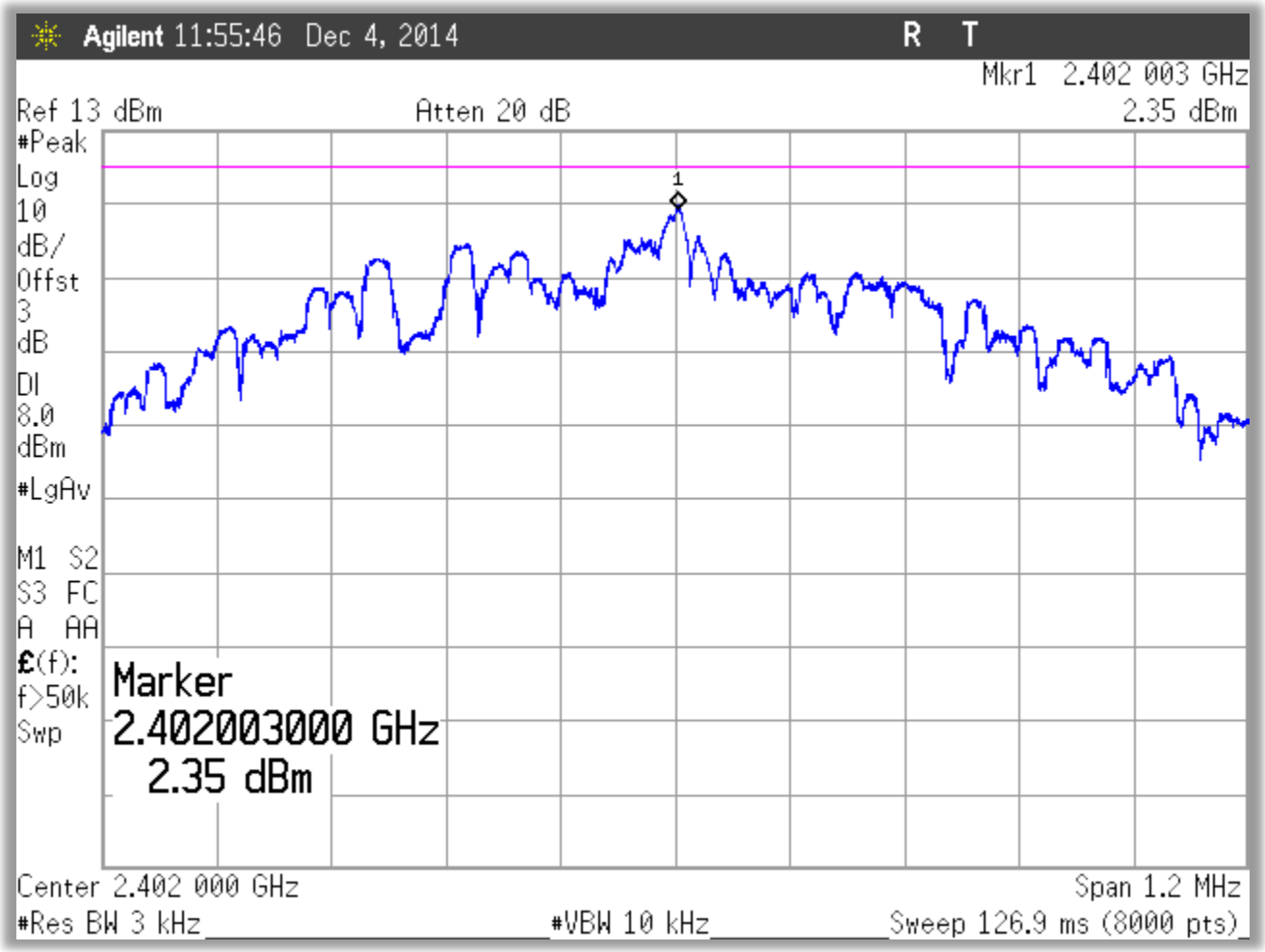

Figure 13: Power Spectral Density, Low Channel -High Power Mode

Figure 14: Power Spectral Density, Center Channel - High Power Mode

Figure 15: Power Spectral Density, High Channel - High Power Mode

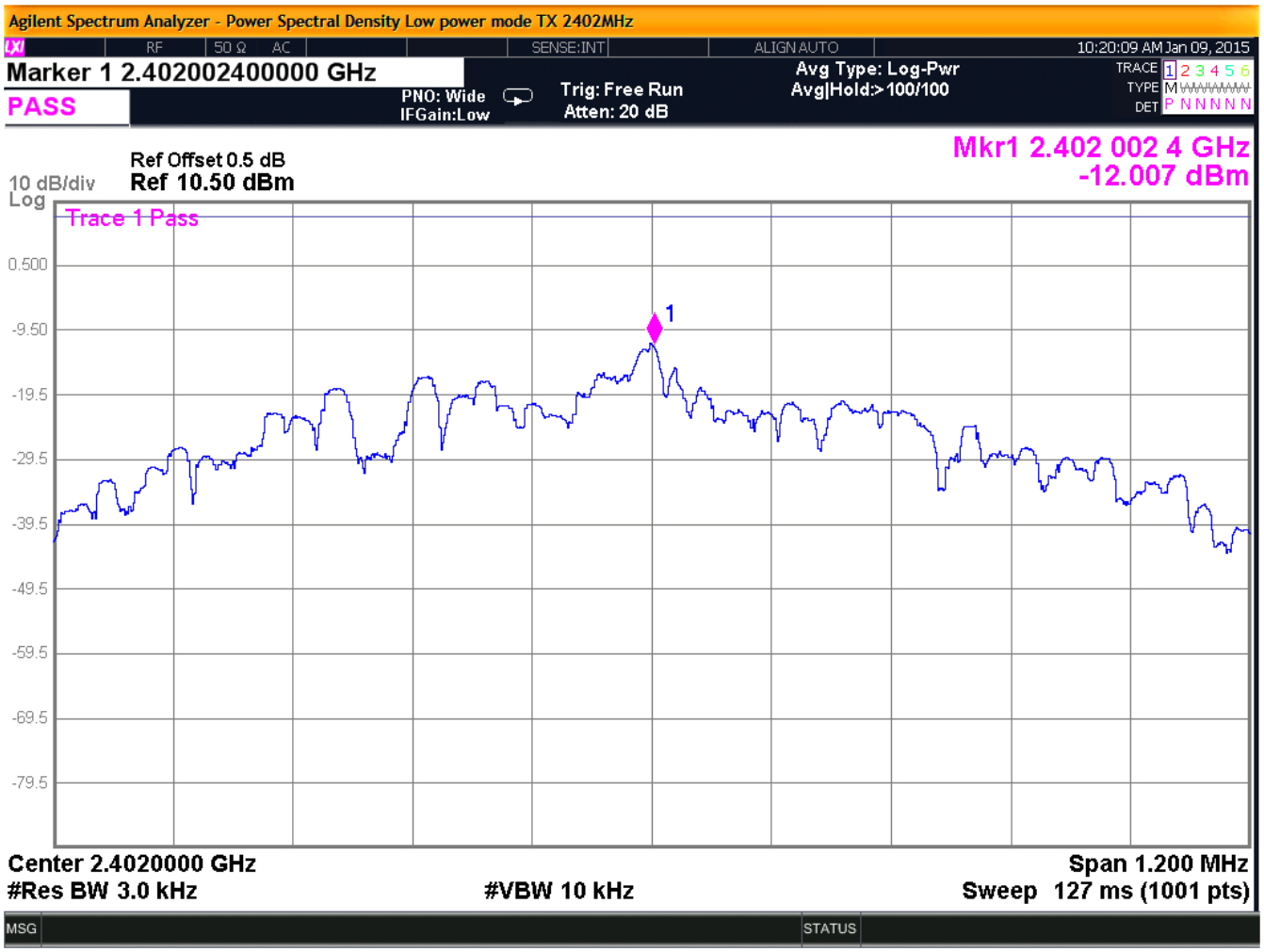

Figure 16: Power Spectral Density, Low Channel - Low Power Mode

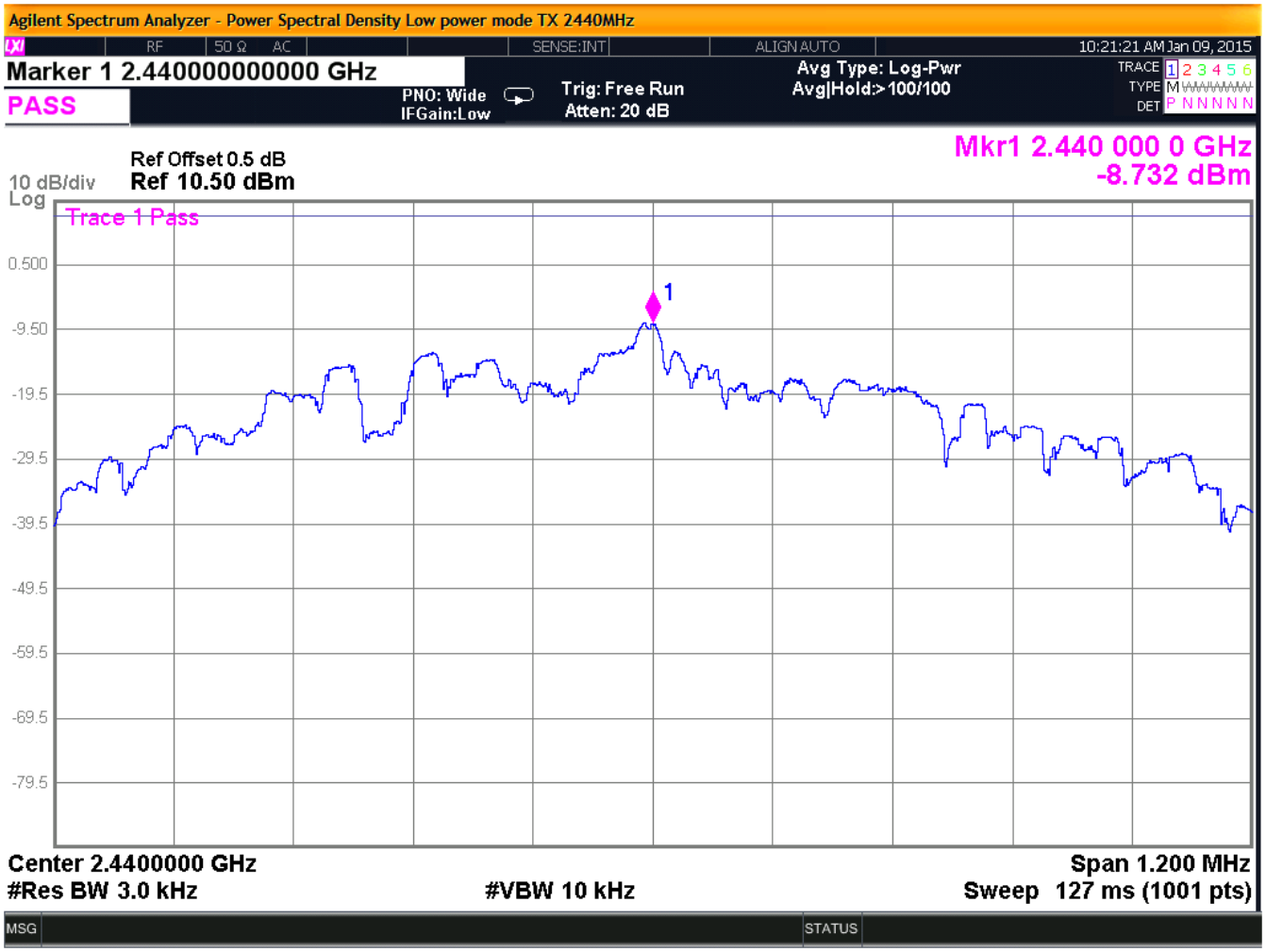

Figure 17: Power Spectral Density, Center Channel - Low Power Mode

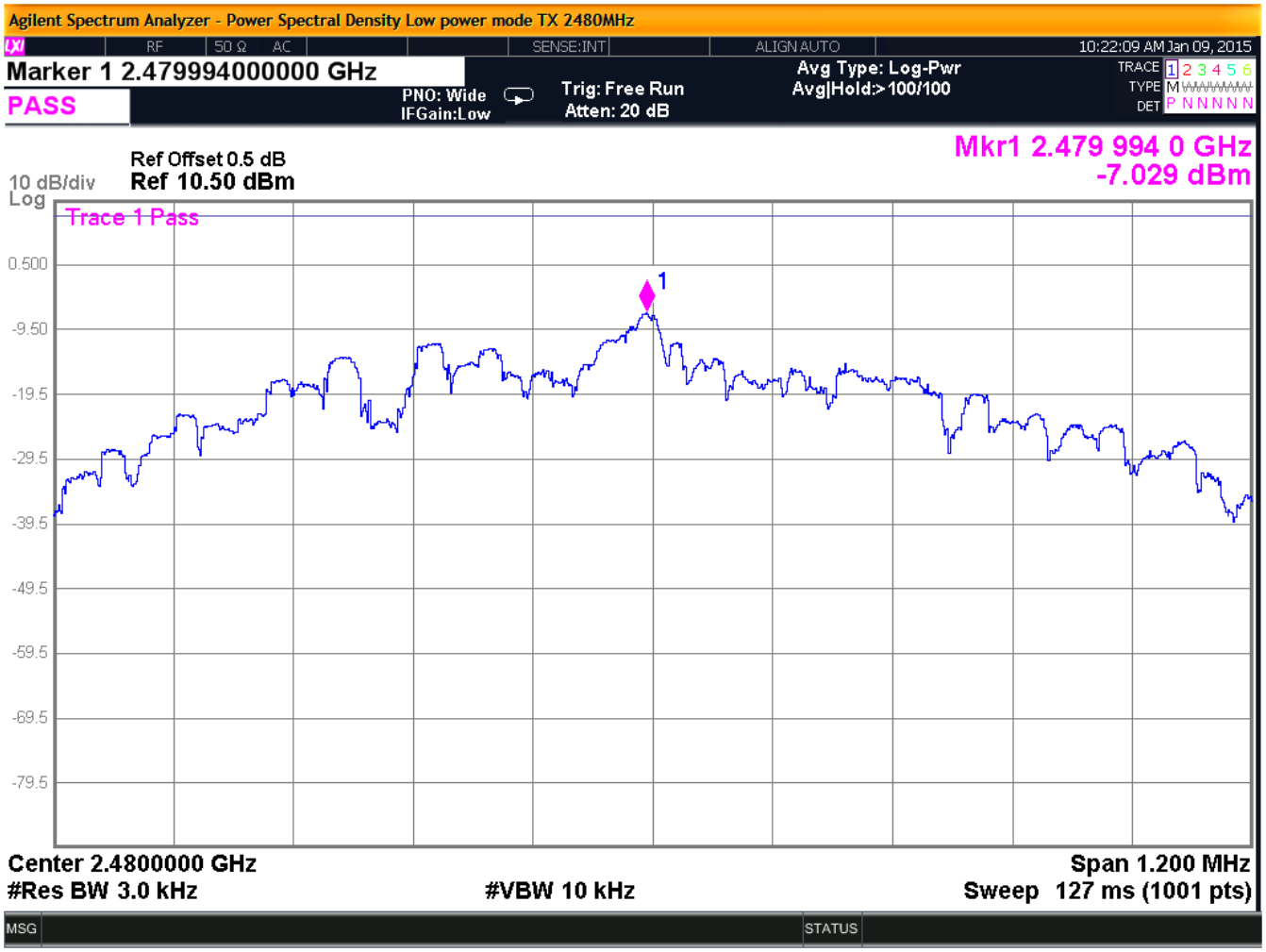

Figure 18: Power Spectral Density, High Channel - Low Power Mode

5.4 Conducted Spurious Emissions at Antenna Terminals

The EUT must comply with requirements for spurious emissions at antenna terminals. Per §15.247(d) 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.

Table 13: Conducted Spurious Spectrum Analyzer Settings

Resolution Bandwidth	Video Bandwidth
100kHz	300kHz

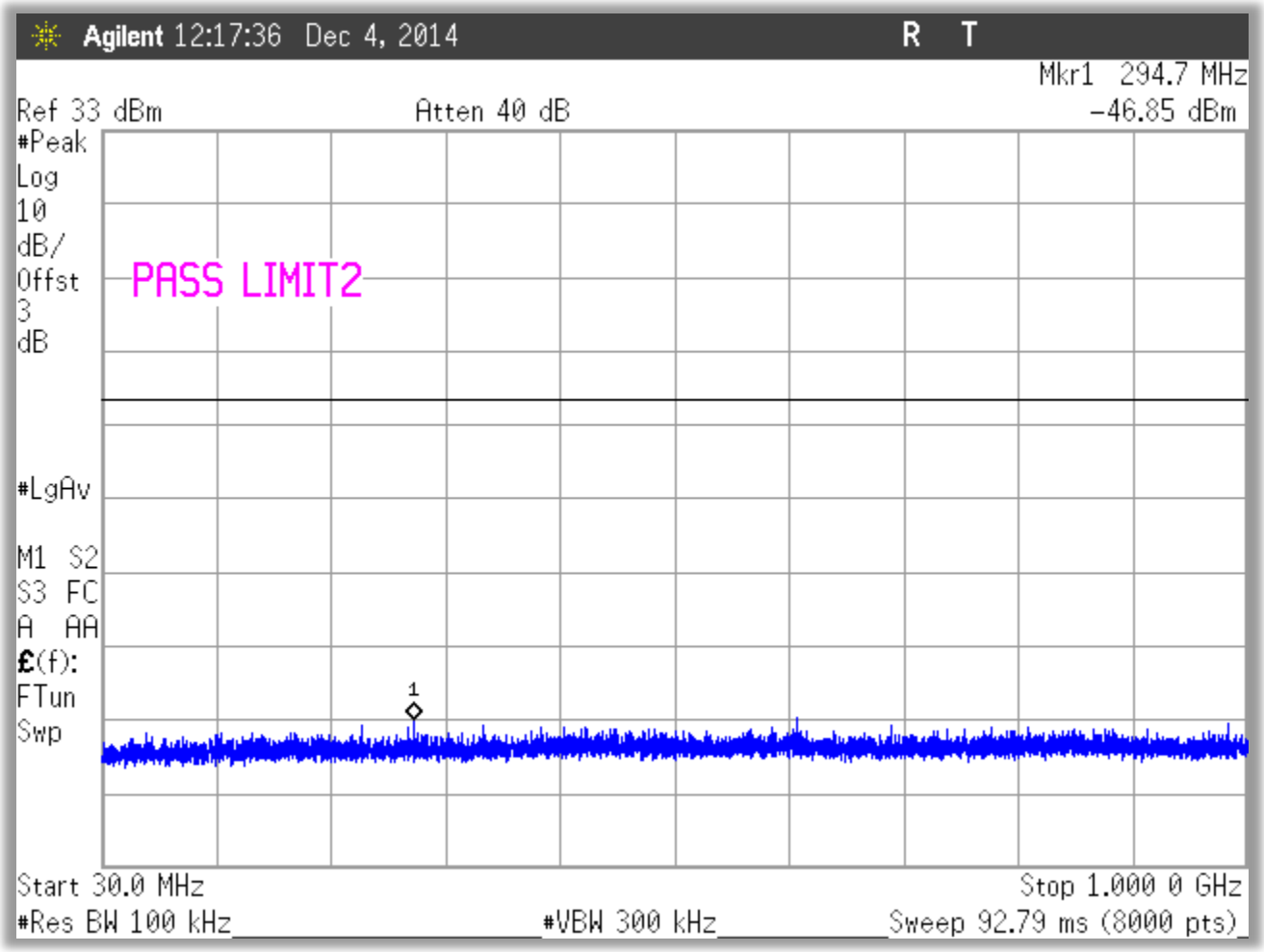

Figure 19: Conducted Spurious Emissions, Low Channel 30 - 1000MHz

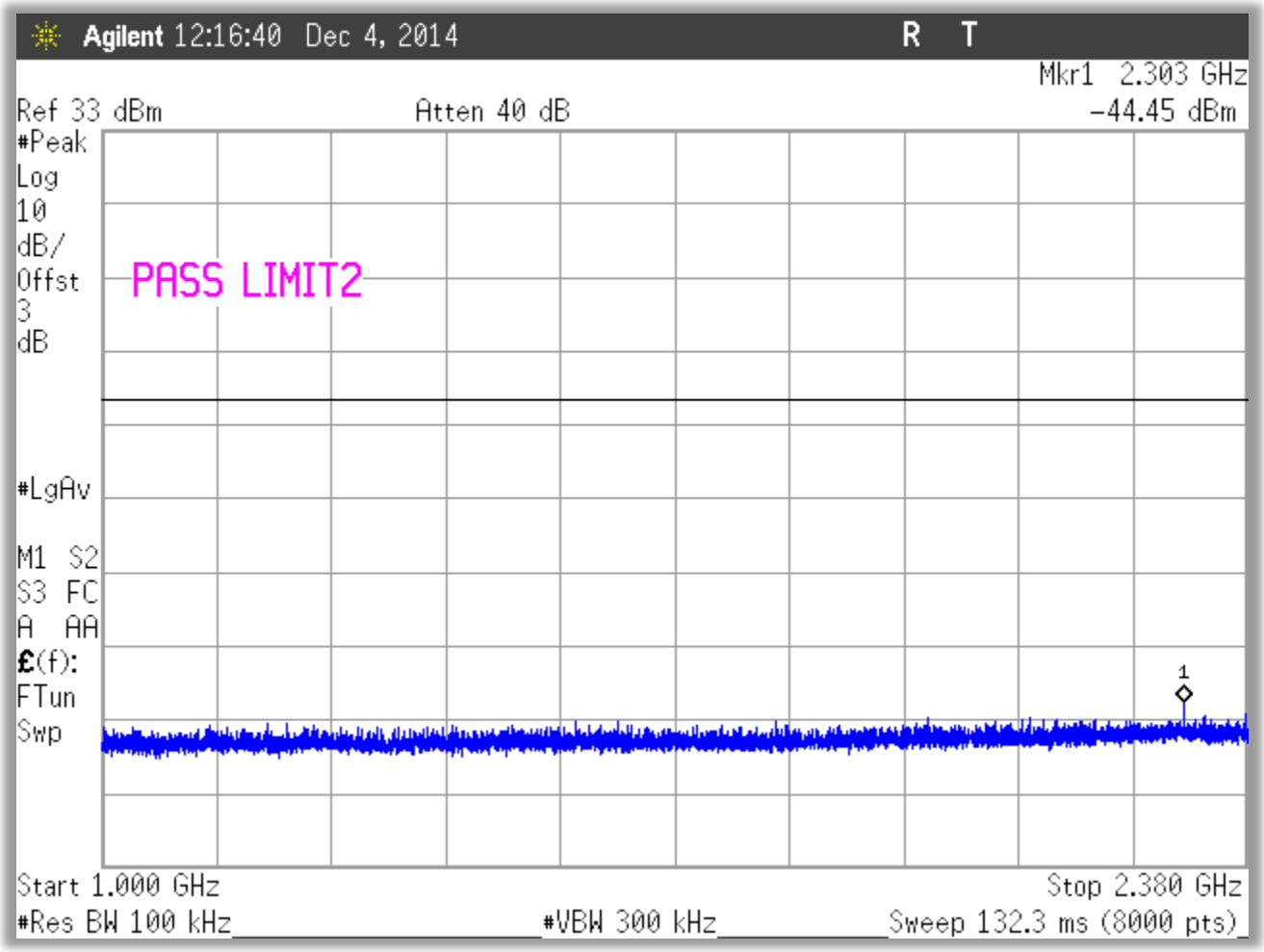

Figure 20: Conducted Spurious Emissions, Low Channel 1 – 2.38GHz

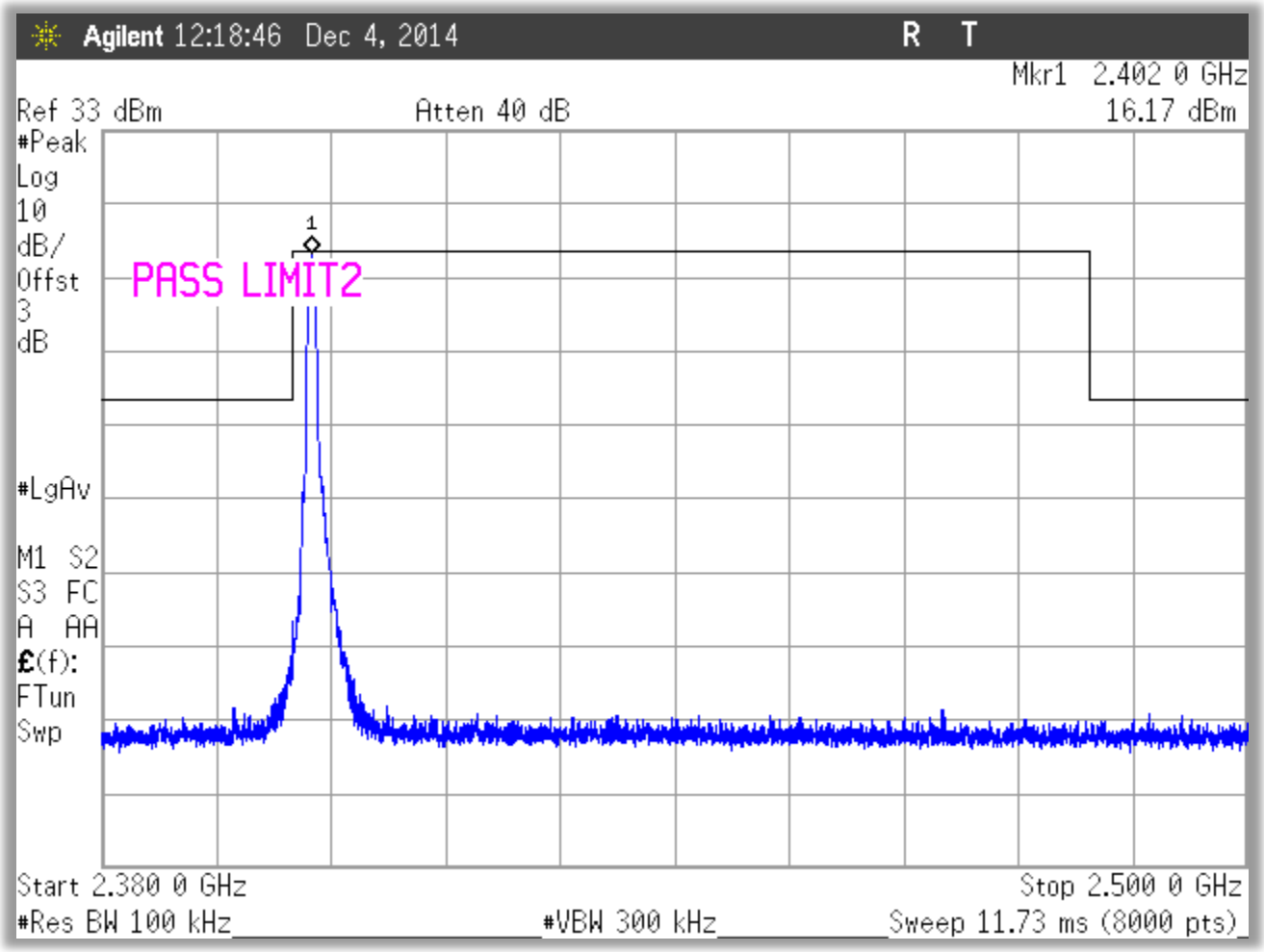

Figure 21: Conducted Spurious Emissions, Low Channel 2.38 – 2.5GHz

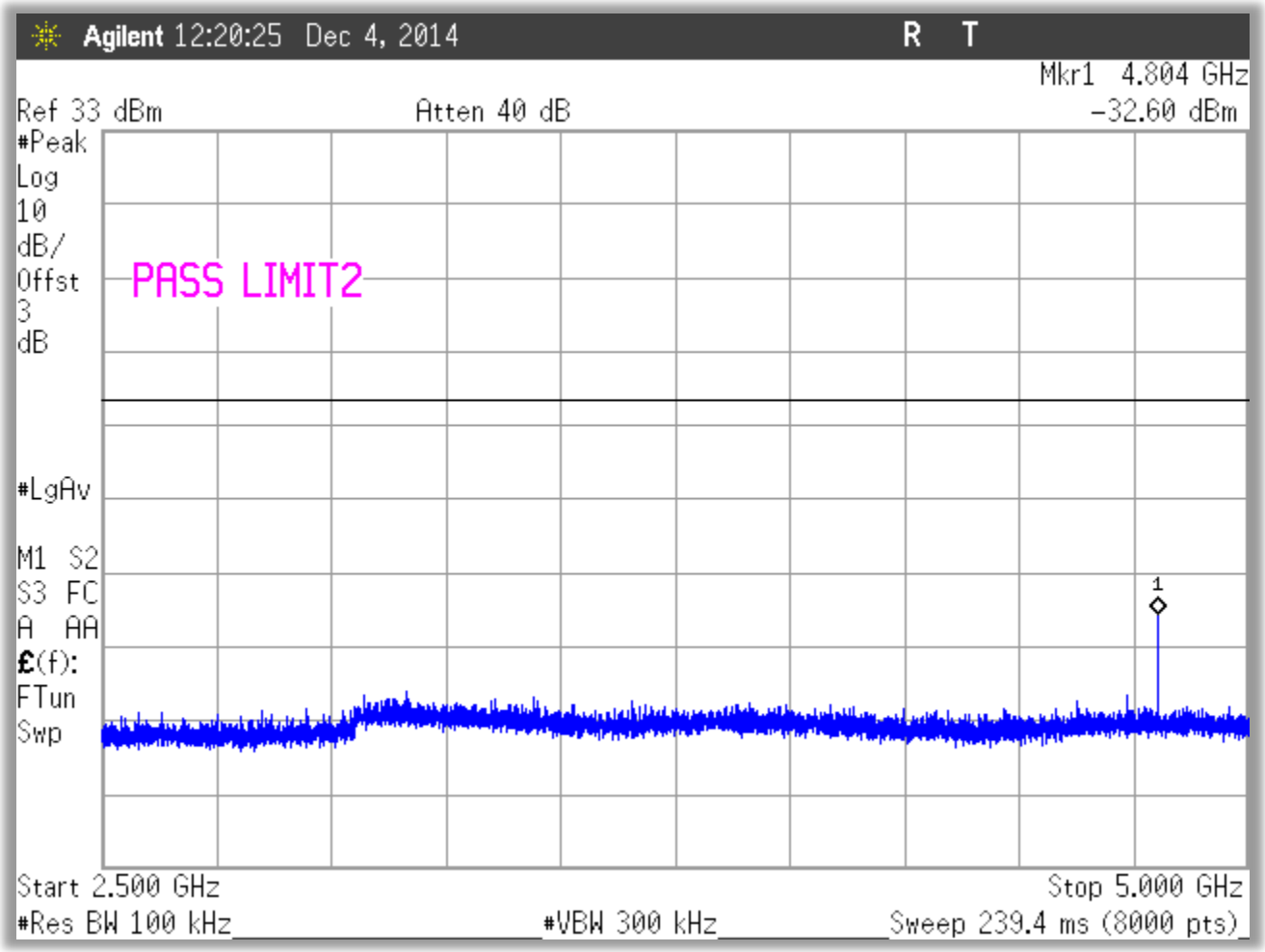

Figure 22: Conducted Spurious Emissions, Low Channel 2.5– 5GHz

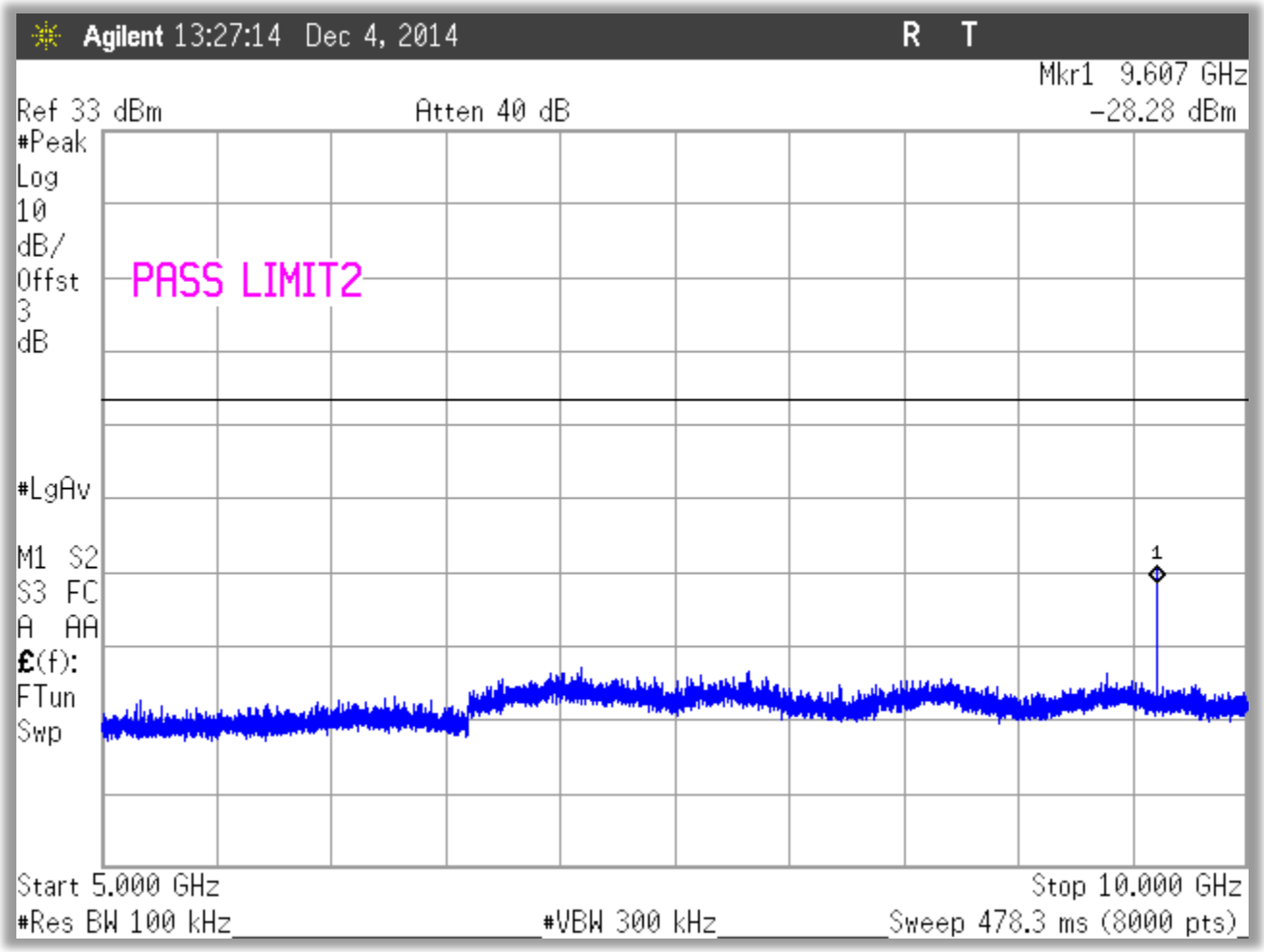

Figure 23: Conducted Spurious Emissions, Low Channel 5 - 10GHz

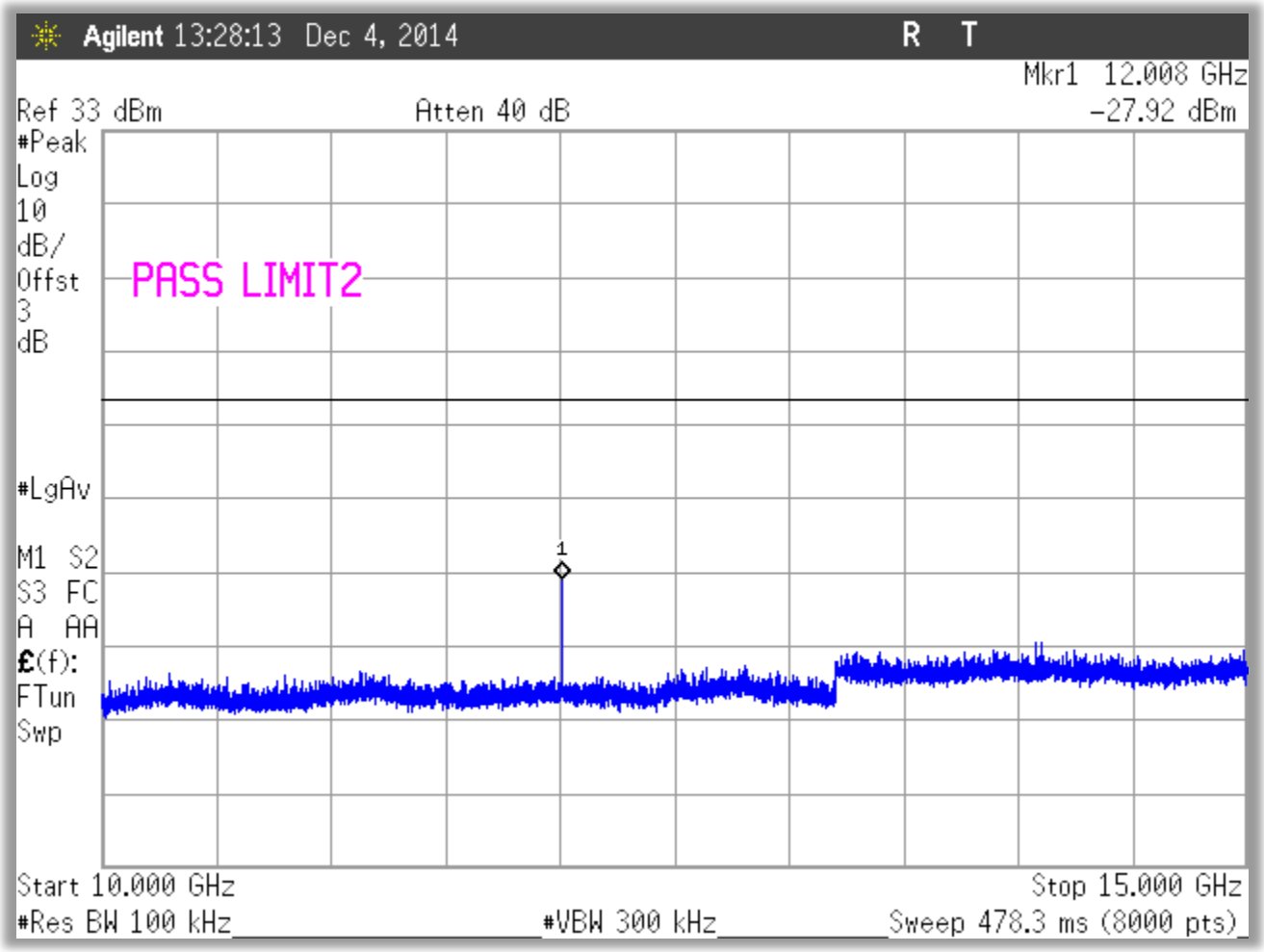

Figure 24: Conducted Spurious Emissions, Low Channel 10 - 15GHz

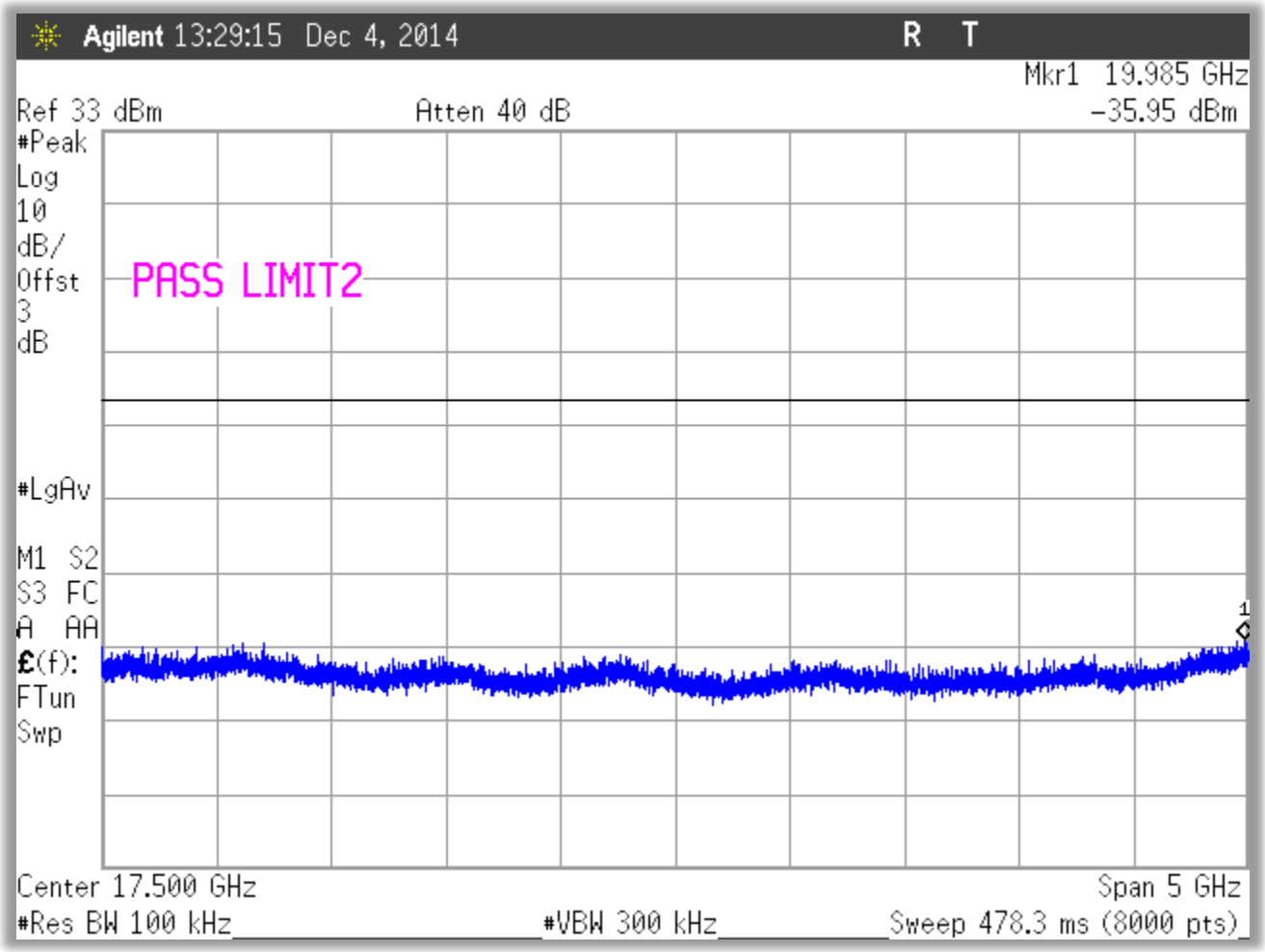

Figure 25: Conducted Spurious Emissions, Low Channel 15 - 20GHz

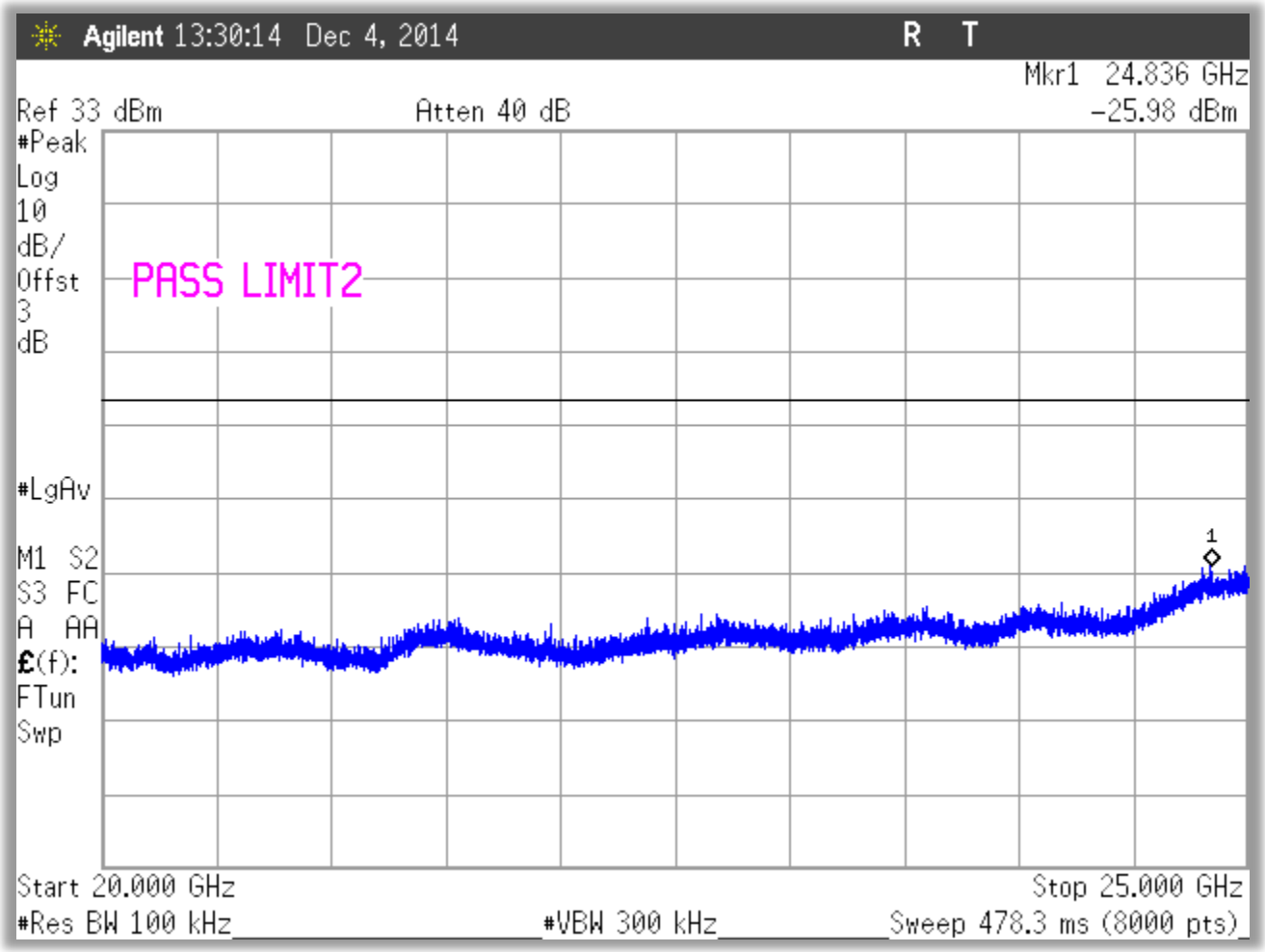

Figure 26: Conducted Spurious Emissions, Low Channel 20 - 25GHz

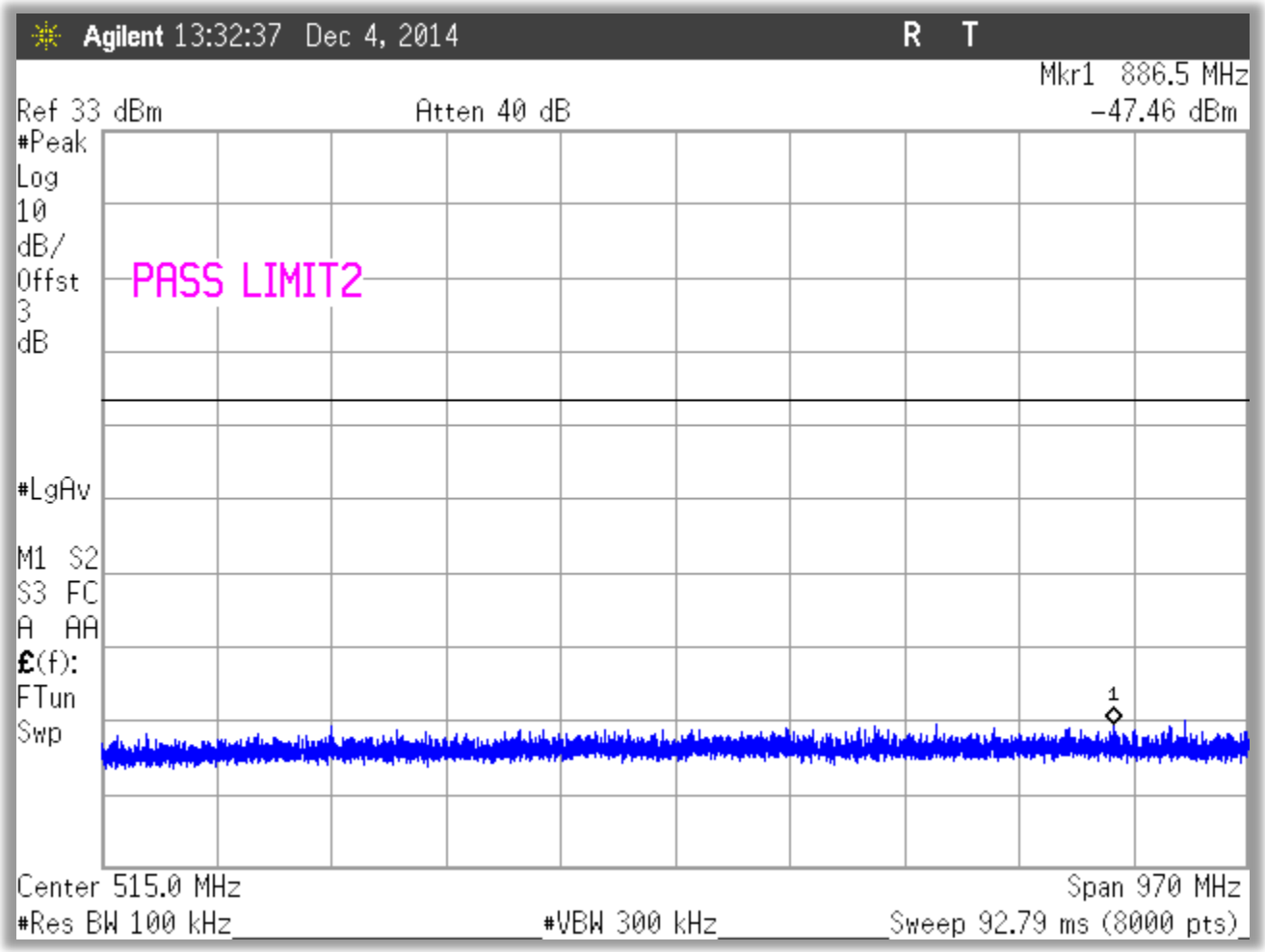

Figure 27: Conducted Spurious Emissions, Center Channel 30 - 1000MHz

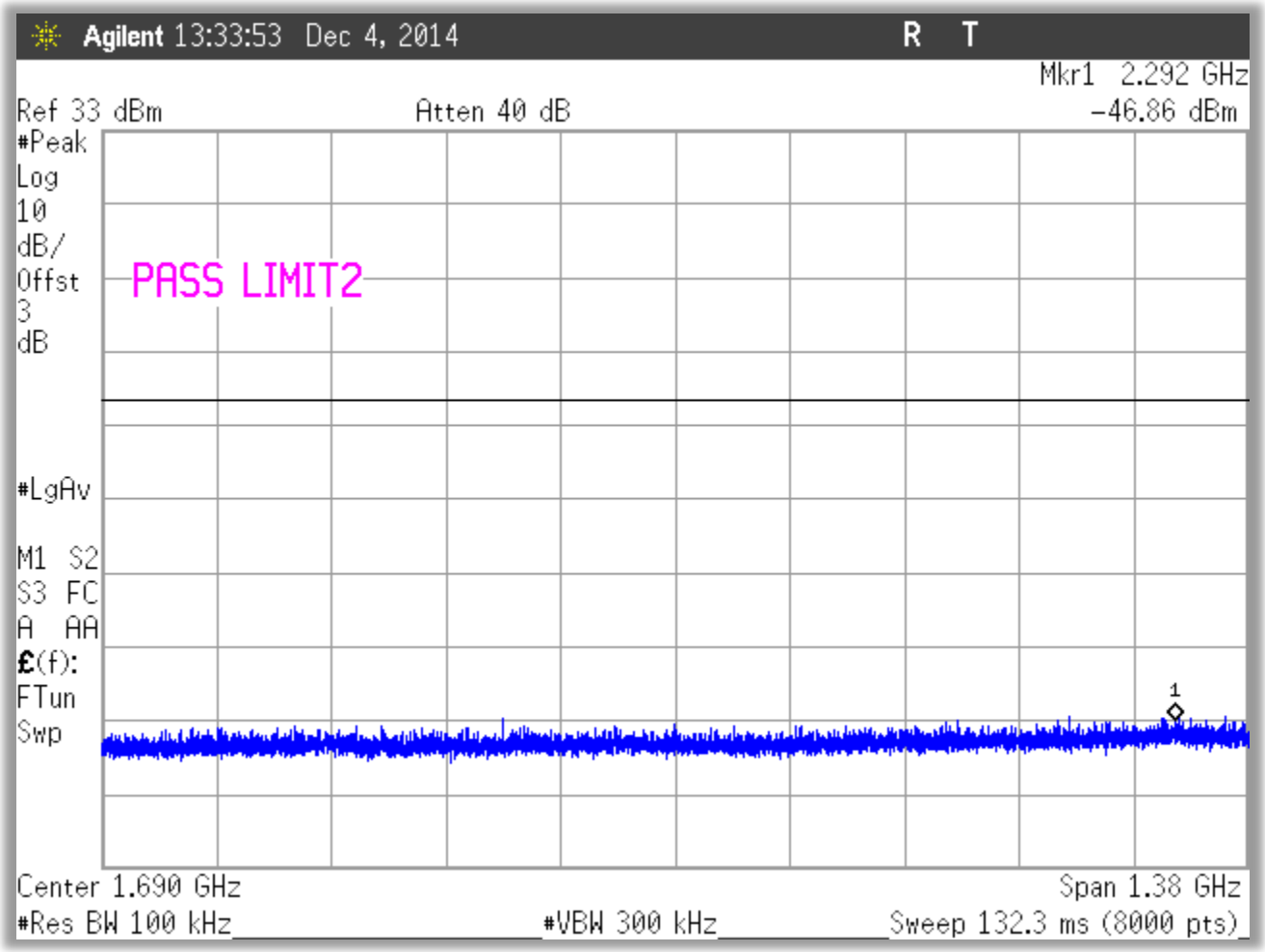

Figure 28: Conducted Spurious Emissions, Center Channel 1 – 2.38GHz

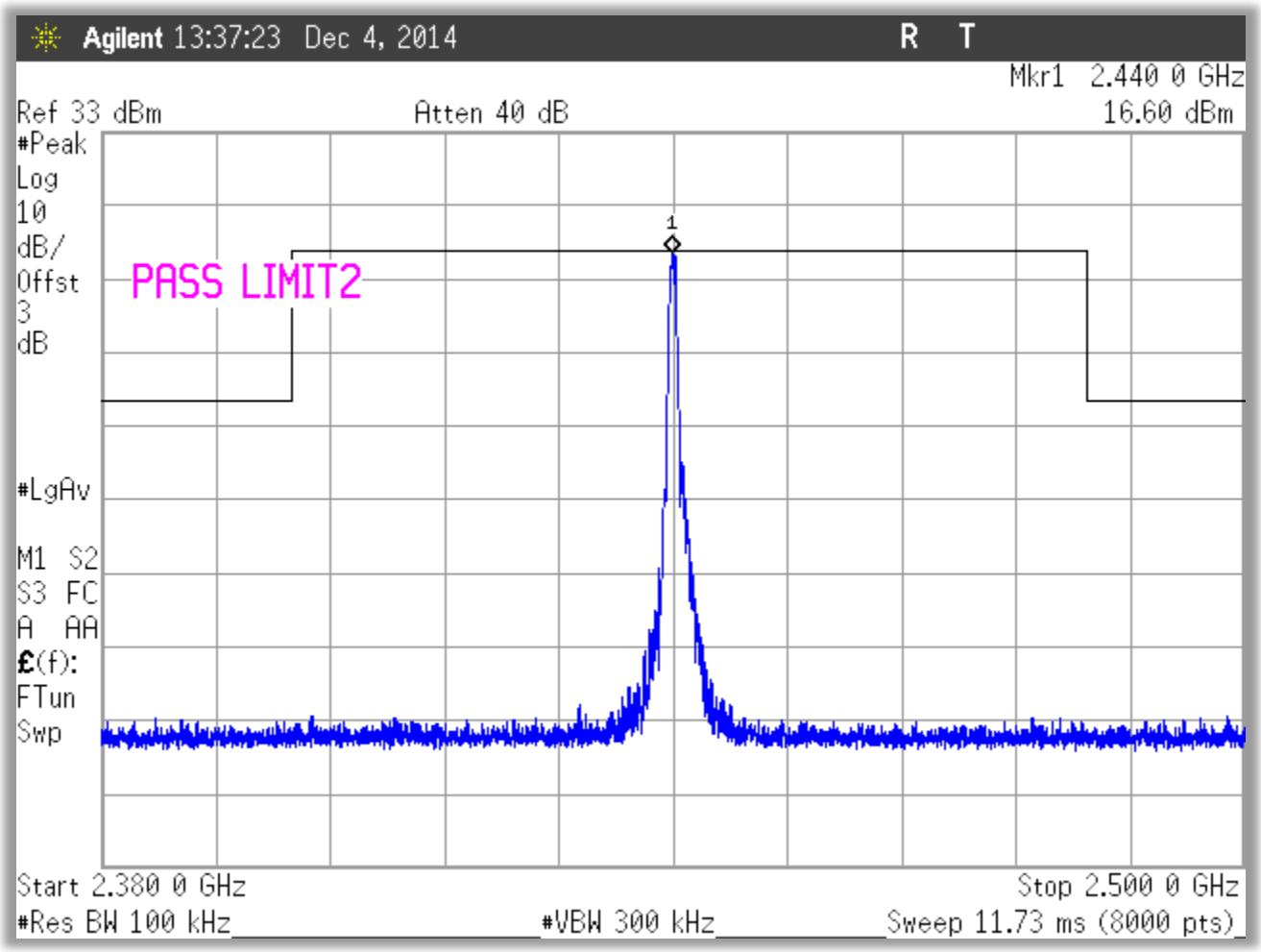

Figure 29: Conducted Spurious Emissions, Center Channel 2.38 – 2.5GHz

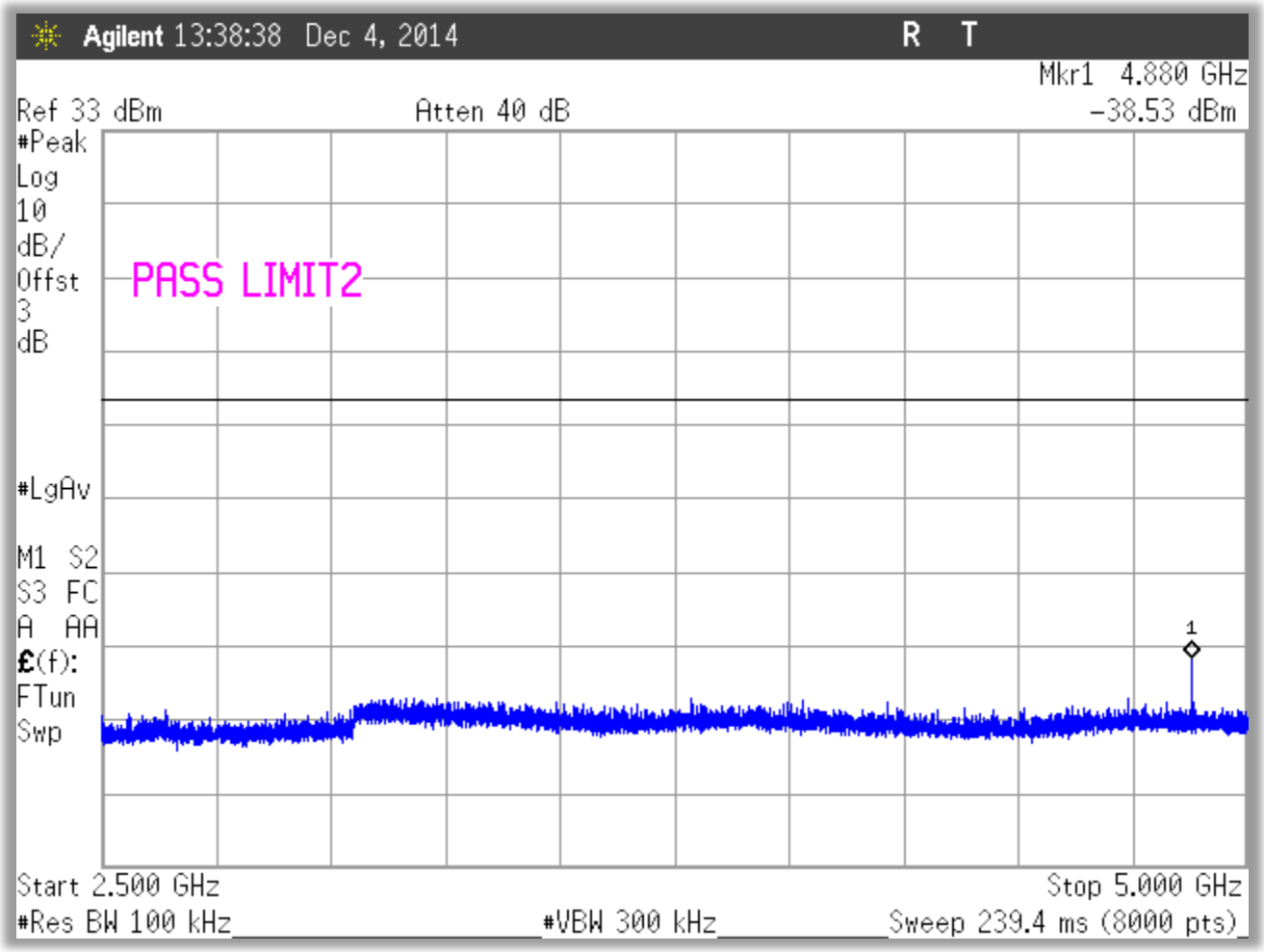

Figure 30: Conducted Spurious Emissions, Center Channel 2.5 - 5GHz

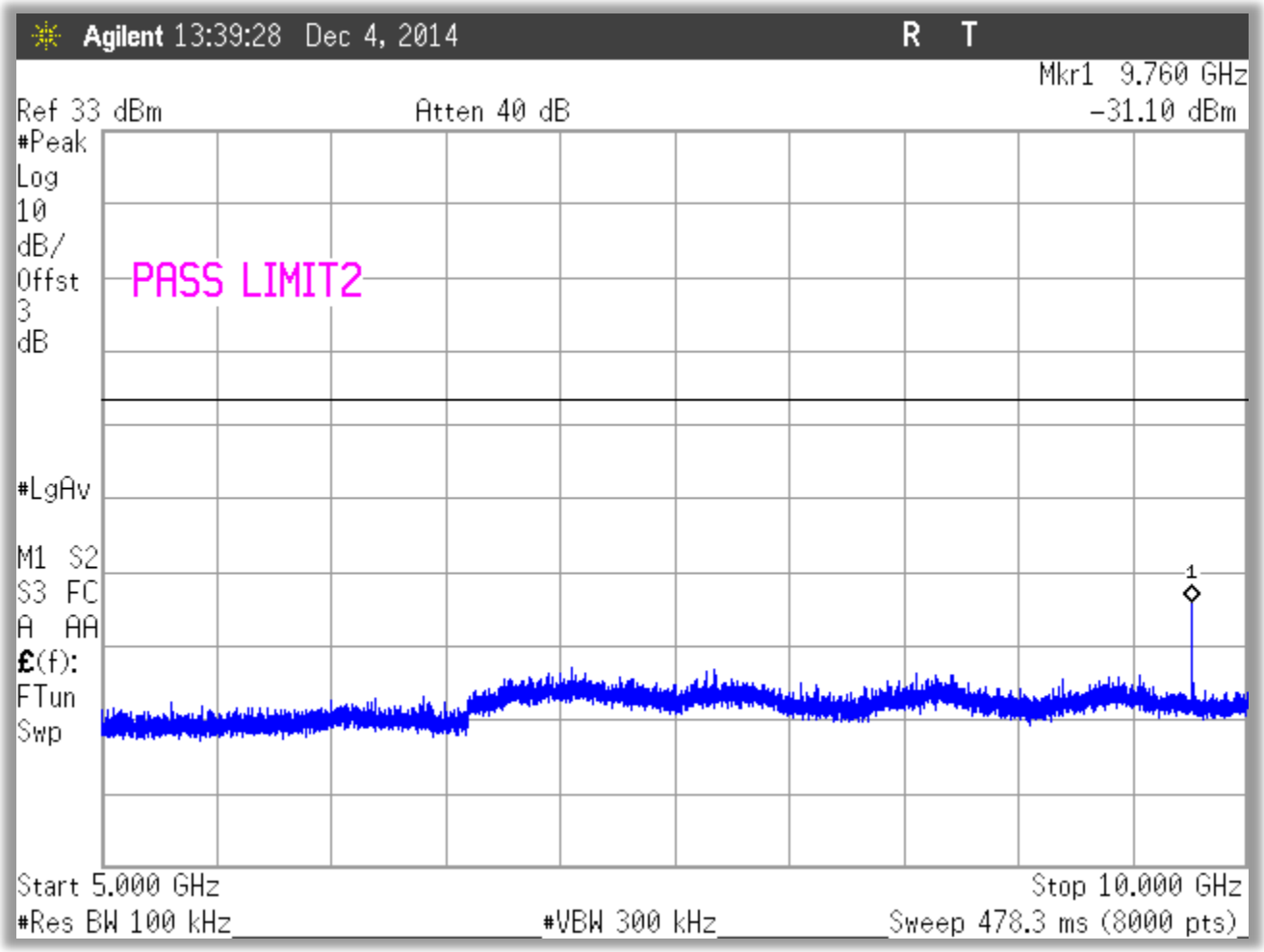

Figure 31: Conducted Spurious Emissions, Center Channel 5 – 10GHz

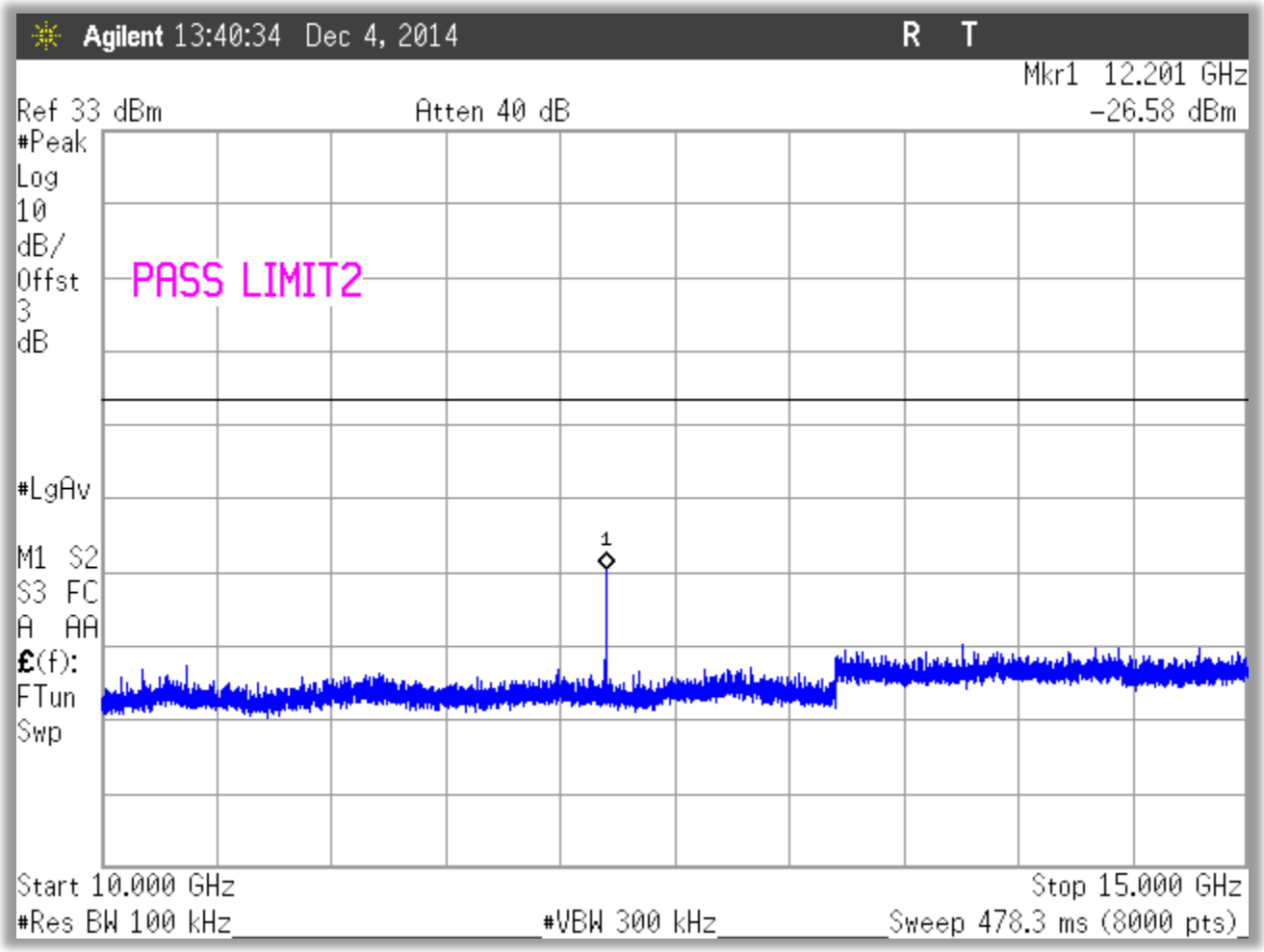

Figure 32: Conducted Spurious Emissions, Center Channel 10 - 15GHz

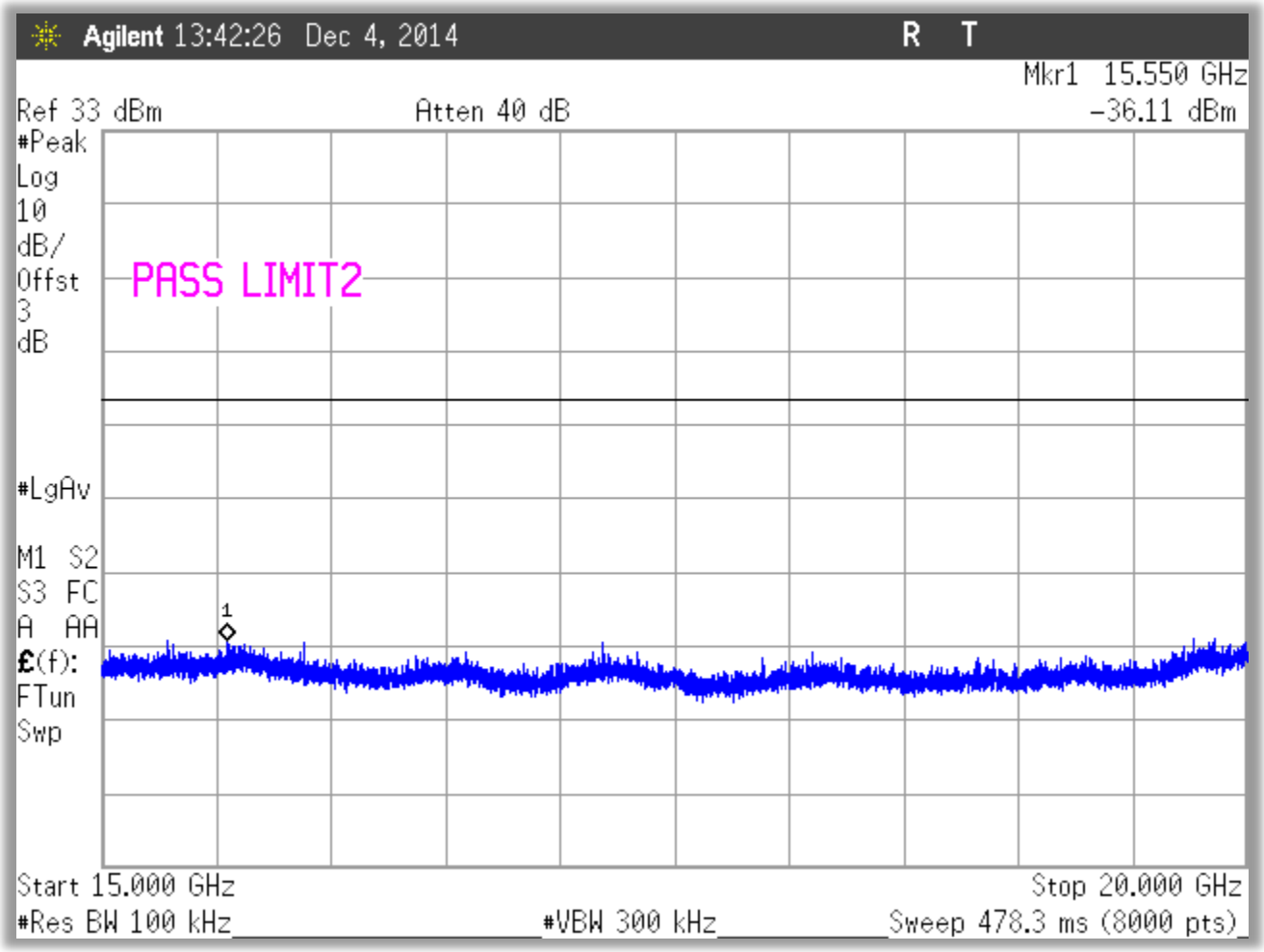

Figure 33: Conducted Spurious Emissions, Center Channel 15 - 20GHz

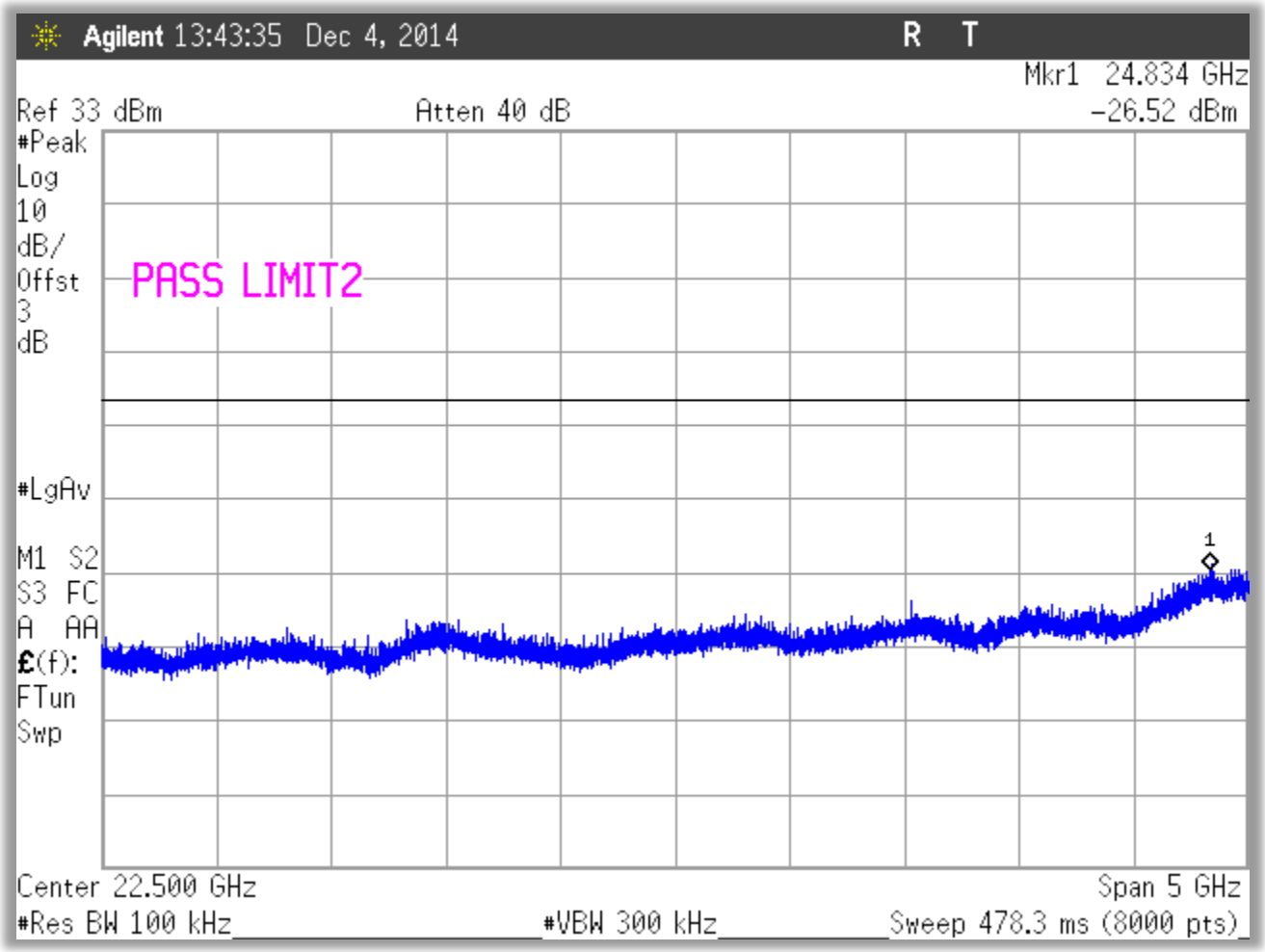

Figure 34: Conducted Spurious Emissions, Center Channel 20 - 25GHz

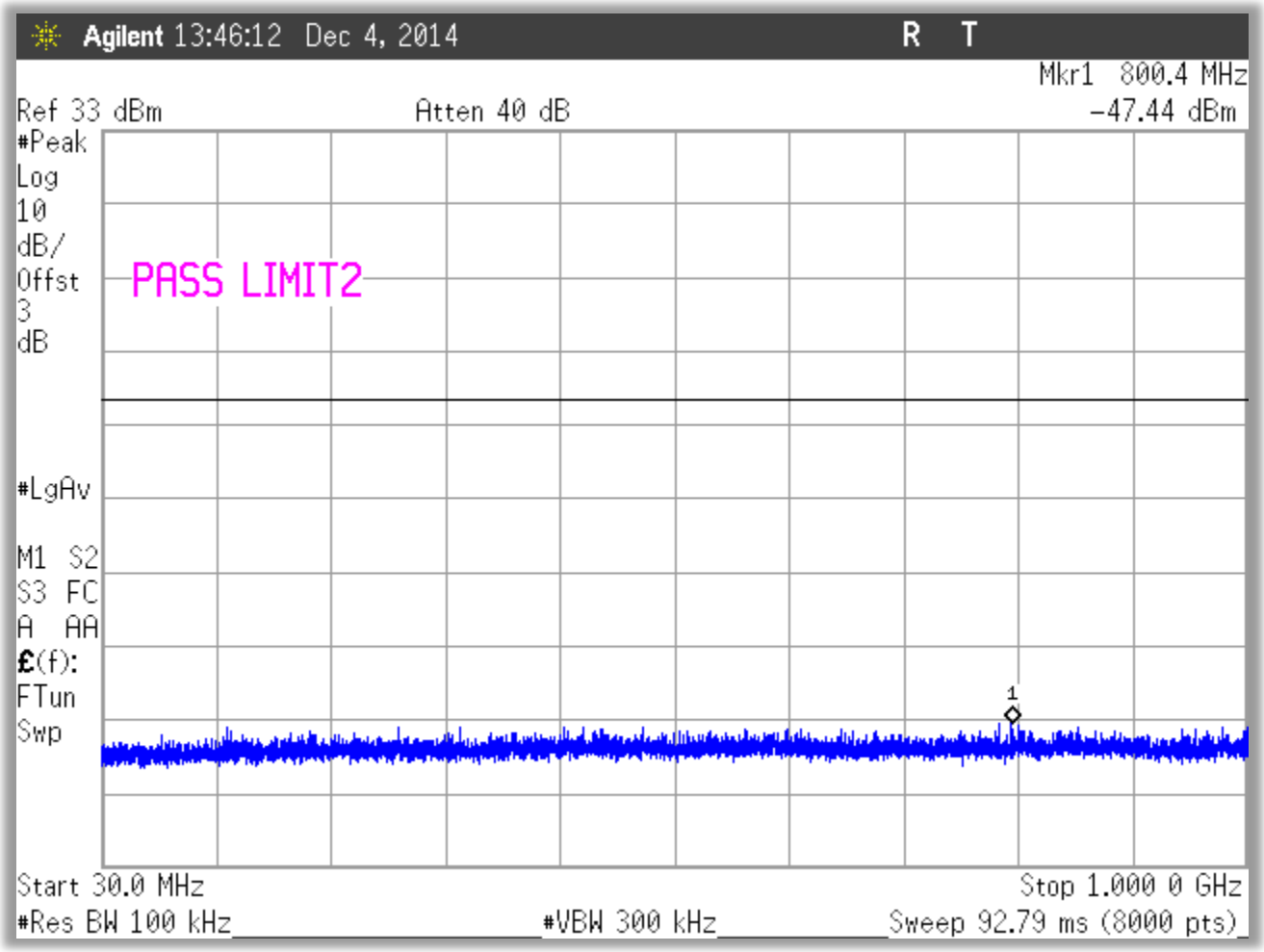

Figure 35: Conducted Spurious Emissions, High Channel 30 - 1000MHz

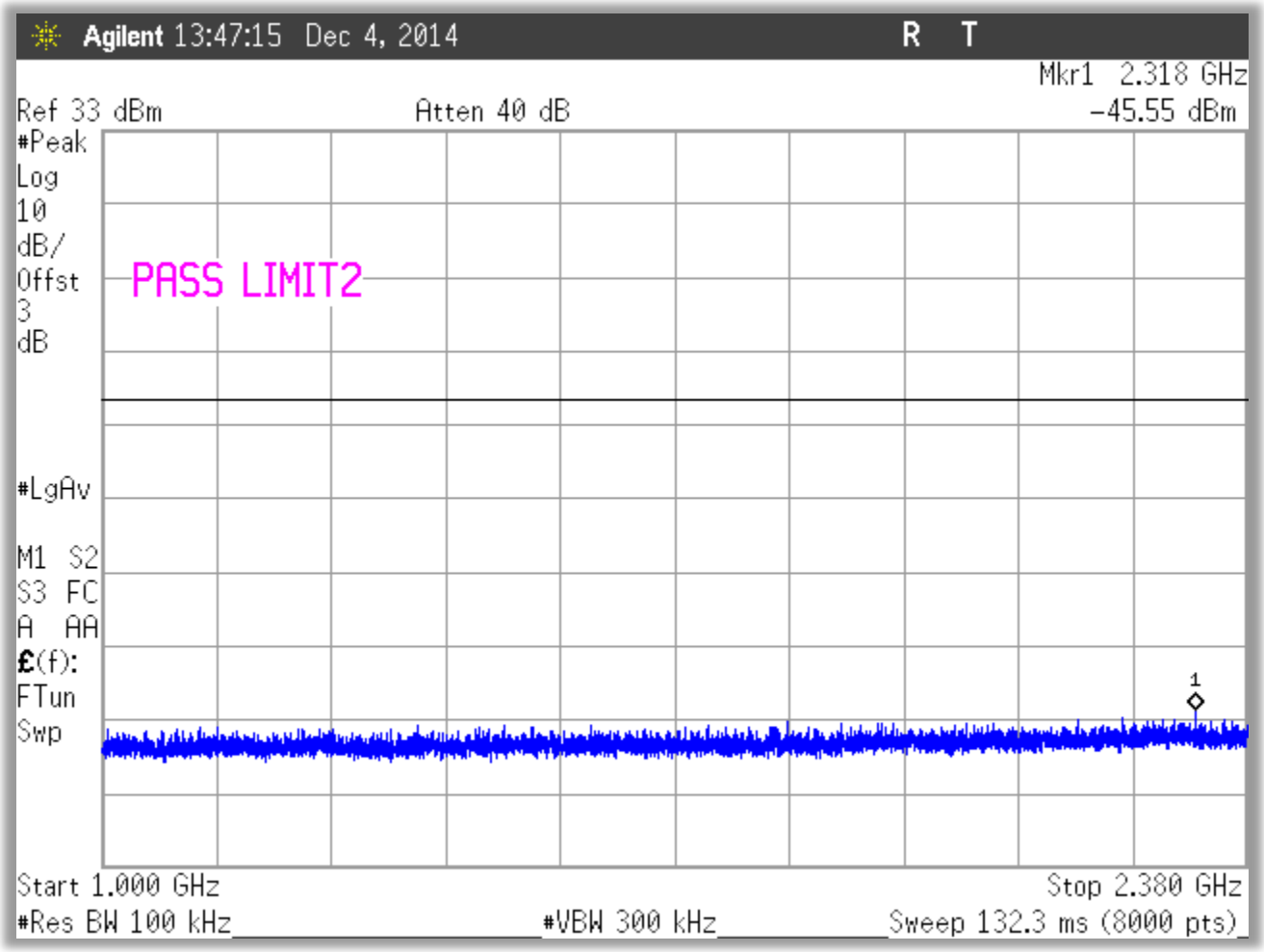

Figure 36: Conducted Spurious Emissions, High Channel 1 – 2.38GHz

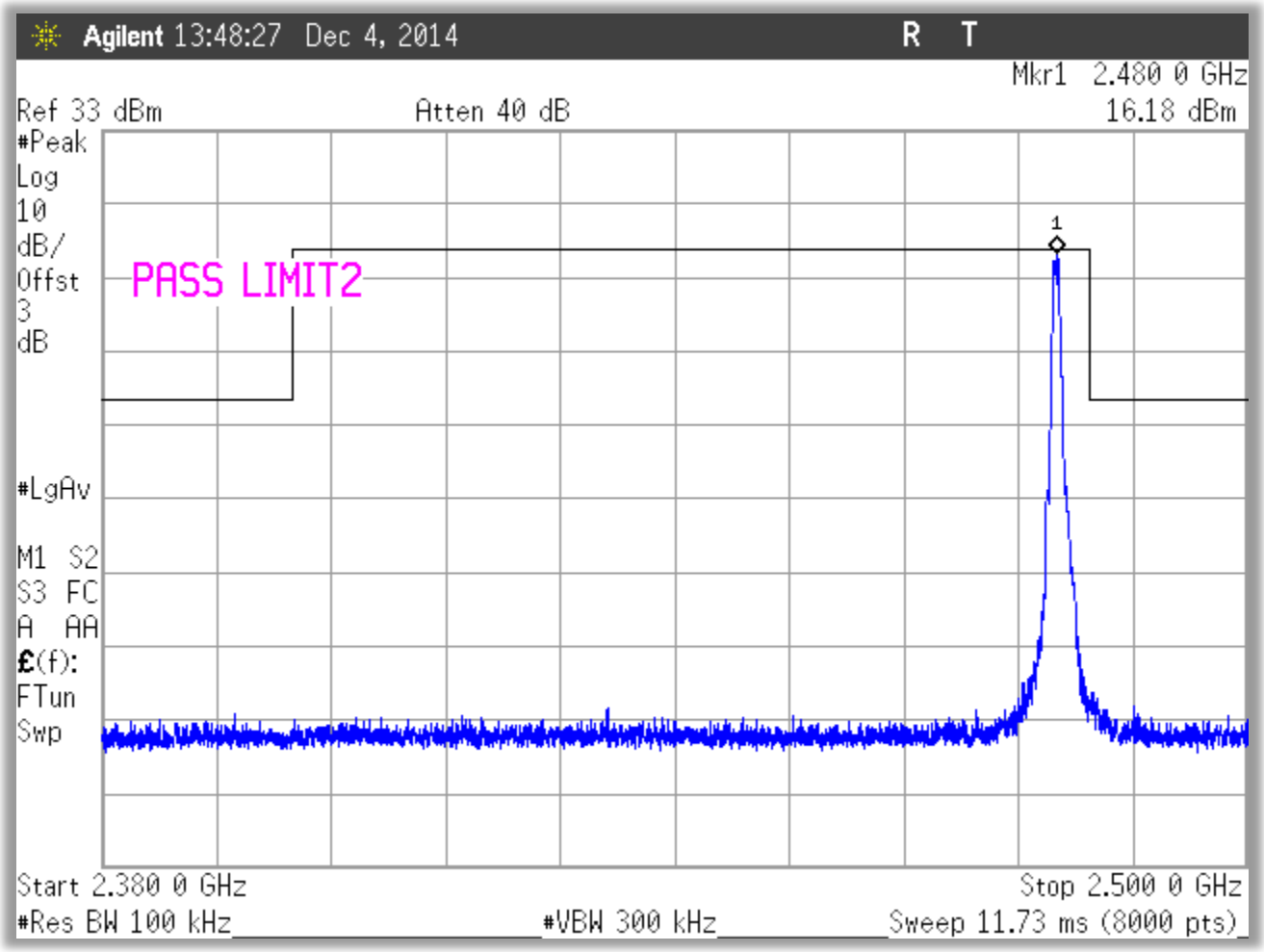

Figure 37: Conducted Spurious Emissions, High Channel 2.38 – 2.5GHz

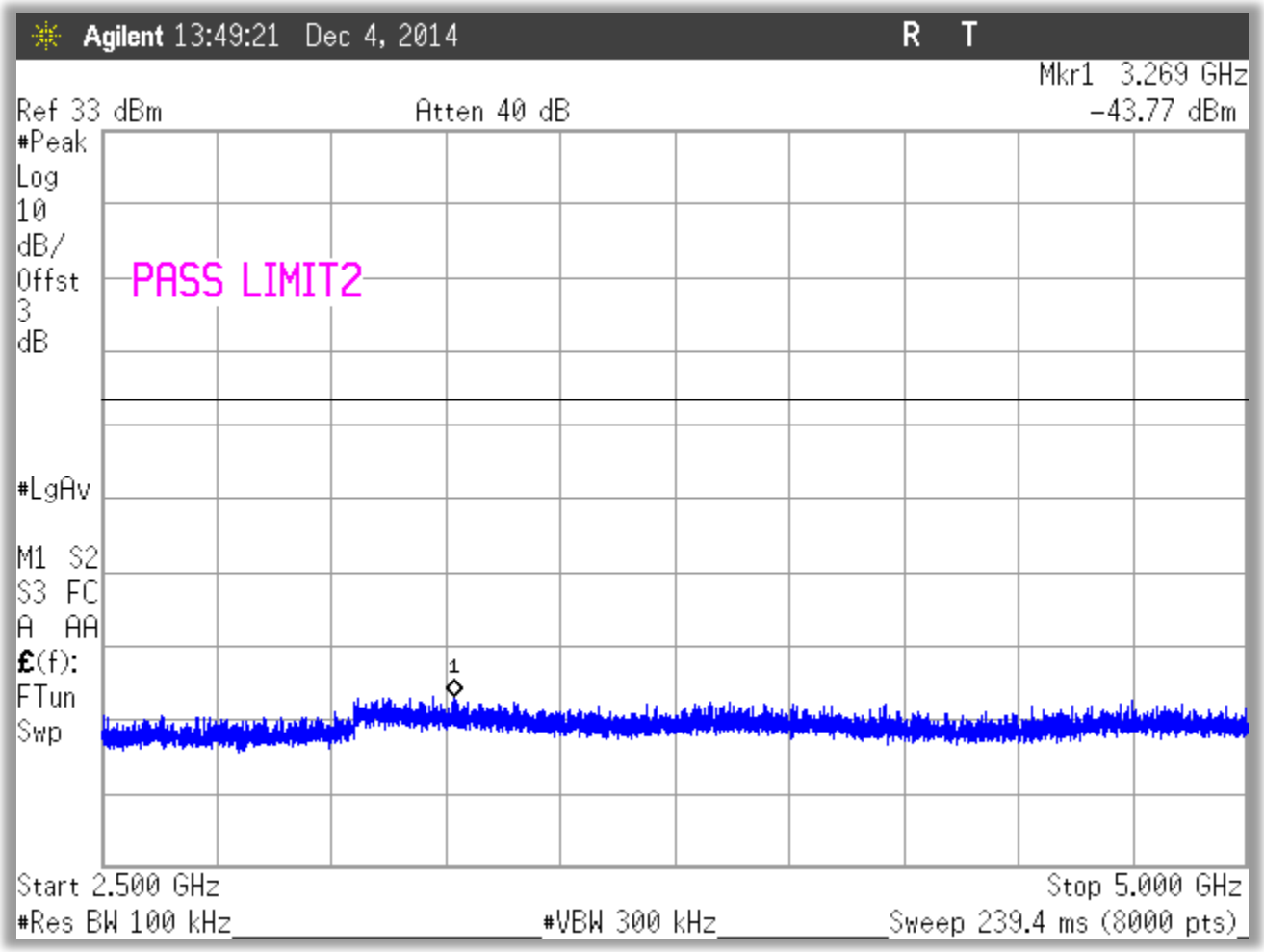

Figure 38: Conducted Spurious Emissions, High Channel 2.38 – 5GHz

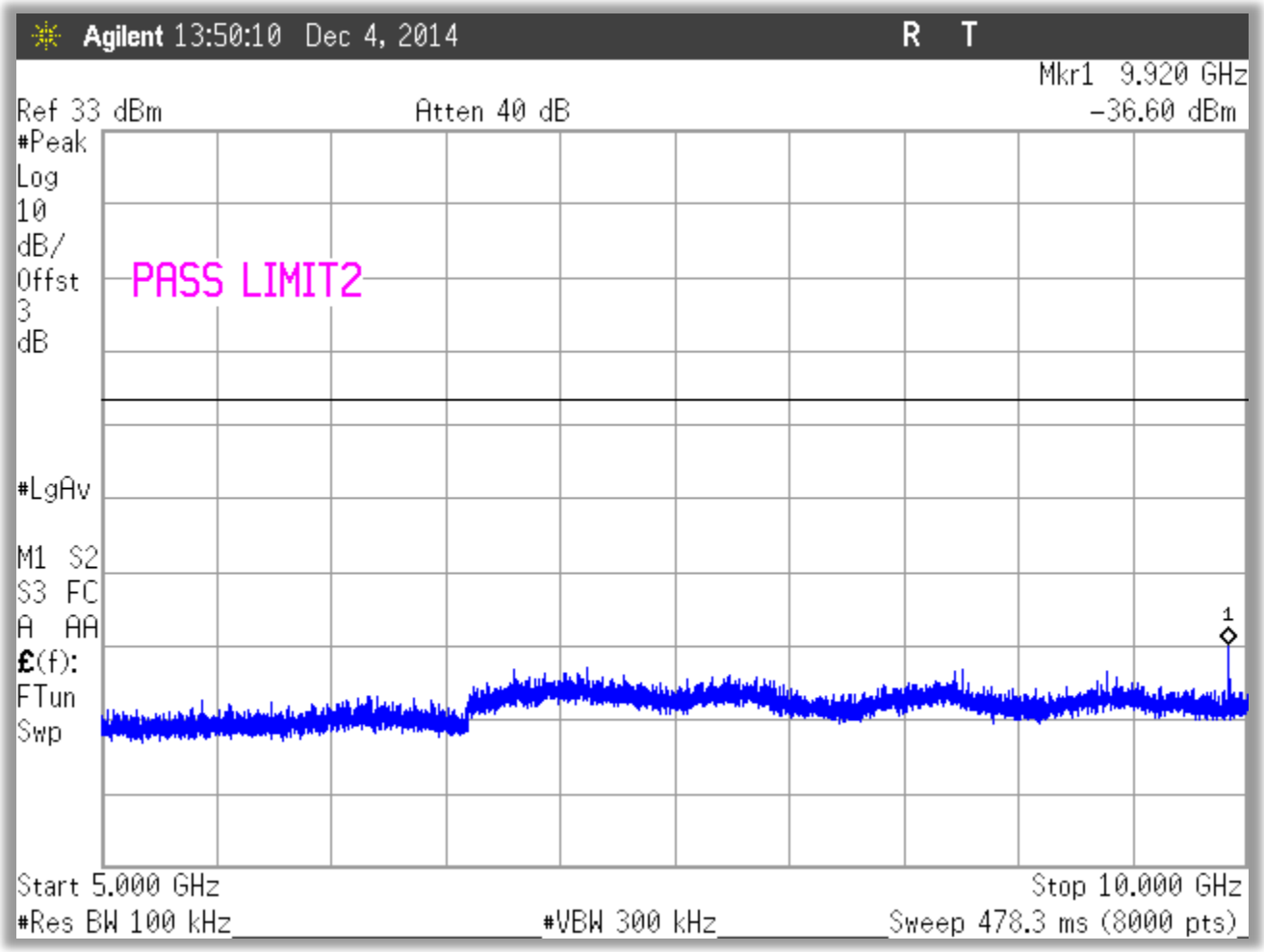

Figure 39: Conducted Spurious Emissions, High Channel 5 - 10GHz

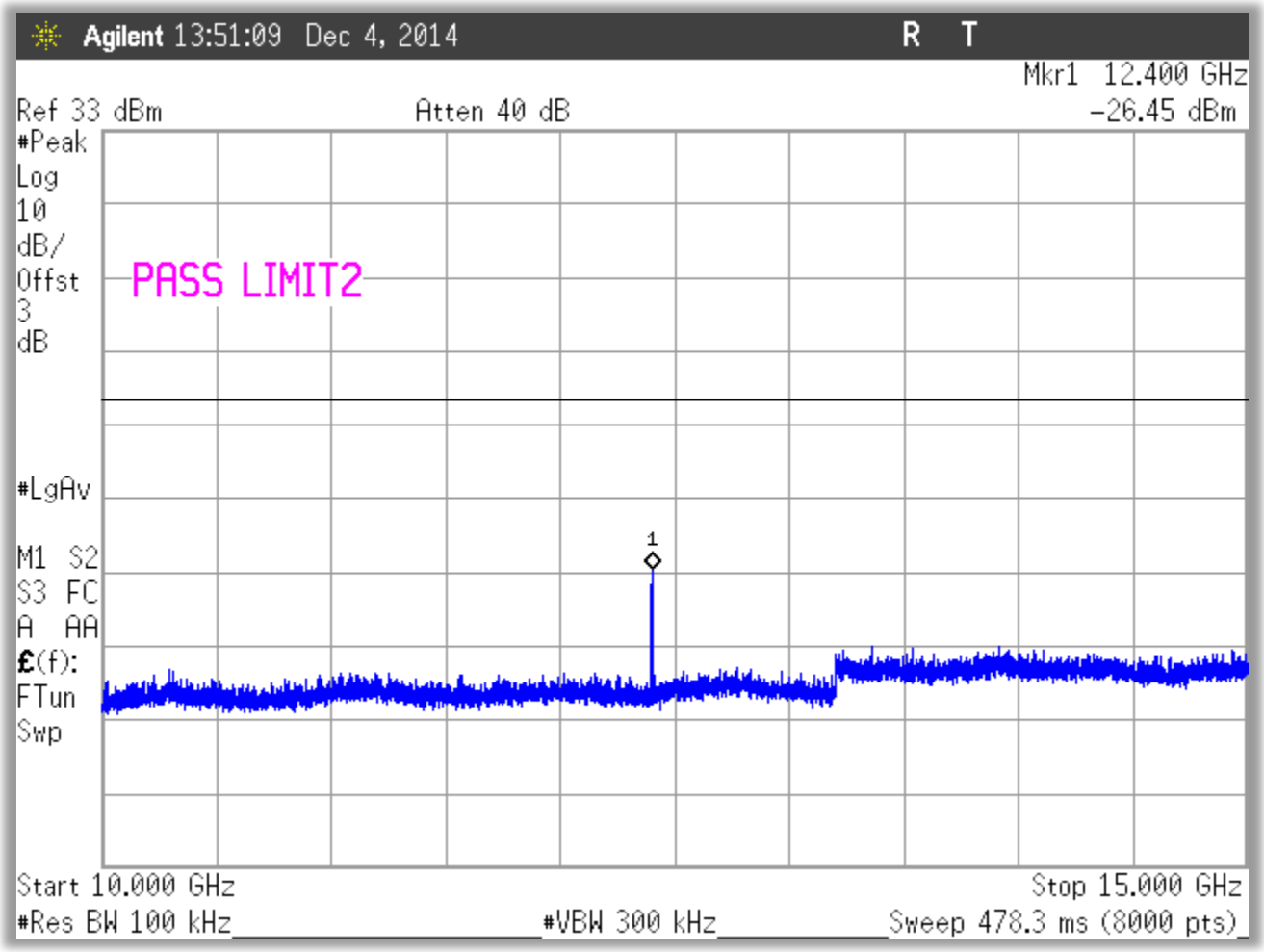

Figure 40: Conducted Spurious Emissions, High Channel 10 - 15GHz

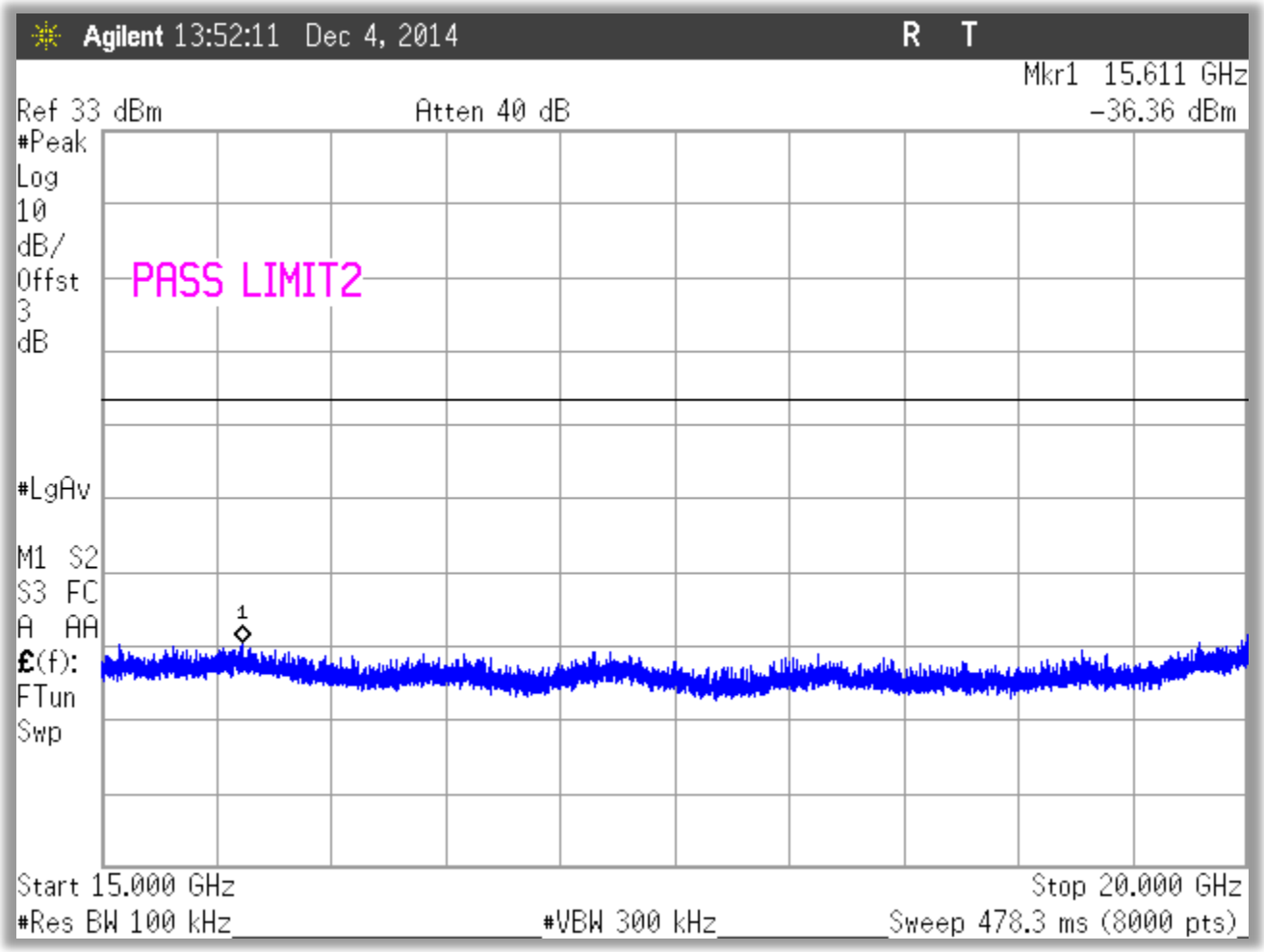

Figure 41: Conducted Spurious Emissions, High Channel 15 - 20GHz

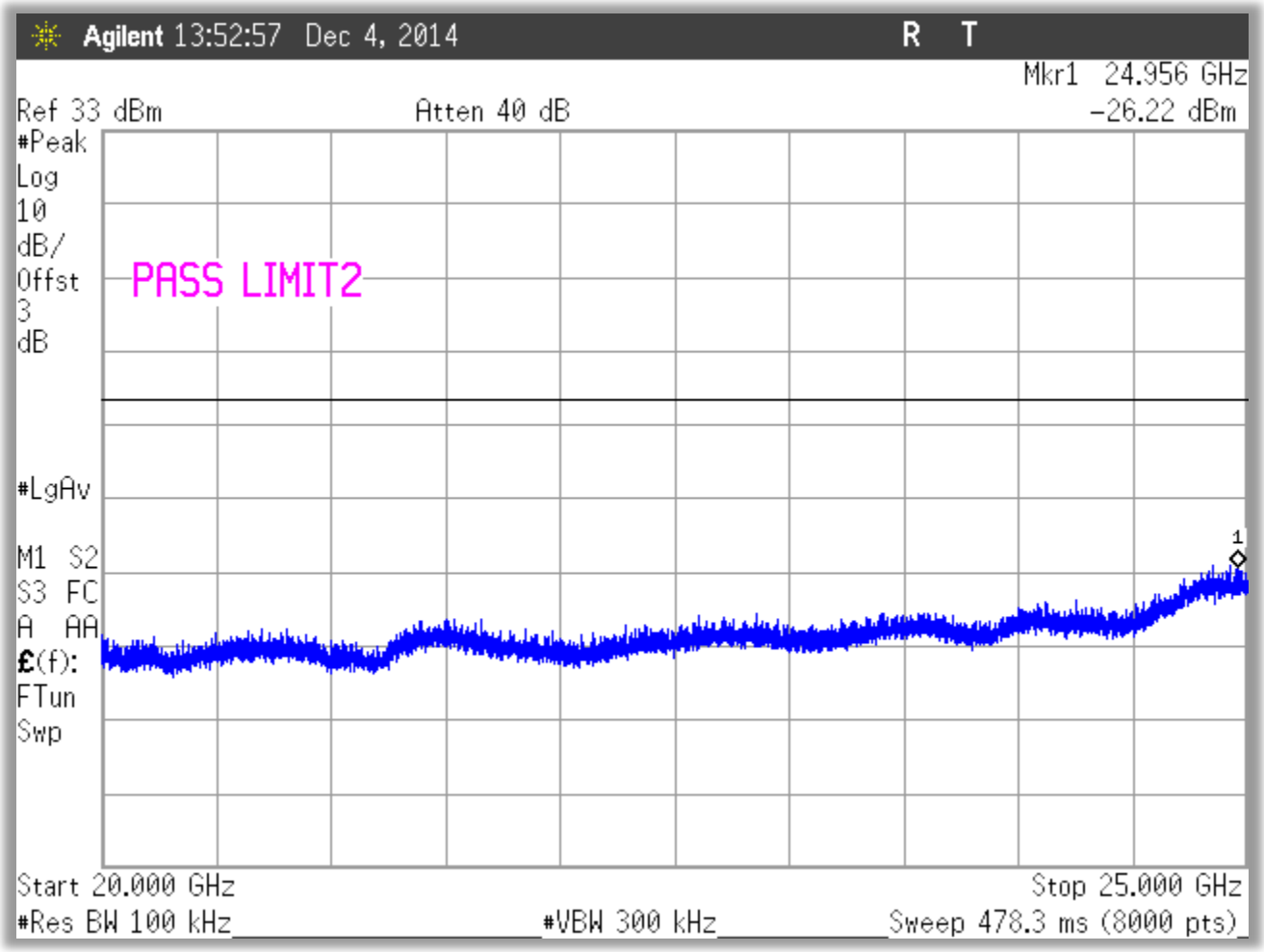

Figure 42: Conducted Spurious Emissions, High Channel 20 - 25GHz

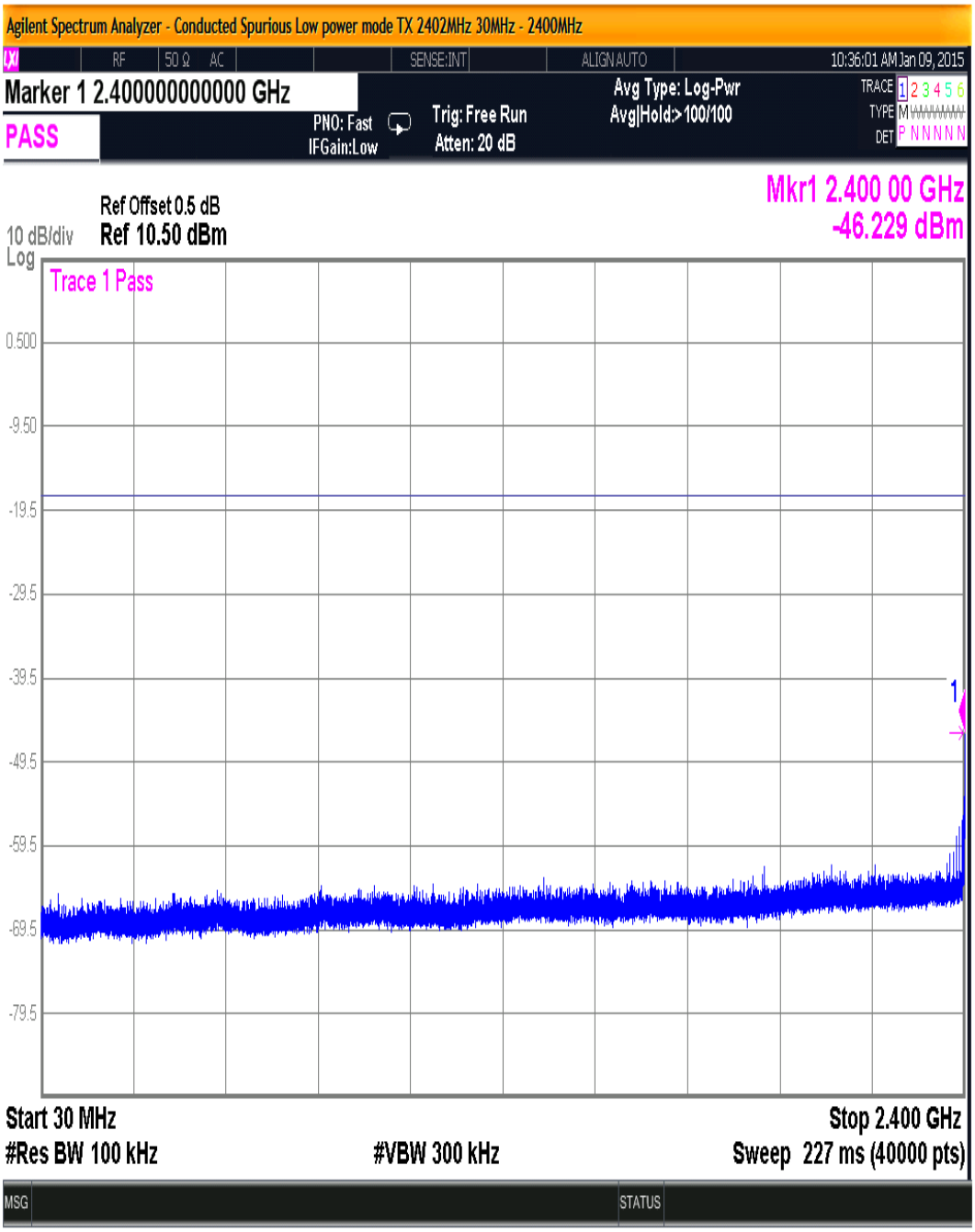

Figure 43. Conducted Spurious Low power mode TX 2402MHz 30MHz - 2400MHz

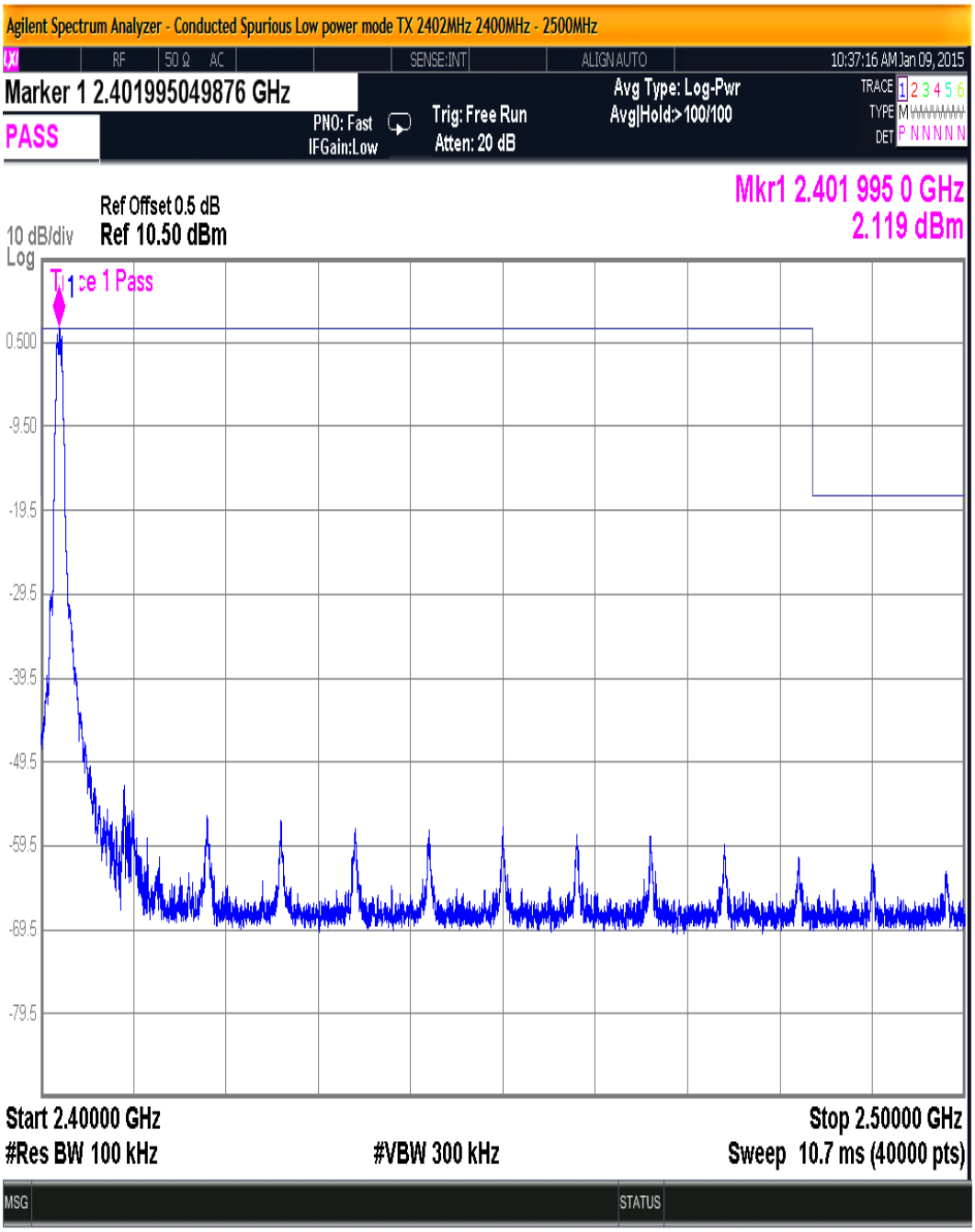

Figure 44. Conducted Spurious Low power mode TX 2402MHz 2400MHz - 2500MHz

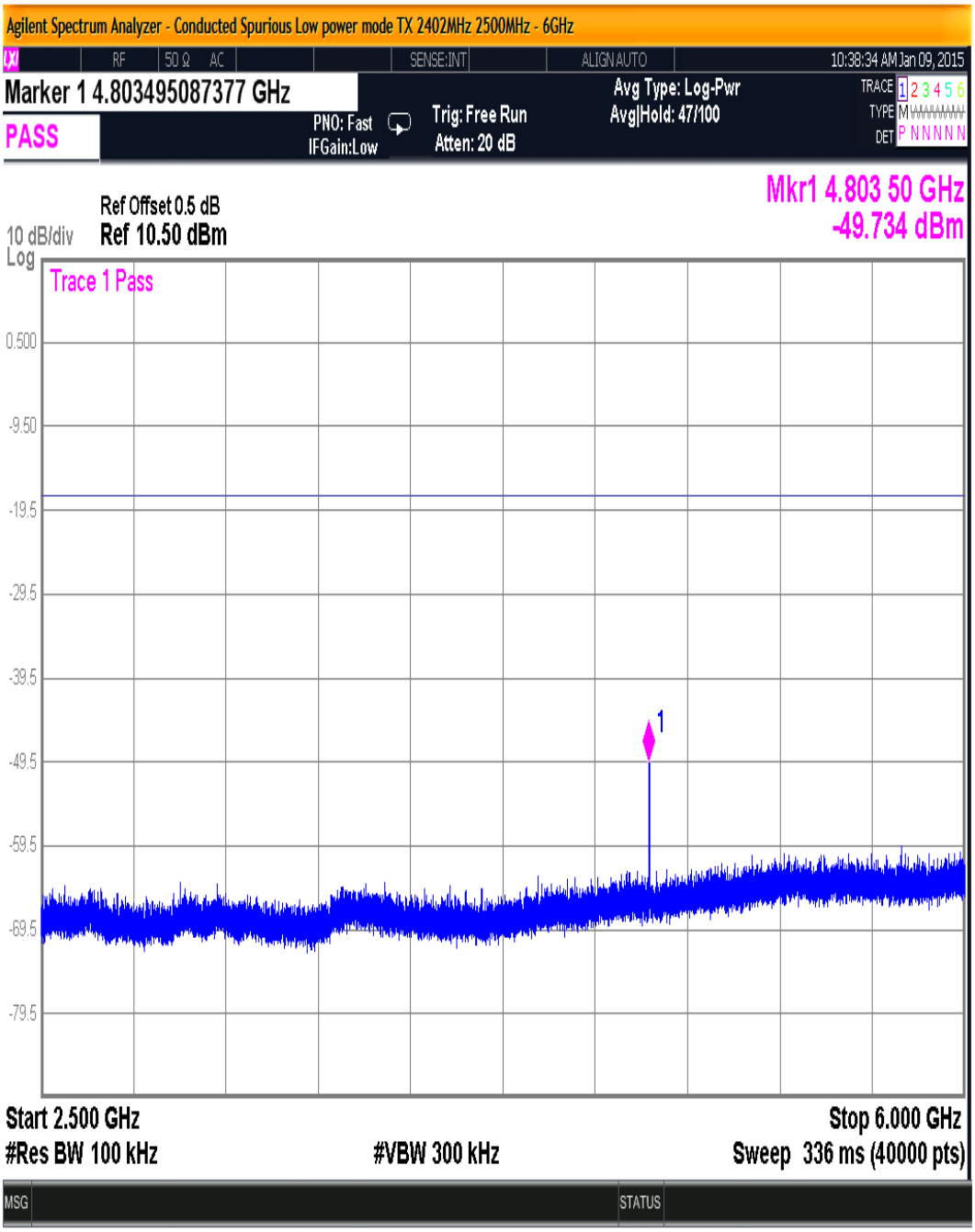

Figure 45. Conducted Spurious Low power mode TX 2402MHz 2500MHz - 6GHz

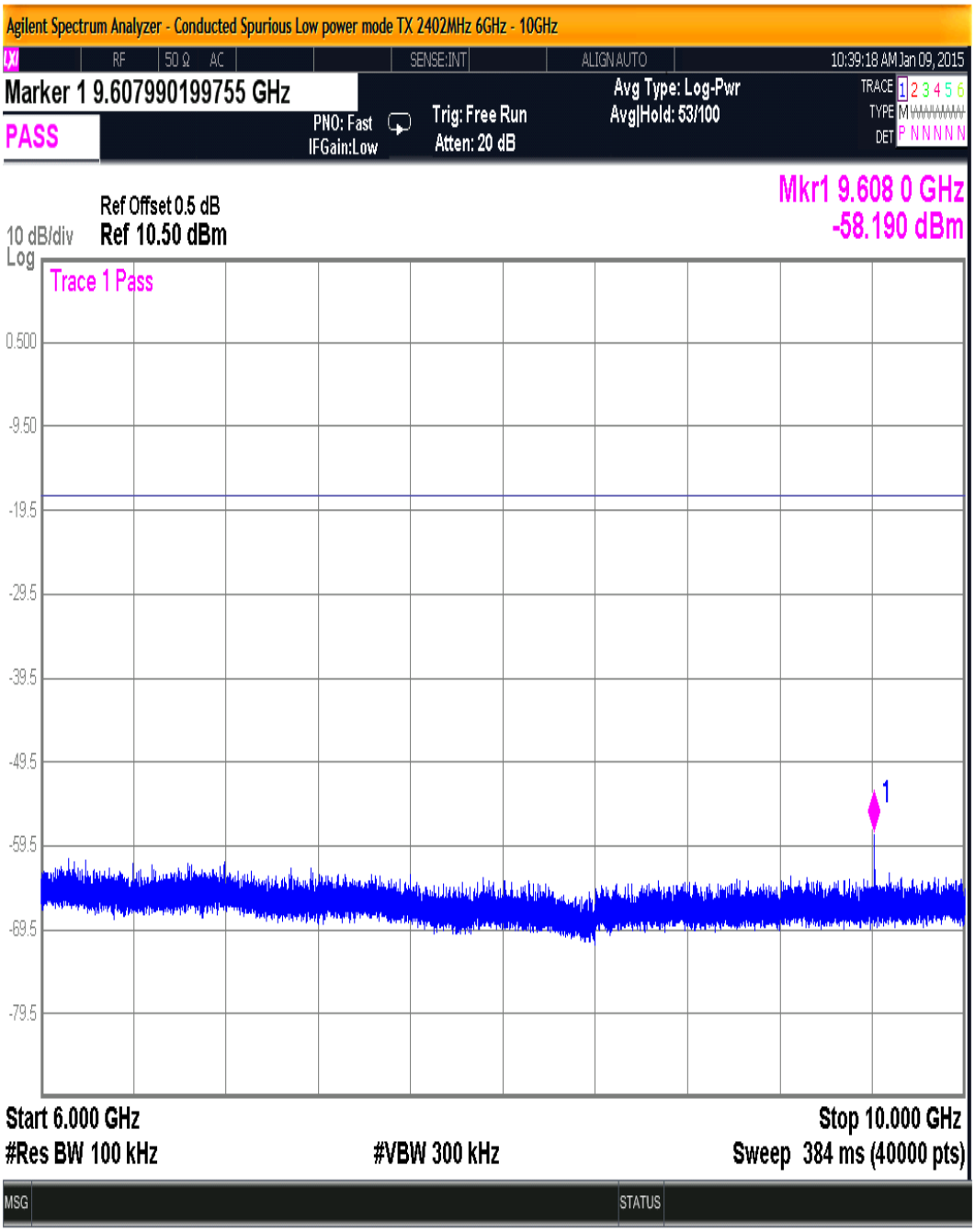

Figure 46. Conducted Spurious Low power mode TX 2402MHz 6GHz - 10GHz

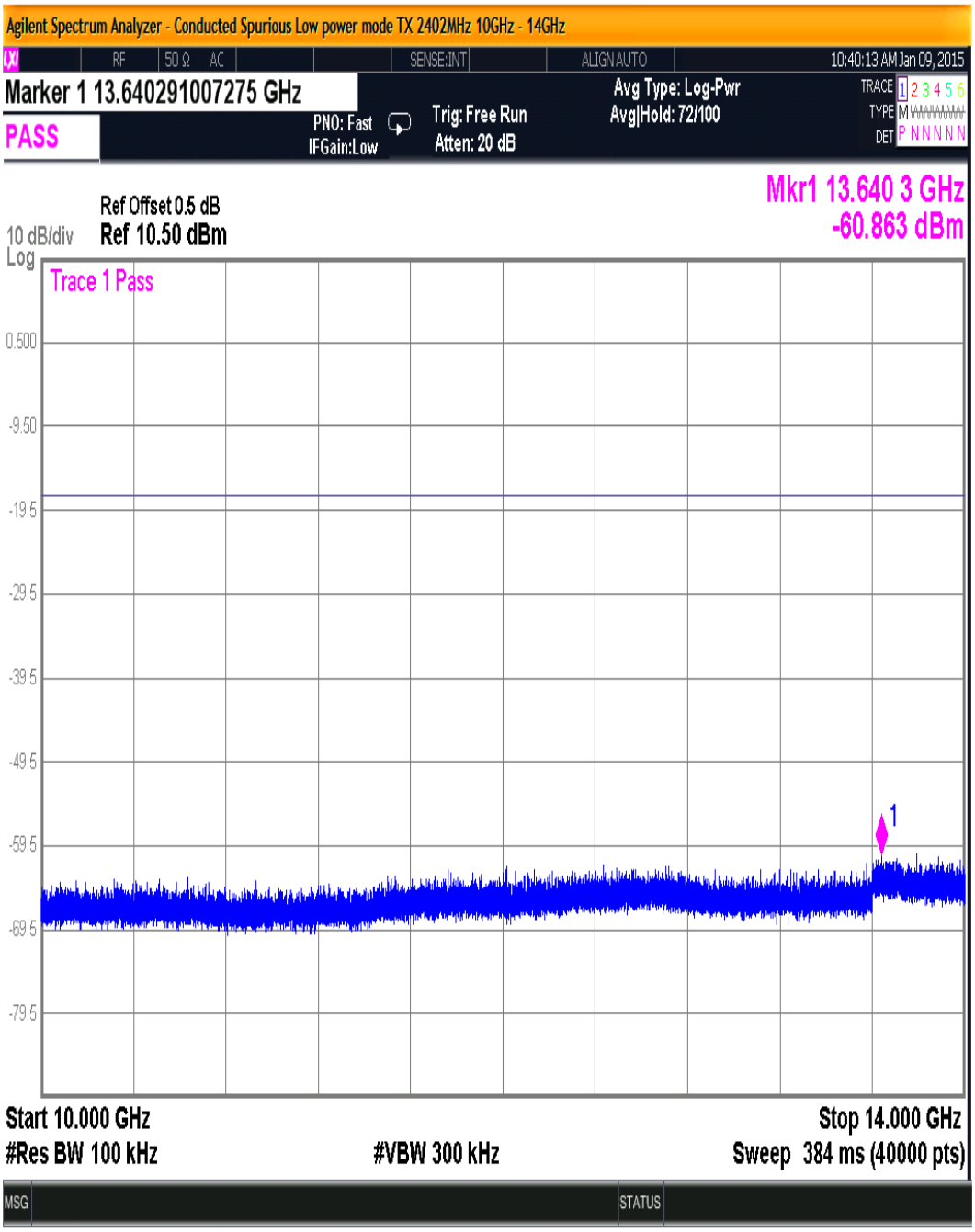

Figure 47. Conducted Spurious Low power mode TX 2402MHz 10GHz - 14GHz

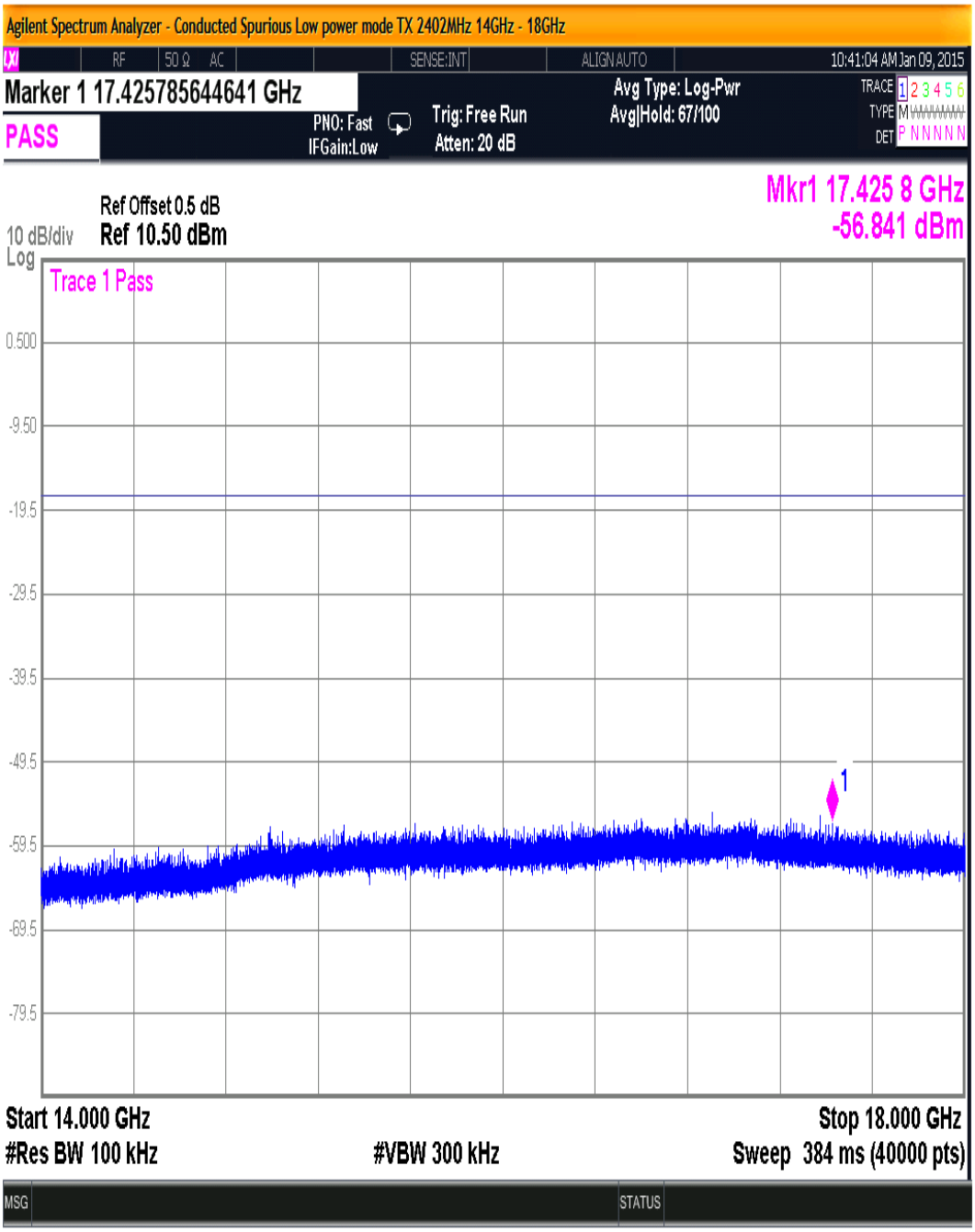

Figure 48. Conducted Spurious Low power mode TX 2402MHz 14GHz - 18GHz

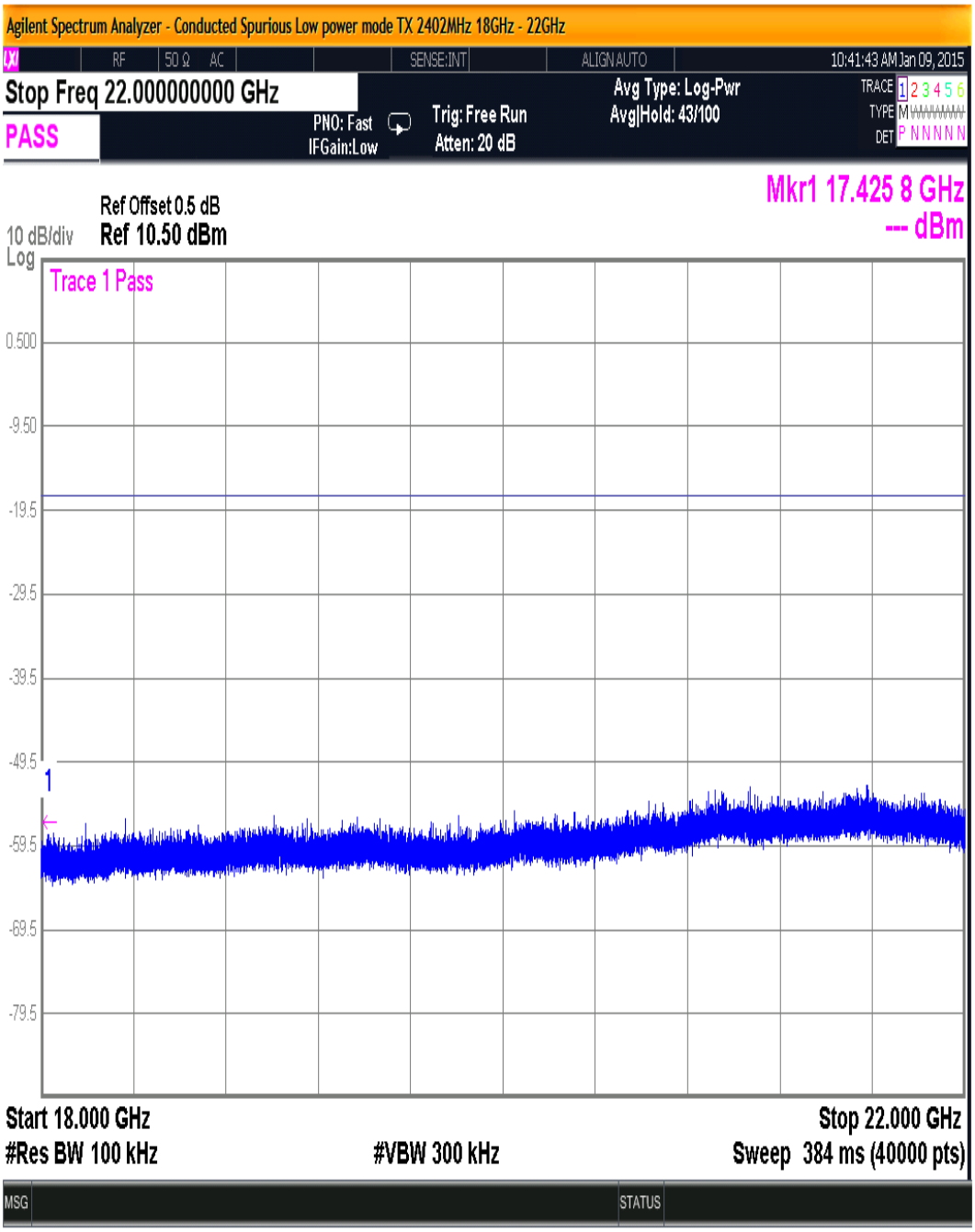

Figure 49. Conducted Spurious Low power mode TX 2402MHz 18GHz - 22GHz

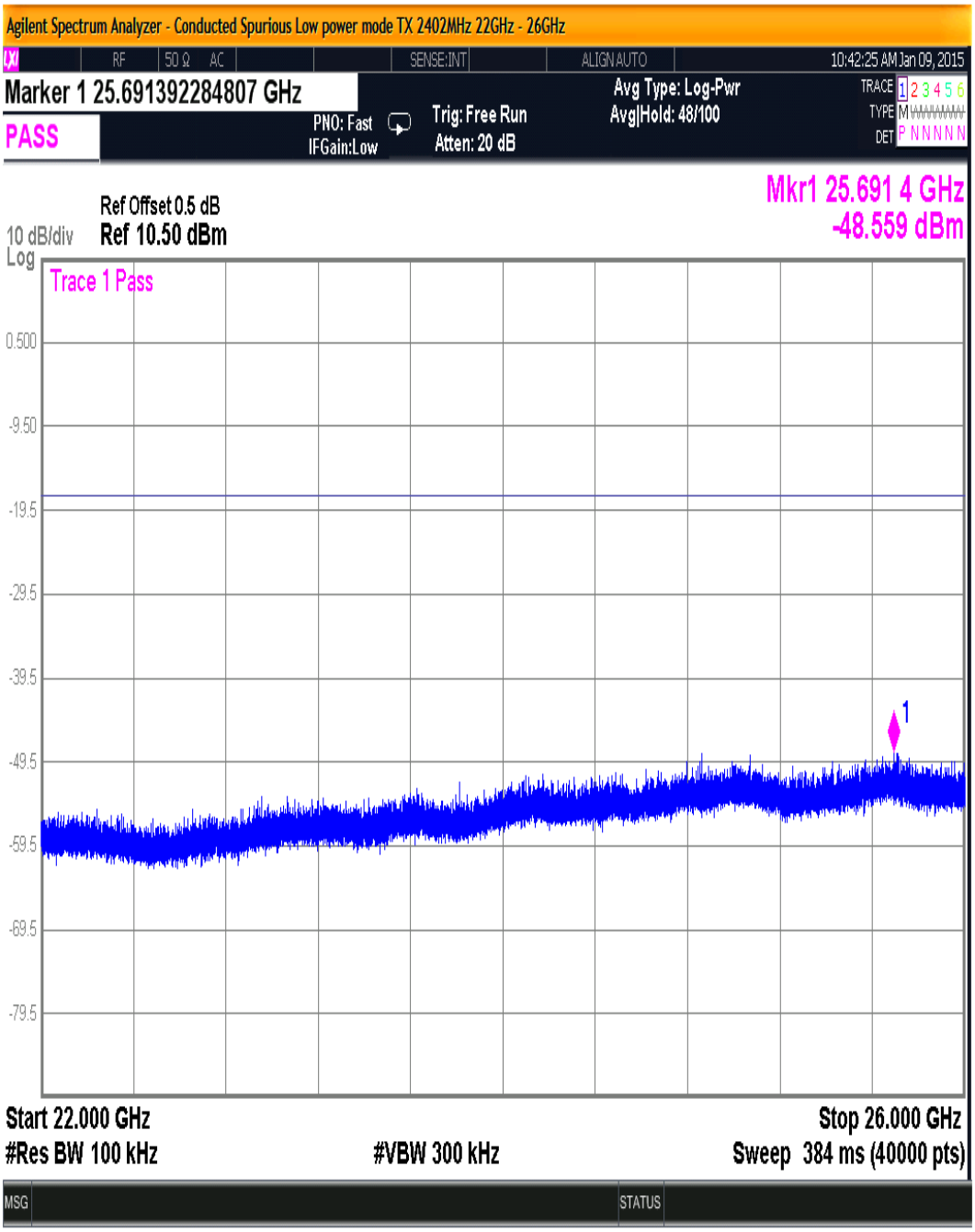

Figure 50. Conducted Spurious Low power mode TX 2402MHz 22GHz - 26GHz

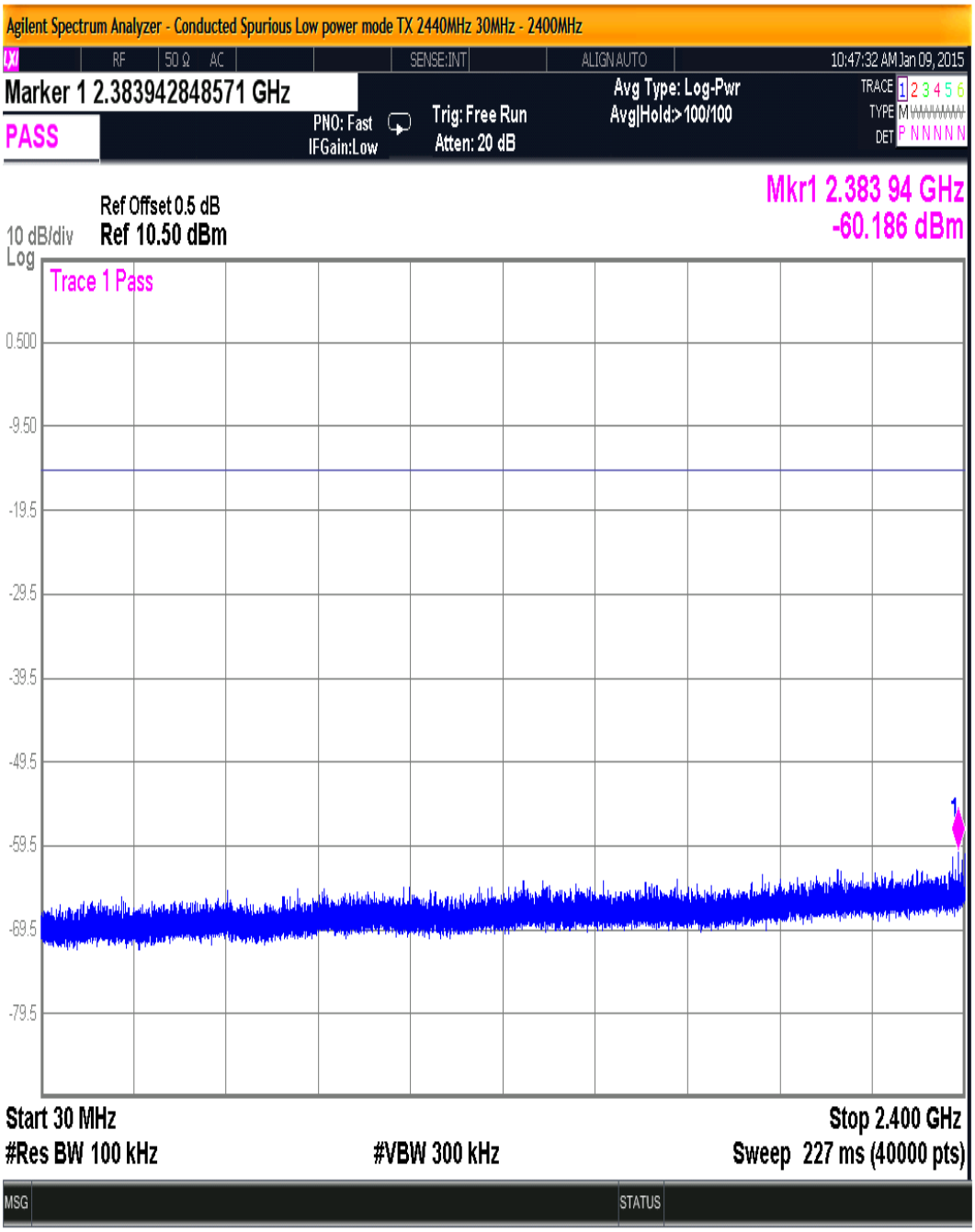

Figure 51. Conducted Spurious Low power mode TX 2440MHz 30MHz - 2400MHz

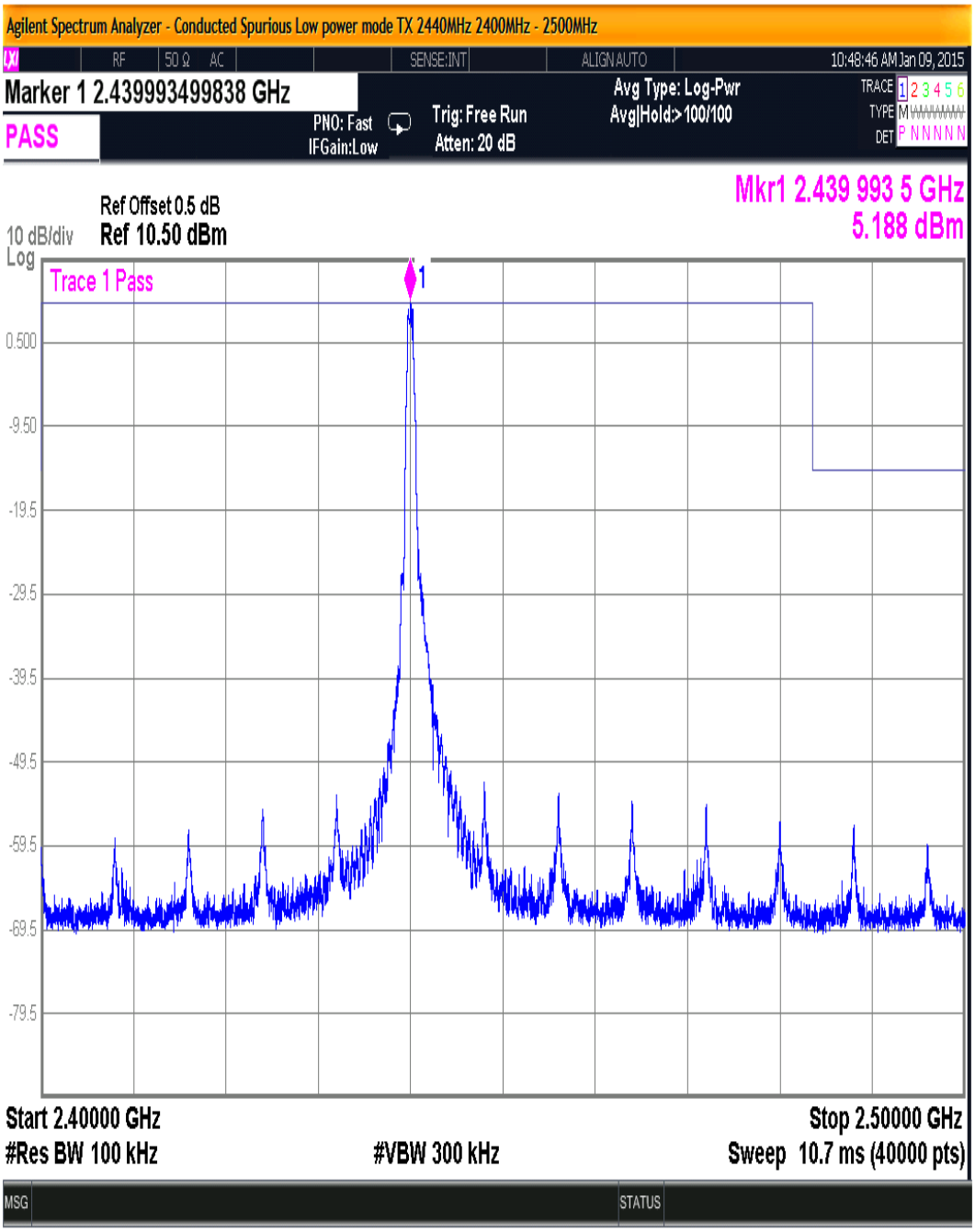

Figure 52. Conducted Spurious Low power mode TX 2440MHz 2400MHz - 2500MHz

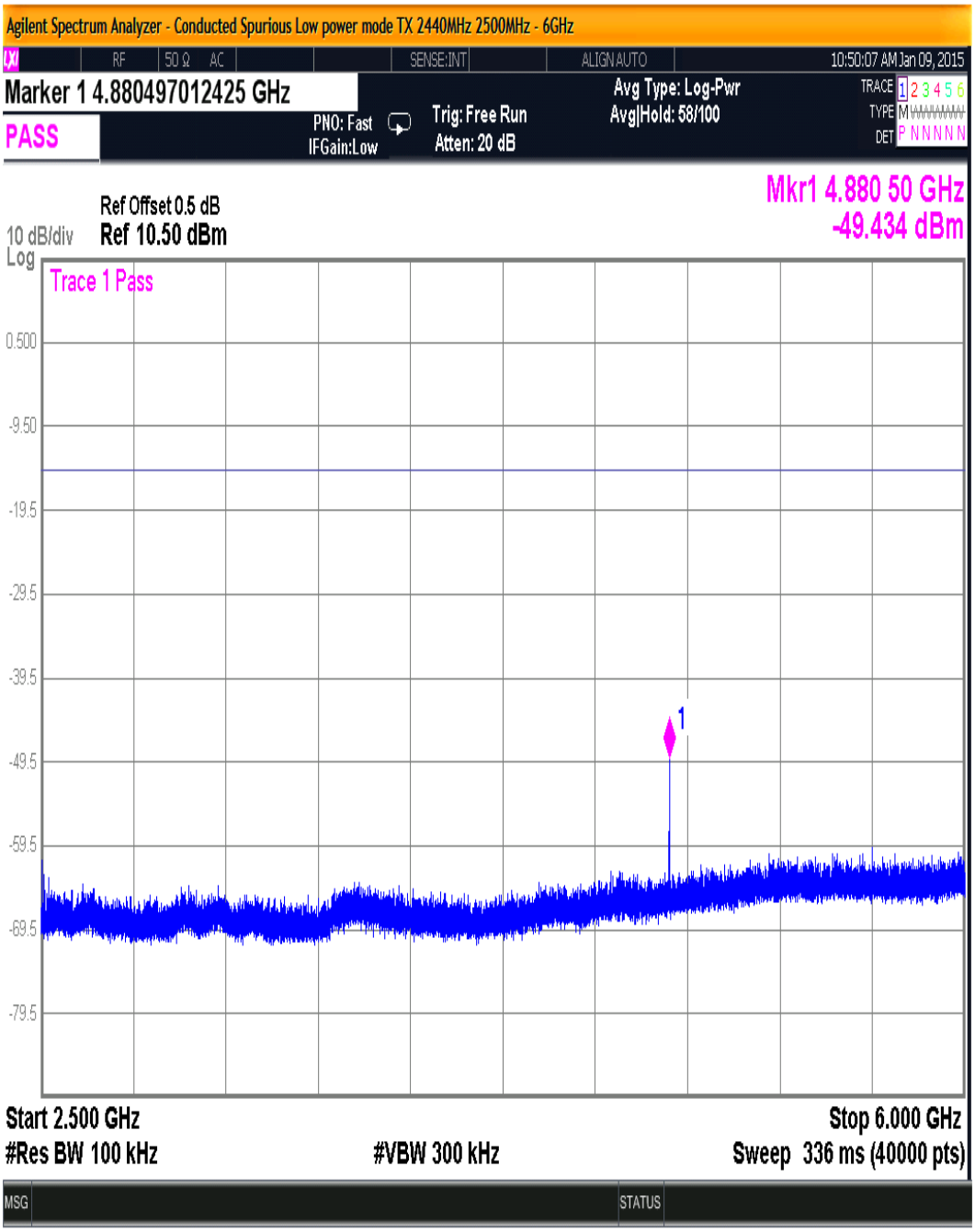

Figure 53. Conducted Spurious Low power mode TX 2440MHz 2500MHz - 6GHz

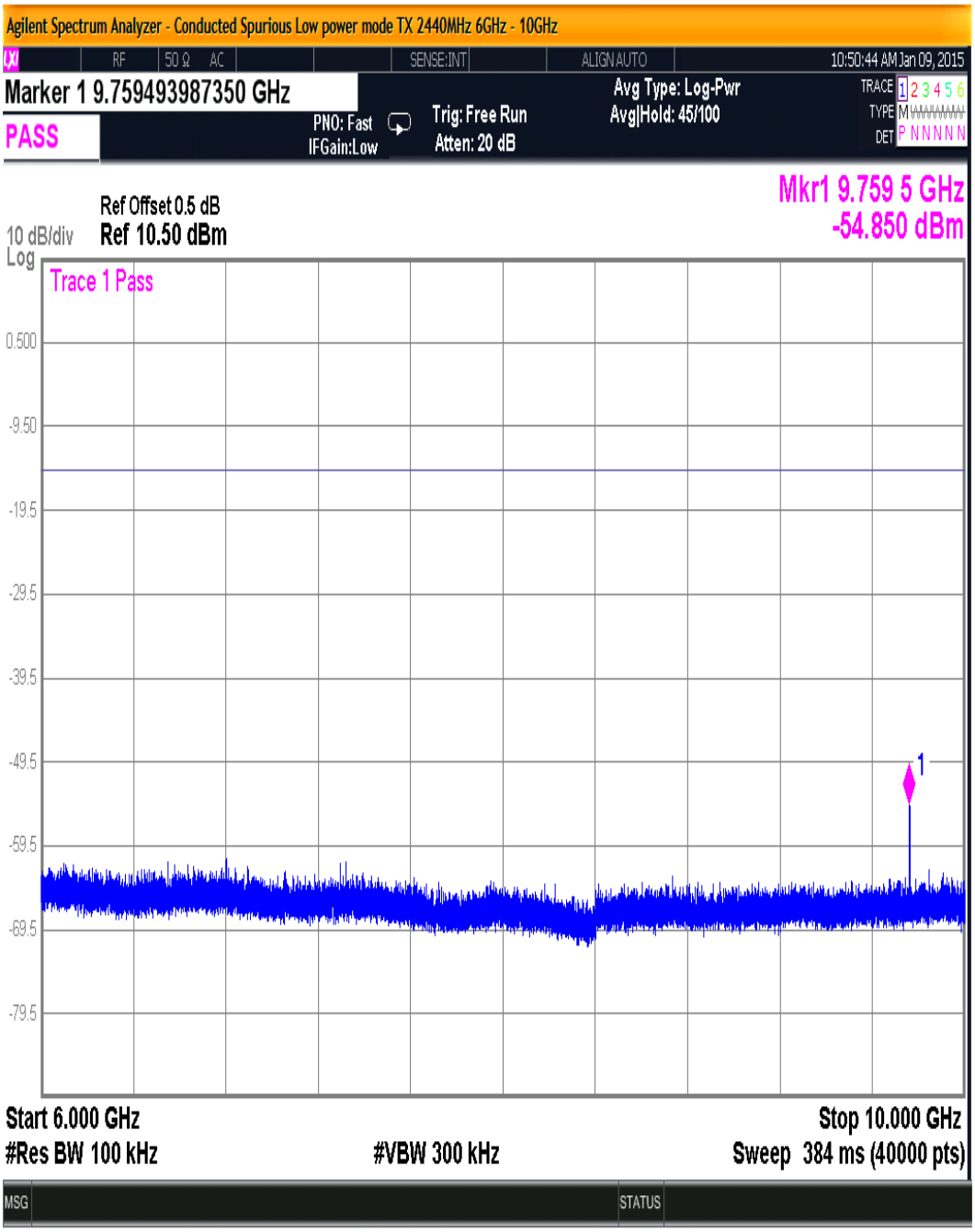

Figure 54. Conducted Spurious Low power mode TX 2440MHz 6GHz - 10GHz

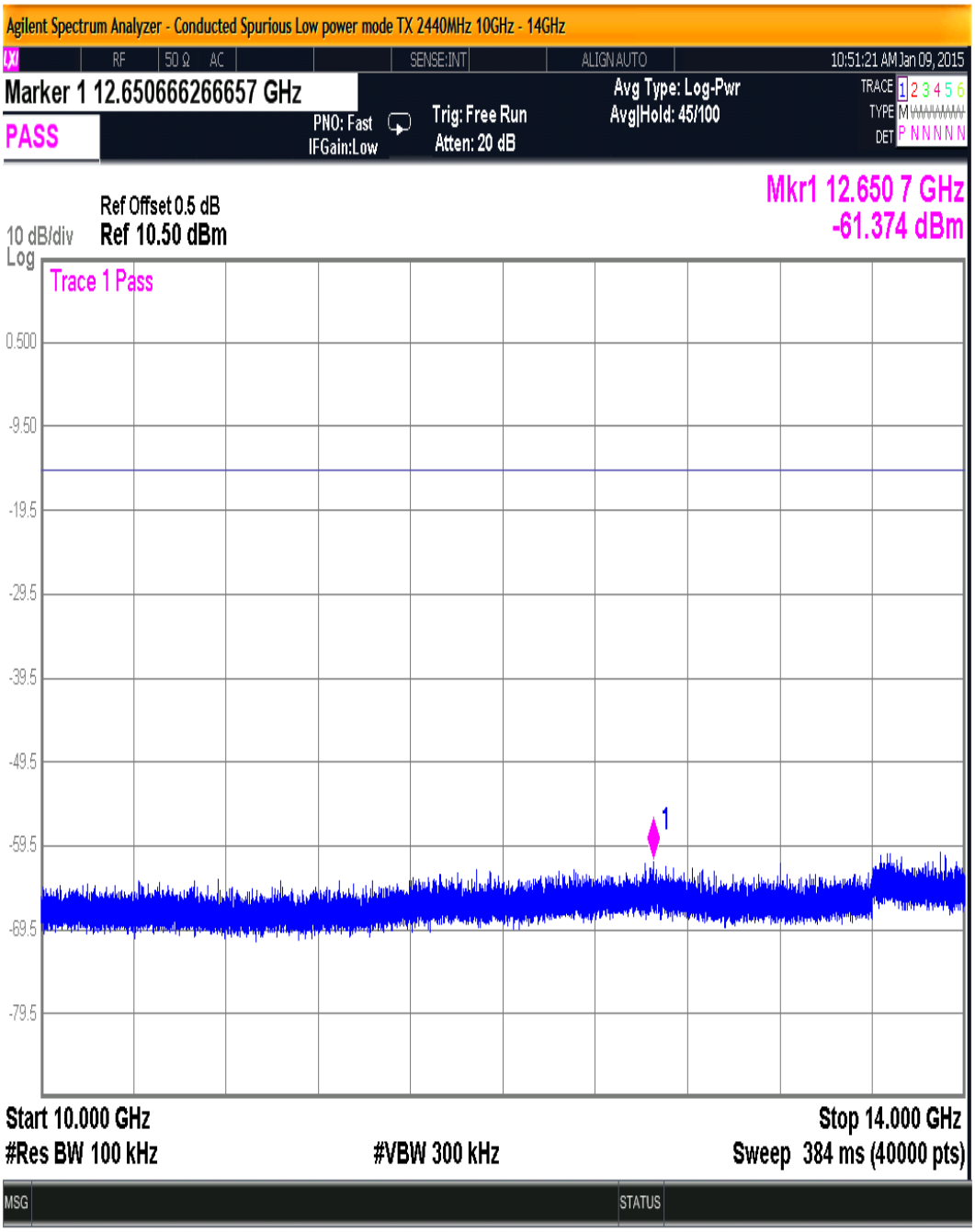

Figure 55. Conducted Spurious Low power mode TX 2440MHz 10GHz - 14GHz

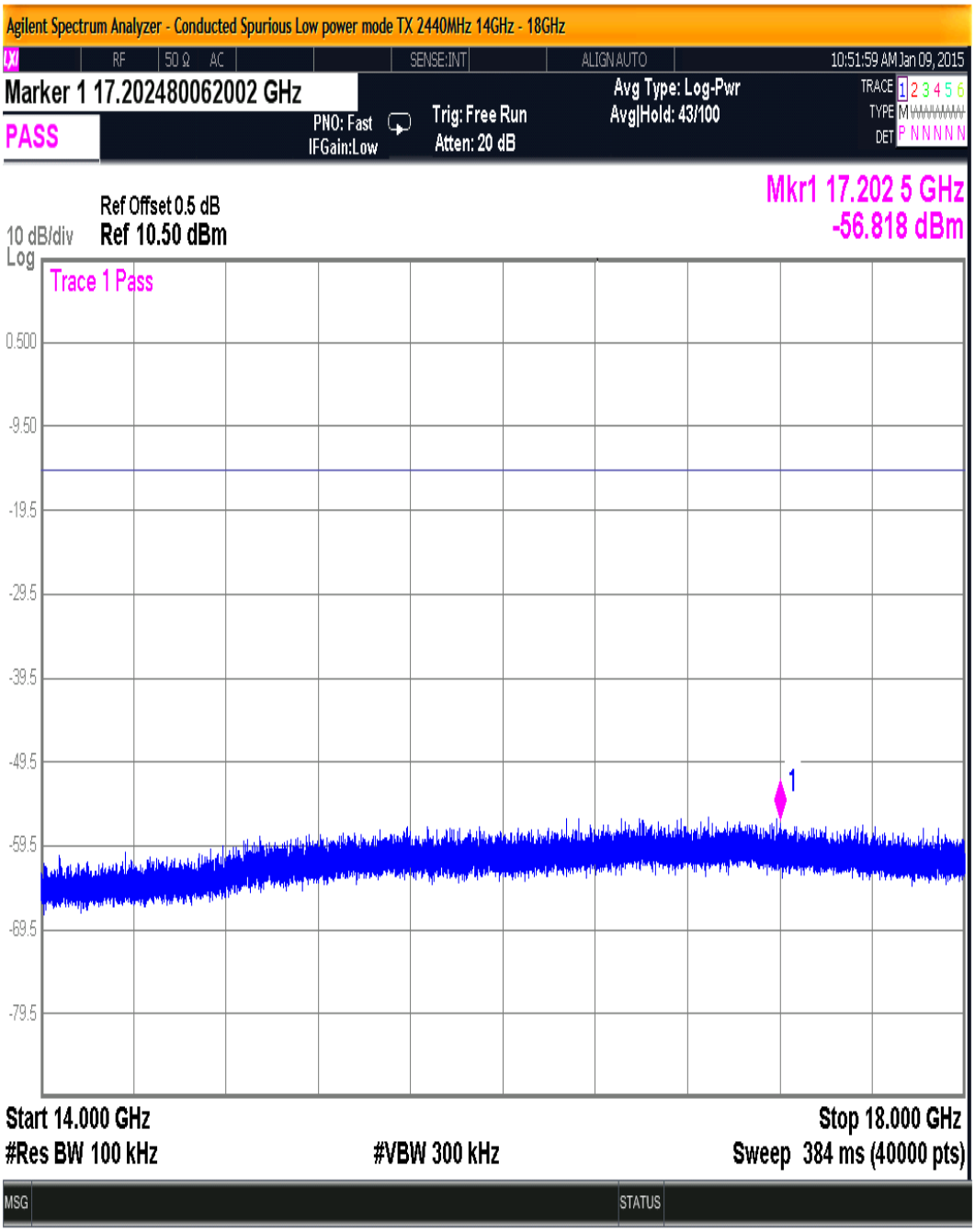

Figure 56. Conducted Spurious Low power mode TX 2440MHz 14GHz - 18GHz

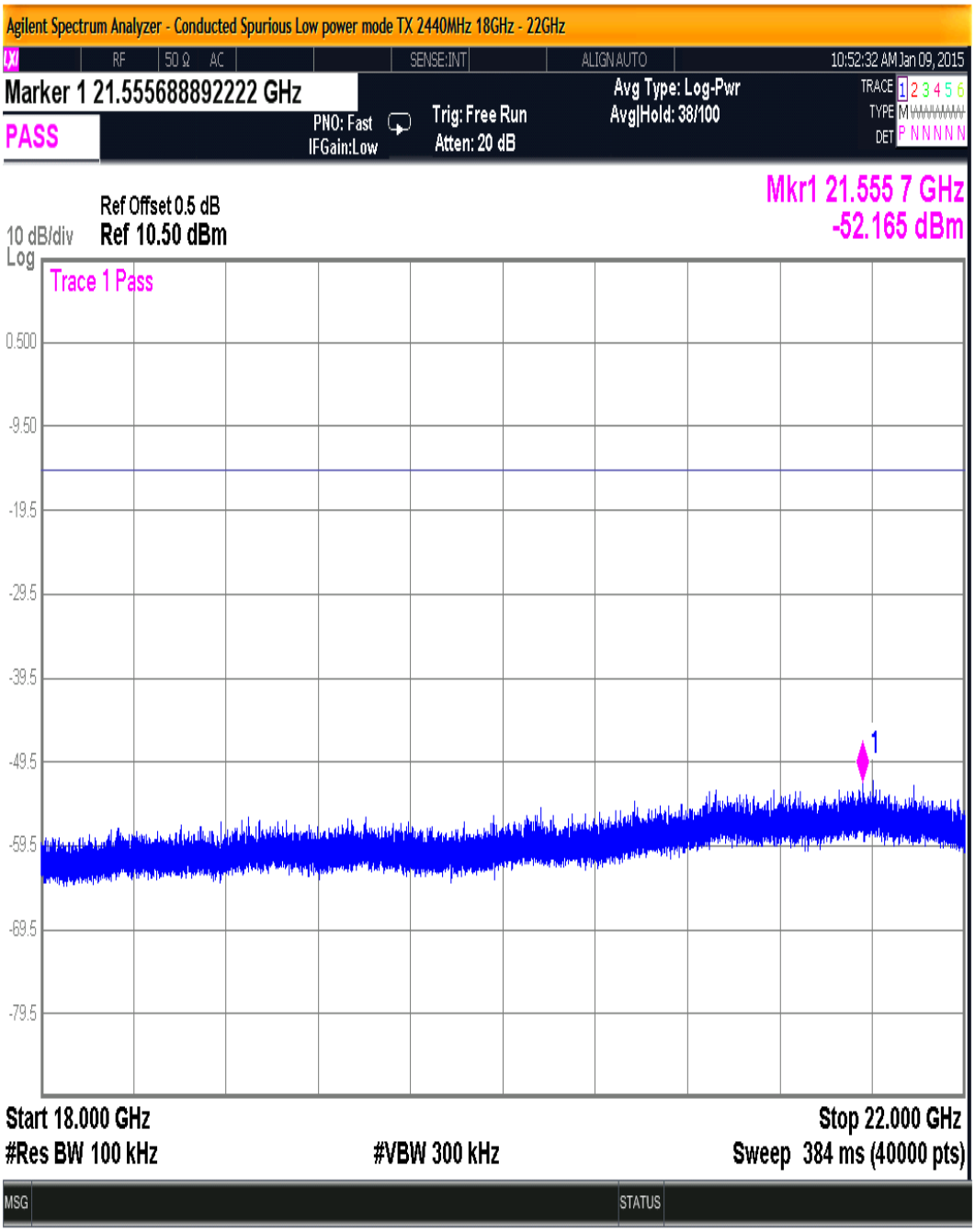

Figure 57. Conducted Spurious Low power mode TX 2440MHz 18GHz - 22GHz

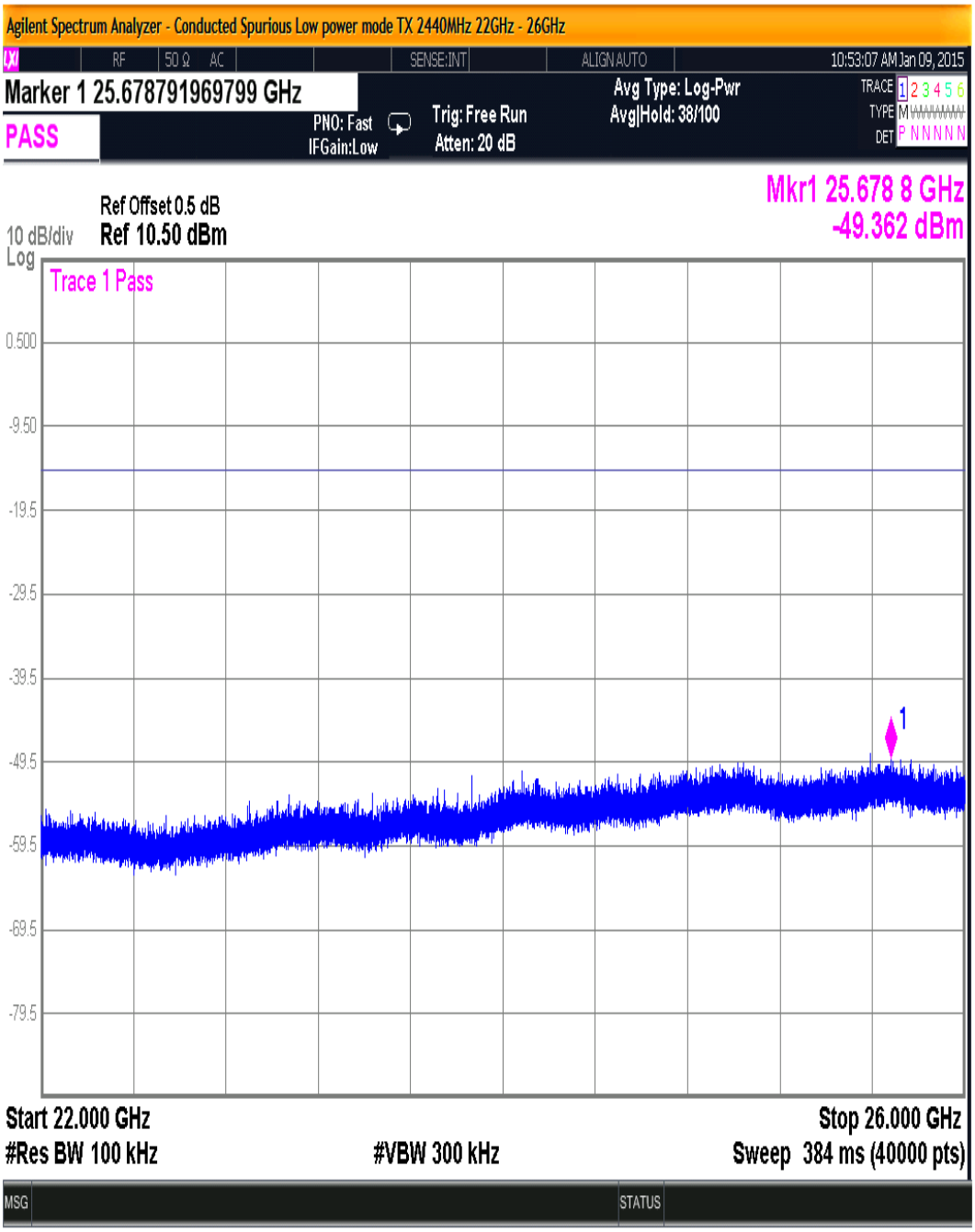

Figure 58. Conducted Spurious Low power mode TX 2440MHz 22GHz - 26GHz

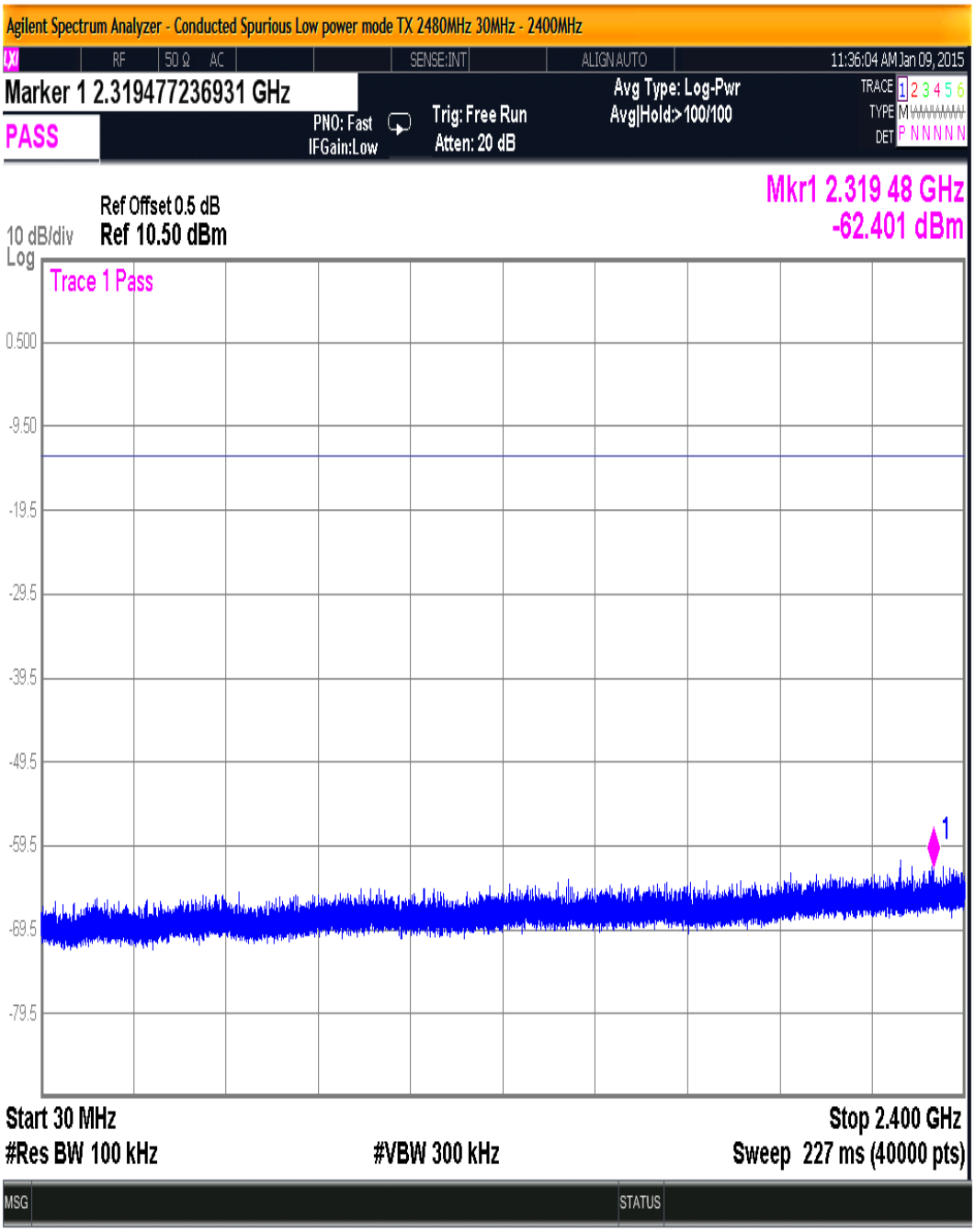

Figure 59. Conducted Spurious Low power mode TX 2480MHz 30MHz - 2400MHz

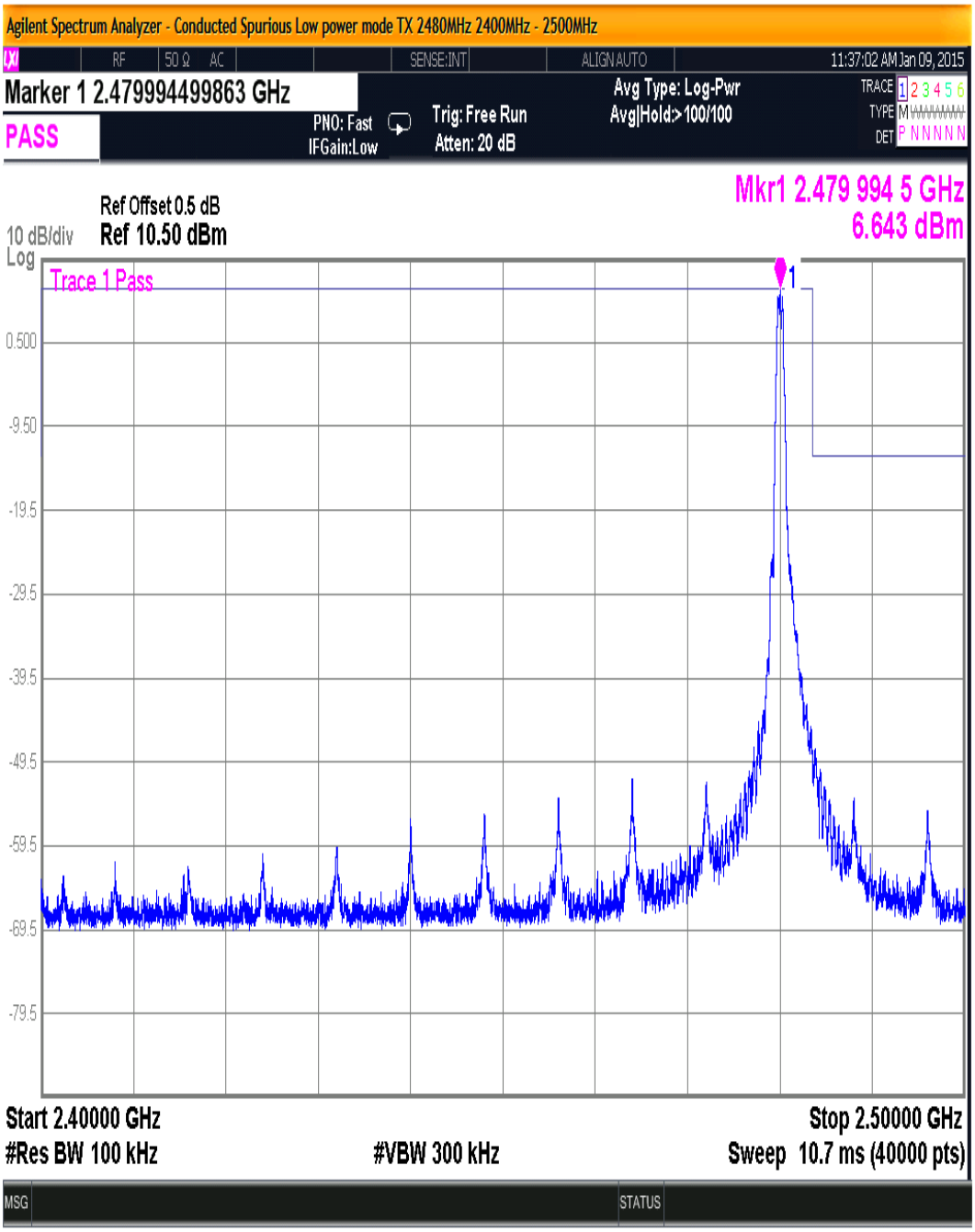

Figure 60. Conducted Spurious Low power mode TX 2480MHz 2400MHz - 2500MHz

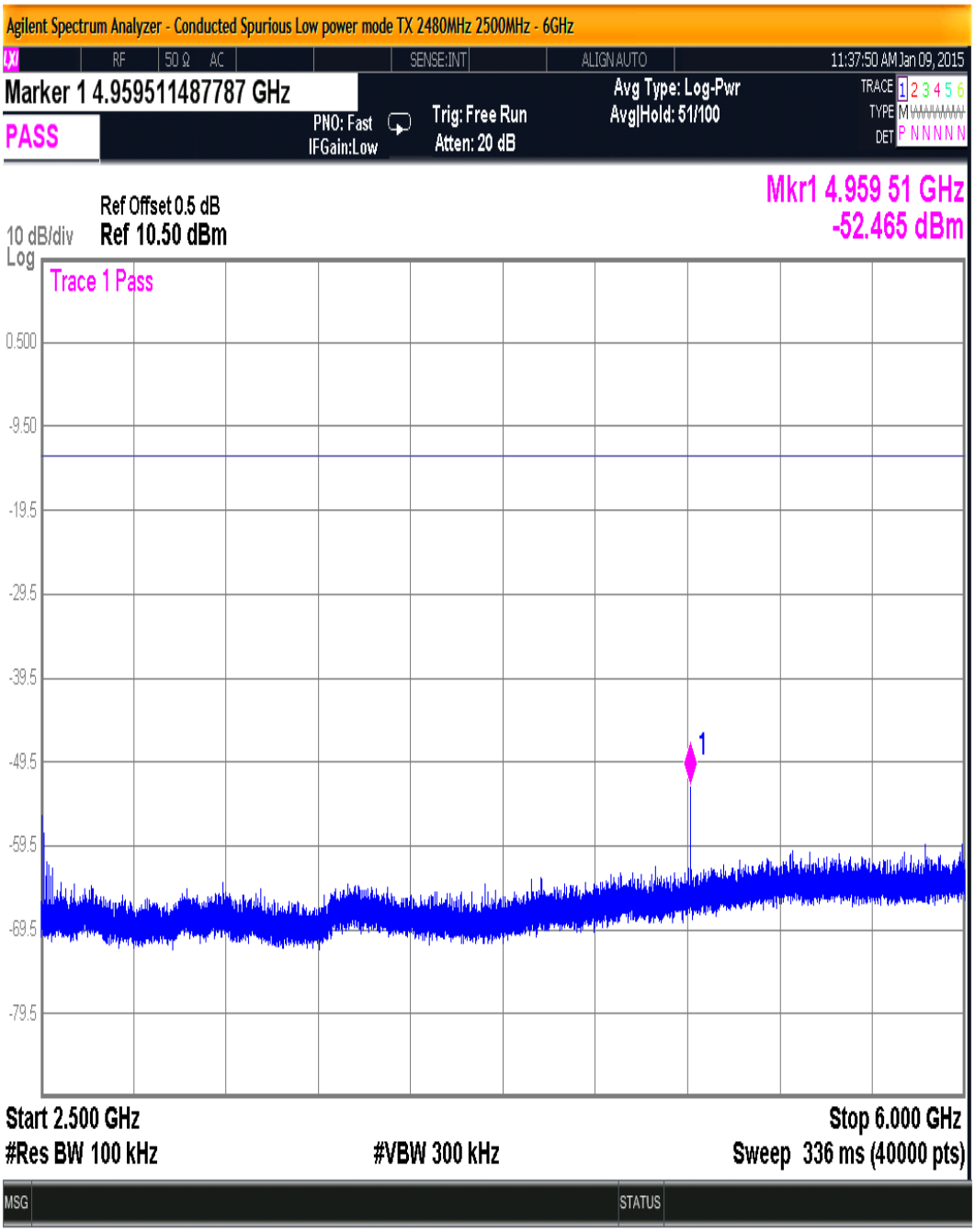

Figure 61. Conducted Spurious Low power mode TX 2480MHz 2500MHz - 6GHz

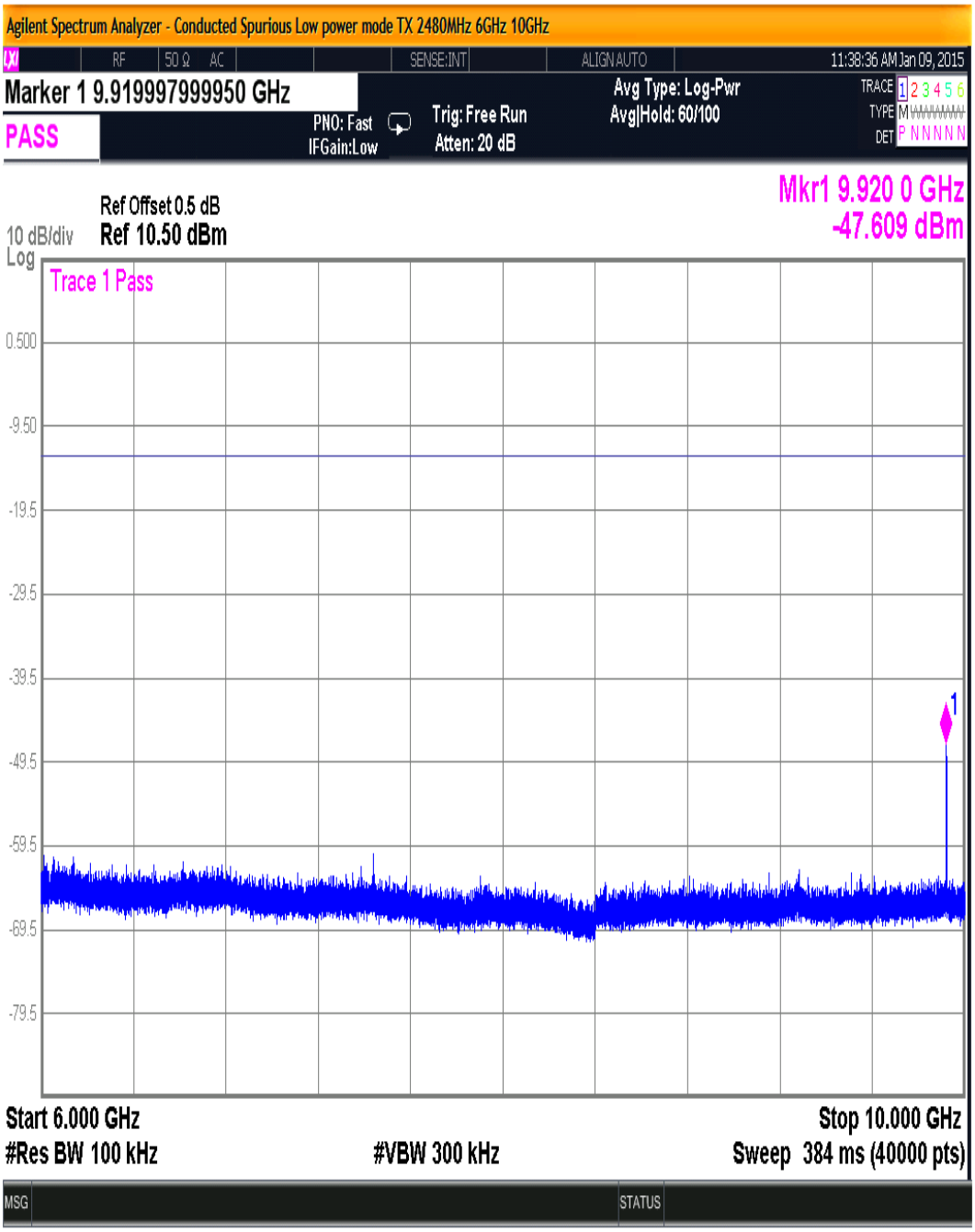

Figure 62. Conducted Spurious Low power mode TX 2480MHz 6GHz 10GHz

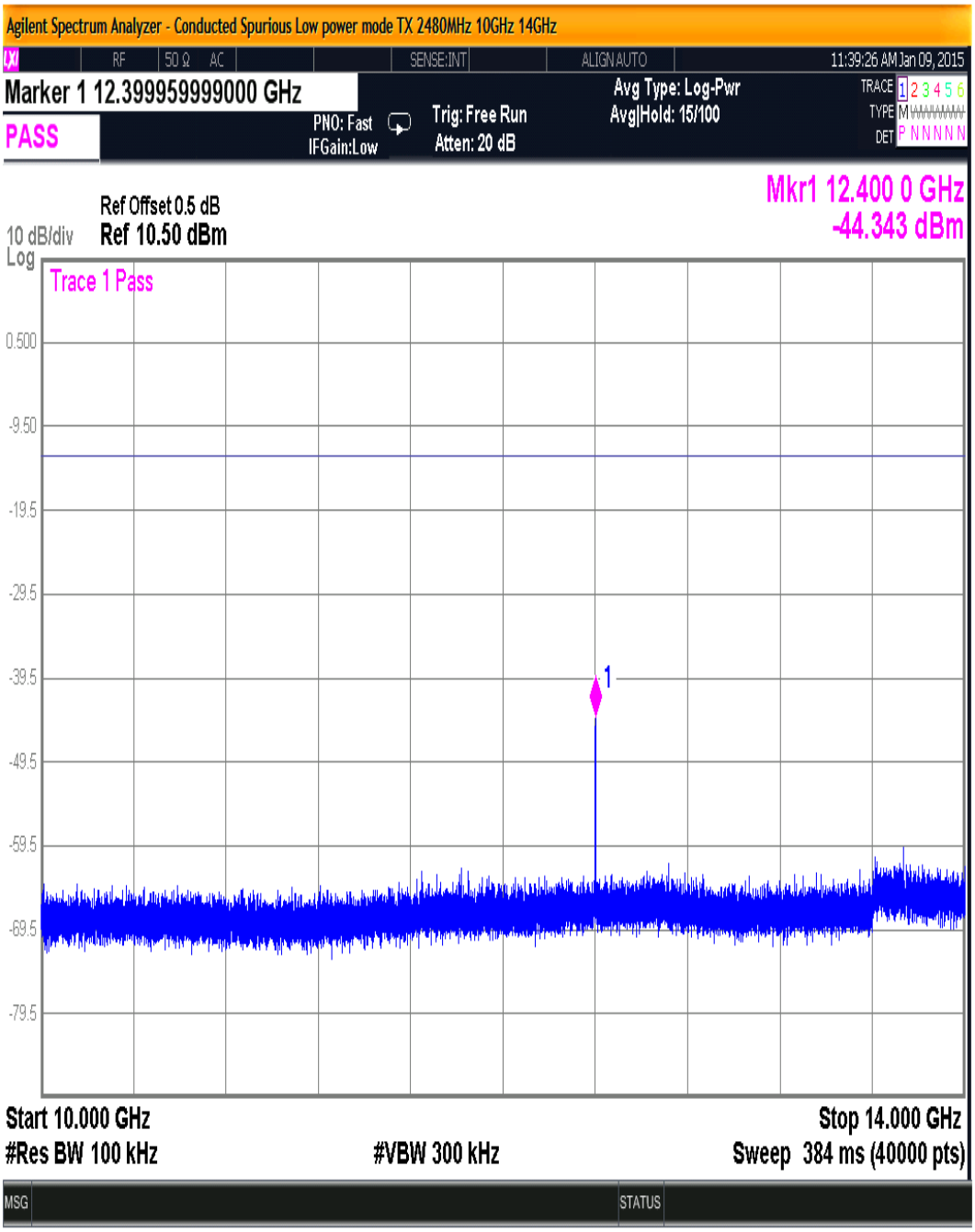

Figure 63. Conducted Spurious Low power mode TX 2480MHz 10GHz 14GHz

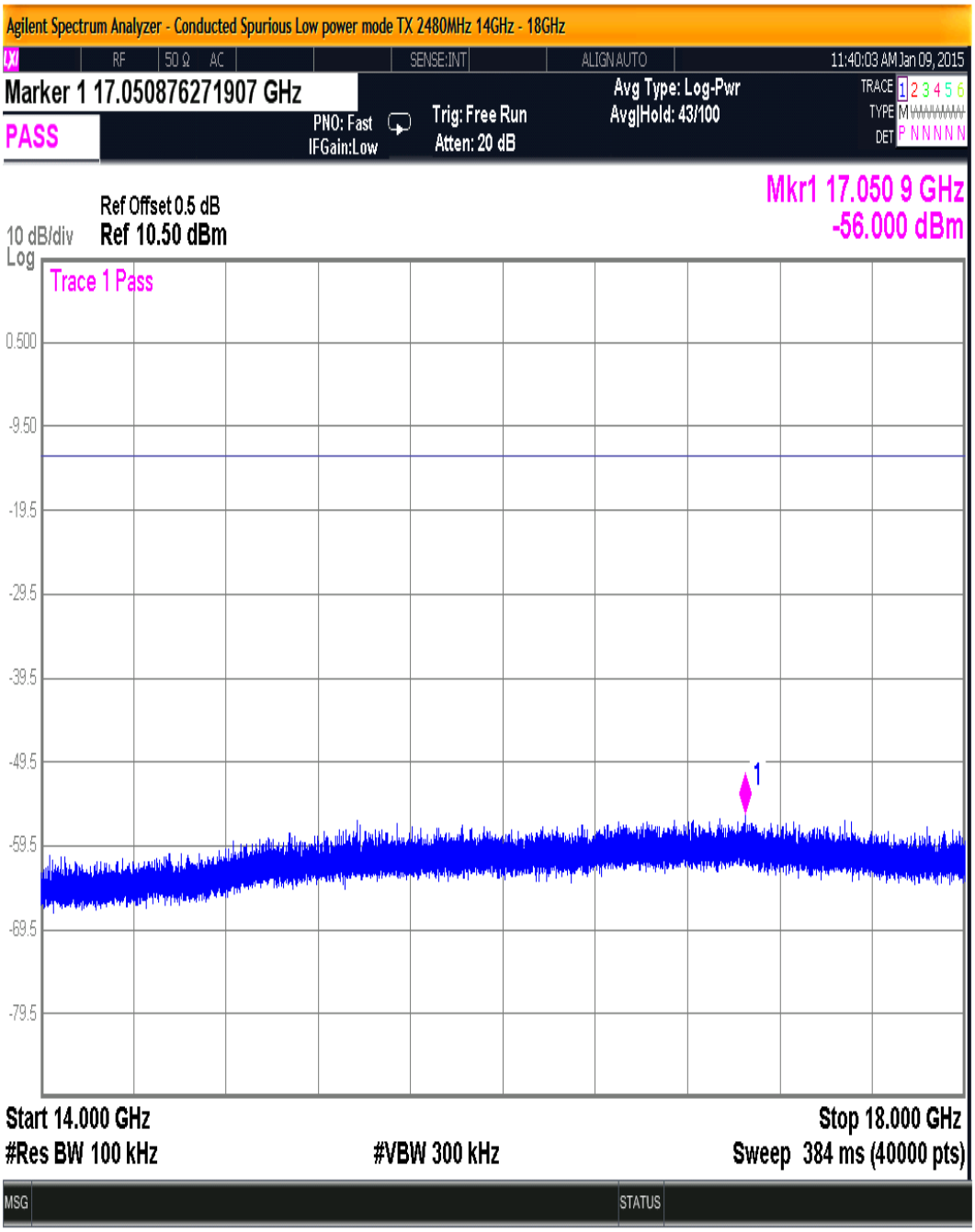

Figure 64. Conducted Spurious Low power mode TX 2480MHz 14GHz - 18GHz

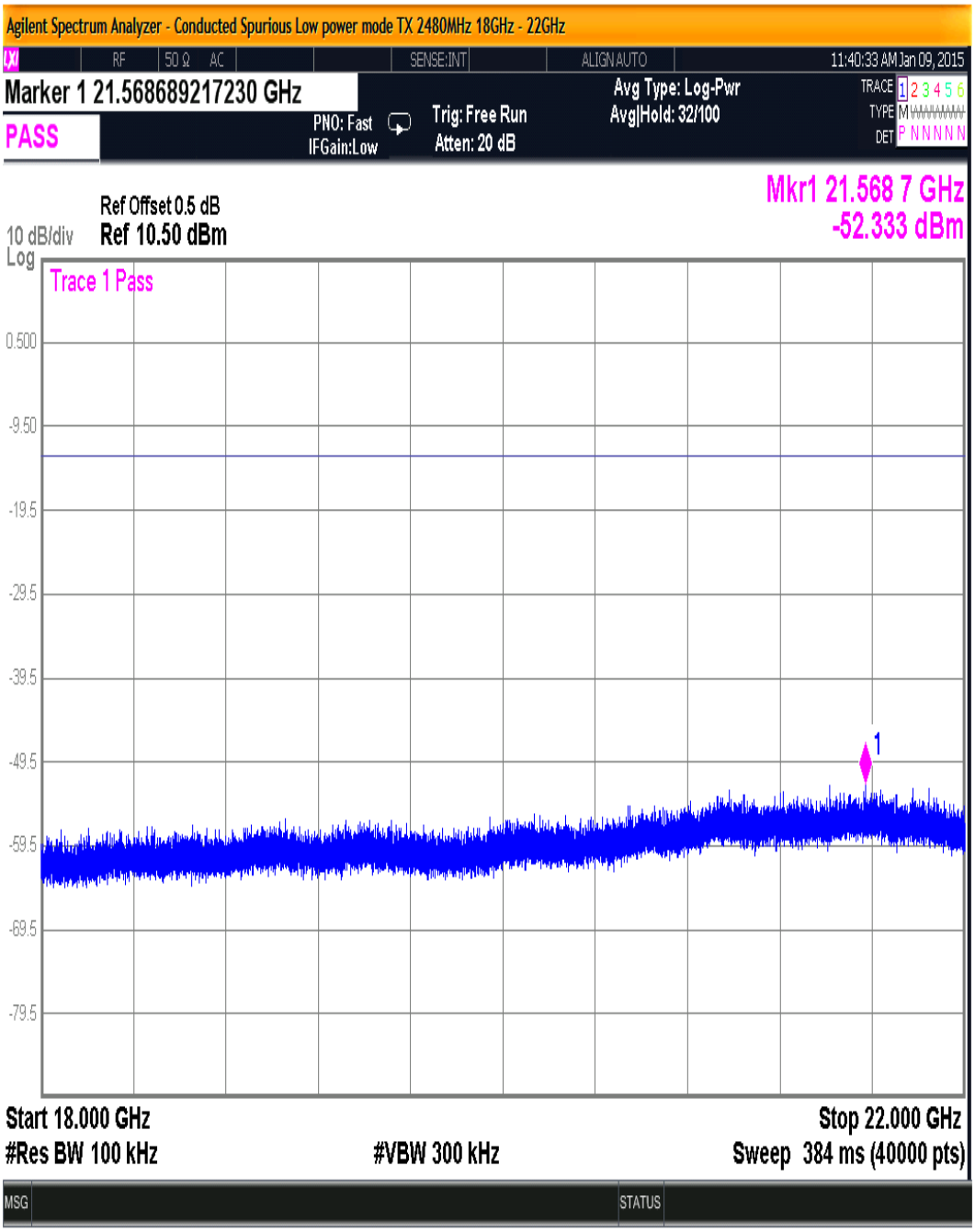

Figure 65. Conducted Spurious Low power mode TX 2480MHz 18GHz - 22GHz

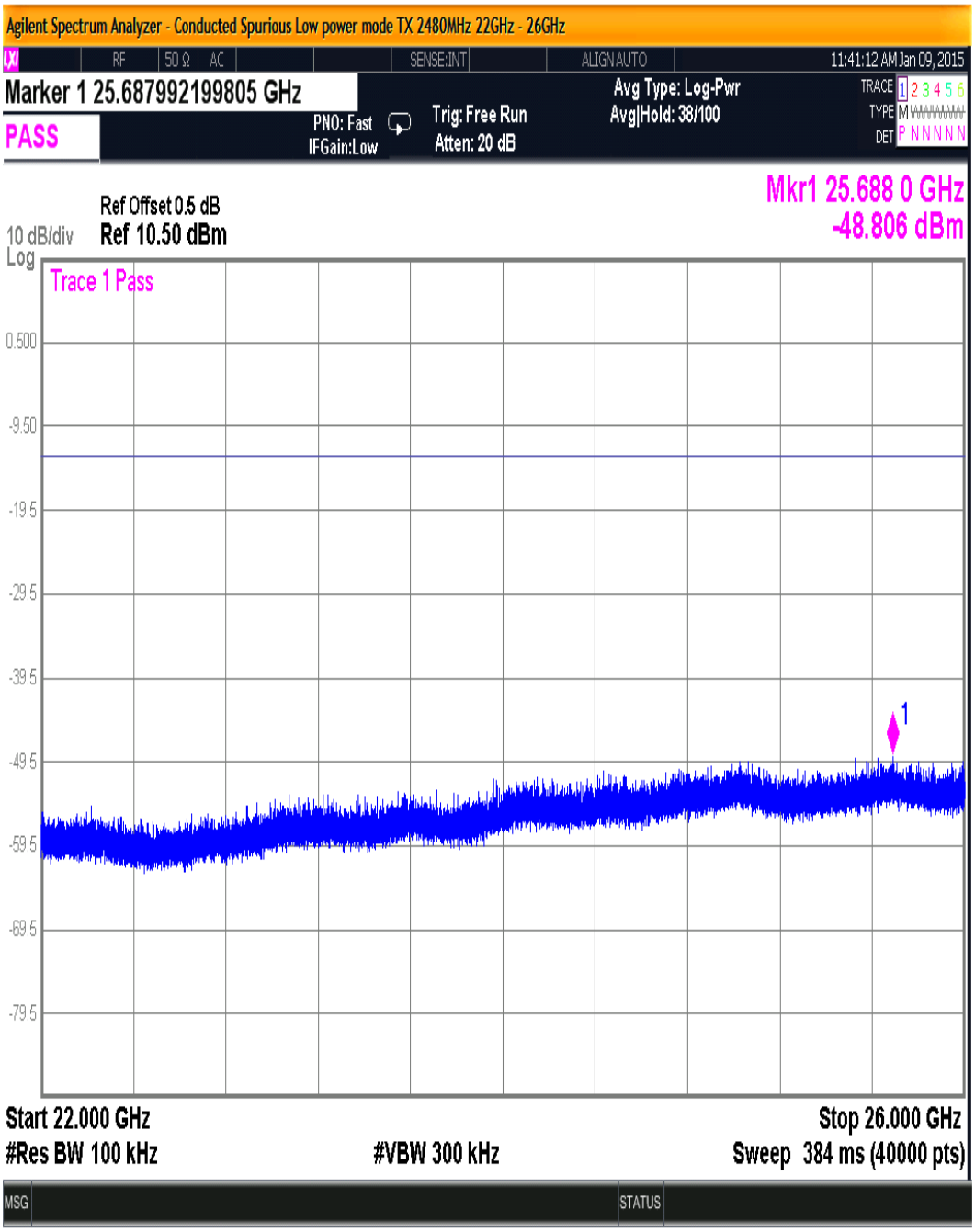

Figure 66. Conducted Spurious Low power mode TX 2480MHz 22GHz - 26GHz

5.4.1 Band Edge Compliance

Close-up plots of the upper and lower channels 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

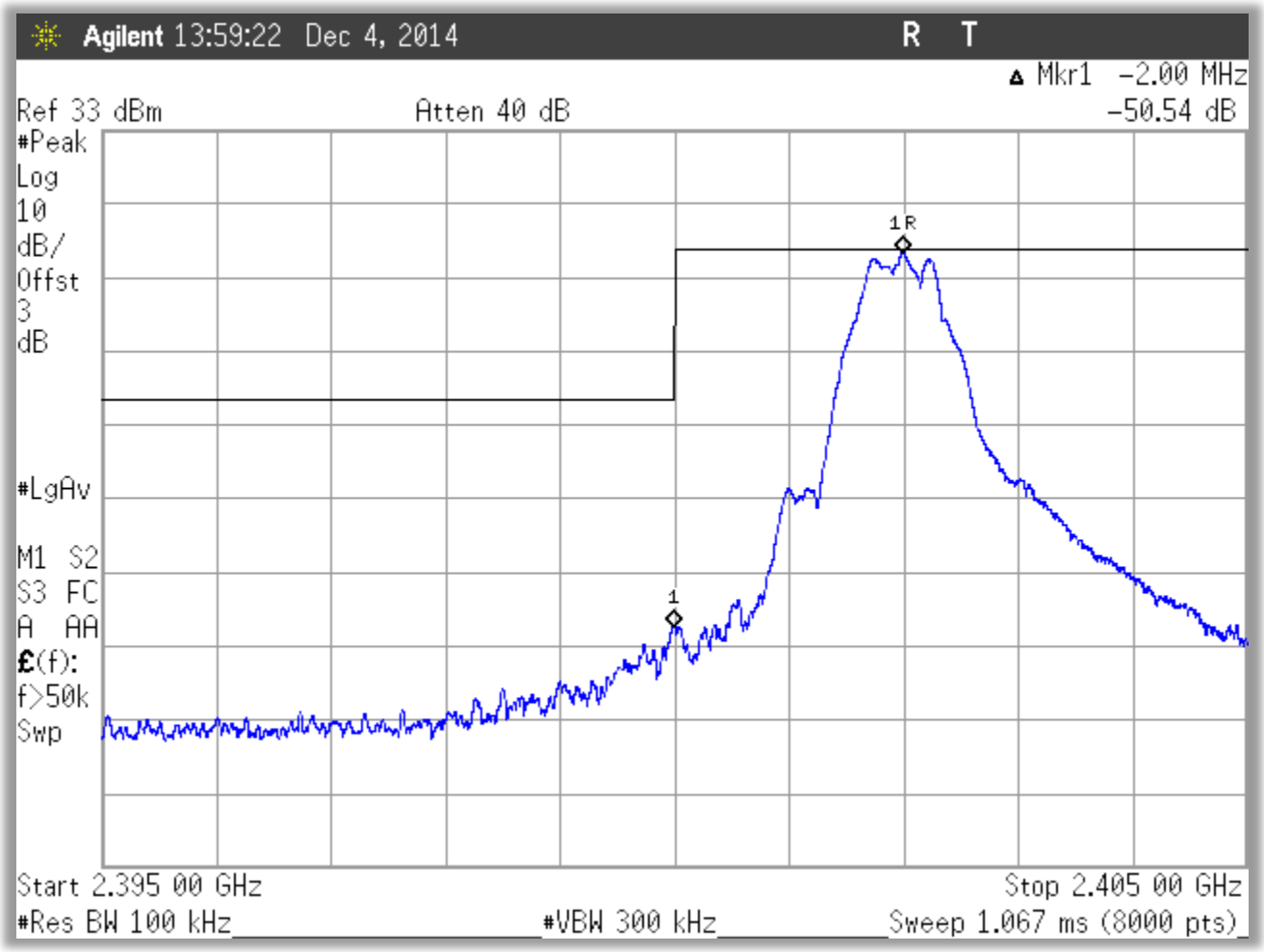

Figure 67: Lower Band-edge, Low Channel

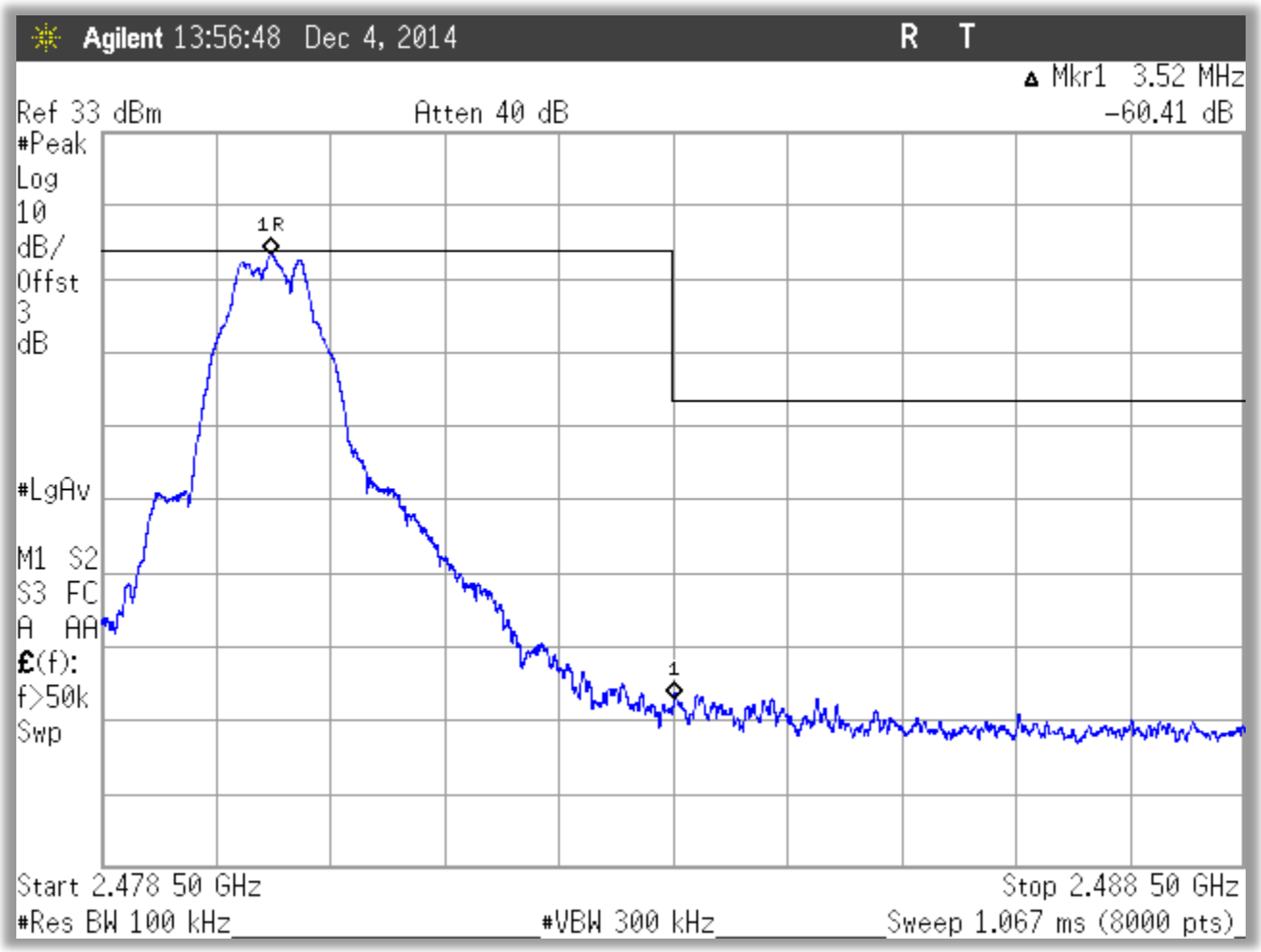

Figure 68: Upper Band-edge, High Channel

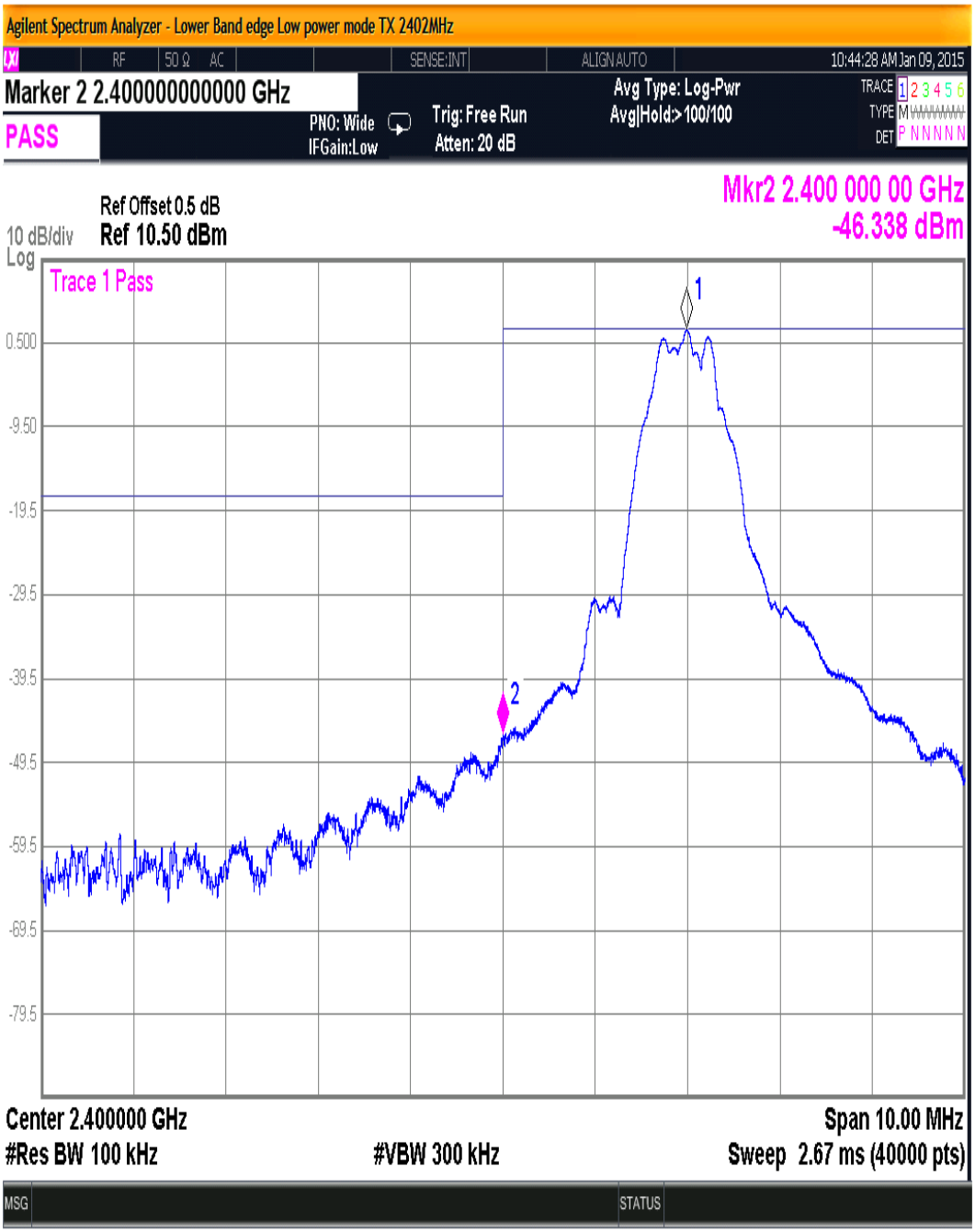

Figure 69. Lower Band edge Low power mode TX 2402MHz

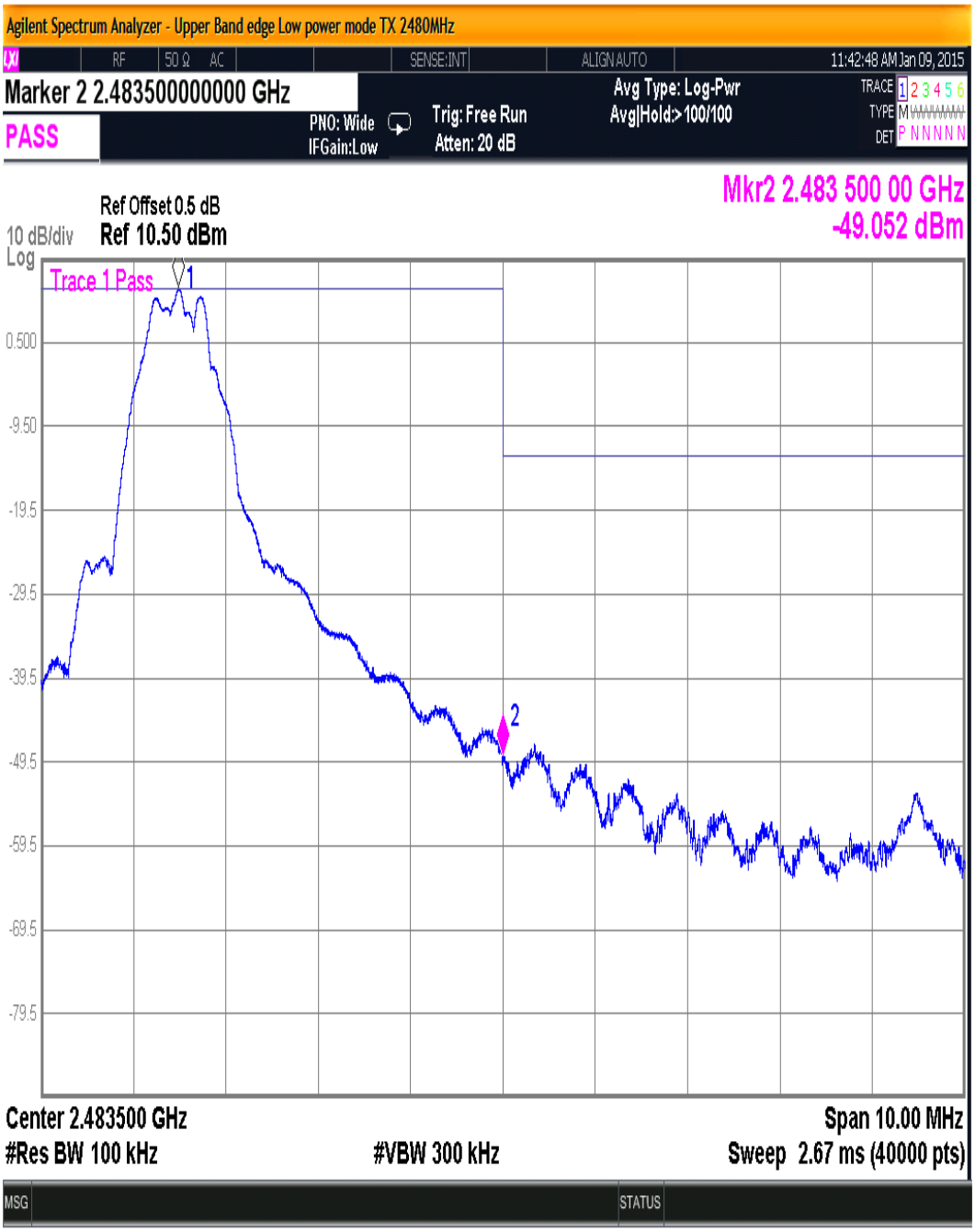

Figure 70. Upper Band edge Low power mode TX 2480MHz

5.5 Radiated Spurious Emissions:

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.

5.5.1 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. Both the horizontal and vertical field components were measured.

The EUT was tested in 3 orthogonals with the worst case readings reported

The emissions were measured using the following resolution bandwidths:

Table 14: Spectrum Analyzer Settings

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

Average measurements above 1GHz were made with the Spectrum analyzer set to the linear mode with a Video bandwidth of 10Hz, and the resultant reading mathematically converted to dBuV. Correction factors were then applied and the resulting value was compared to the limit.

No emissions below 1GHz were noted in the restricted bands.

Table 15: Radiated Emission Test Data, Low Channel

(Restricted Bands/Band Edge)

Low Channel @ 2402MHz

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
4804.00	V	45.00	2.80	54.73	2.7	745.9	5000.0	-16.5	
4804.00	V	45.00	2.80	44.50	2.7	229.7	500.0	-6.8	
7206.00	V	350.00	2.50	48.92	10.1	888.9	5000.0	-15.0	Peak
7206.00	V	350.00	2.50	38.66	10.1	272.8	500.0	-5.3	Average
2390.00	V	0.00	3.00	55.24	-3.6	380.2	5000.0	-22.4	Peak- band edge
2390.00	V	0.00	3.00	44.10	-3.6	105.4	500.0	-13.5	Average-band edge
4804.00	H	10.00	2.32	53.60	2.7	654.9	5000.0	-17.7	Peak
4804.00	H	10.00	2.32	46.30	2.7	282.6	500.0	-5.0	Average
7206.00	H	45.00	3.00	49.44	10.1	943.7	5000.0	-14.5	Peak
7206.00	H	45.00	3.00	38.30	10.1	261.7	500.0	-5.6	Average
2390.00	H	45.00	2.50	55.79	-3.6	405.0	5000.0	-21.8	Peak- band edge
2390.00	H	45.00	2.50	43.92	-3.6	103.3	500.0	-13.7	Average-band edge

No Emissions were noted in the restricted bands below 1GHz

Table 16: Radiated Emission Test Data, Center Channel
(Restricted Bands)

Center Channel @ 2440 MHz

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
4880.00	V	10.00	2.60	50.04	2.8	440.8	5000.0	-21.1	
4880.00	V	10.00	2.60	39.61	2.8	132.7	500.0	-11.5	
7320.00	V	0.00	2.50	53.03	9.8	1386.4	5000.0	-11.1	peak
7320.00	V	0.00	2.50	38.80	9.8	269.4	500.0	-5.4	Average
12200.00	V	10.00	2.40	46.37	15.9	1300.8	5000.0	-11.7	peak
12200.00	V	10.00	2.40	32.50	15.9	263.5	500.0	-5.6	Average
4880.00	H	45.00	2.50	51.00	2.8	492.3	5000.0	-20.1	peak
4880.00	H	45.00	2.50	40.04	2.8	139.4	500.0	-11.1	Average
7320.00	H	45.00	2.20	46.66	9.8	665.9	5000.0	-17.5	peak
7320.00	H	45.00	2.20	39.74	9.8	300.2	500.0	-4.4	Average

No Emissions were noted in the restricted bands below 1GHz

Table 17: Radiated Emission Test Data, High Channel

(Restricted Bands/Band Edge)

High Channel @ 2480MHz

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
4960.00	V	0.00	1.50	34.50	2.2	68.4	500.0	-17.3	Average
4960.00	V	0.00	1.50	48.19	2.2	330.9	5000.0	-23.6	Peak
7440.00	V	0.00	1.50	31.54	8.5	100.2	500.0	-14.0	Average
7440.00	V	0.00	1.50	48.91	8.5	740.0	5000.0	-16.6	Peak
4960.00	H	0.00	1.50	46.31	2.2	266.5	5000.0	-25.5	Peak
4960.00	H	0.00	1.50	34.50	2.2	68.4	500.0	-17.3	Average
	H								
7440.00	H	180.00	1.50	40.40	8.5	277.6	5000.0	-25.1	Peak
7440.00	H	180.00	1.50	28.65	8.5	71.8	500.0	-16.9	Average
2483.50	V	350.00	2.10	56.24	-3.6	426.3	5000.0	-21.4	Peak -BE
2483.50	V	350.00	2.10	43.50	-3.6	98.3	500.0	-14.1	Average-BE
2483.50	H	0.00	2.40	58.89	-3.6	578.3	5000.0	-18.7	Peak-BE
2483.50	H	0.00	2.40	44.20	-3.6	106.6	500.0	-13.4	Average-BE

No Emissions were noted in the restricted bands below 1GHz

5.6 Receiver Radiated Spurious Emissions

The EUT must comply with the requirements for radiated spurious emissions. 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 C63.4-2003. 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 18: Spectrum Analyzer Settings

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

Average measurements above 1GHz were made with the Spectrum analyzer set to the linear mode with a Video bandwidth of 10Hz, and the resultant reading mathematically converted to dBuV. Correction factors were then applied and the resulting value was compared to the limit.

Table 19: 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
47.79	V	0.00	1.00	11.00	9.3	10.4	100.0	-19.7	
57.23	V	10.00	1.00	15.30	7.9	14.4	100.0	-16.8	
65.00	V	180.00	1.00	11.90	8.7	10.7	100.0	-19.4	
85.84	V	10.00	1.20	15.80	8.9	17.1	100.0	-15.3	
228.86	V	180.00	1.20	6.30	13.5	9.8	200.0	-26.2	
444.67	V	45.00	1.60	5.70	20.8	21.2	200.0	-19.5	
47.79	H	10.00	4.00	9.10	9.3	8.4	100.0	-21.6	
49.89	H	180.00	4.00	14.60	8.5	14.3	100.0	-16.9	
57.23	H	190.00	4.00	12.50	7.9	10.4	100.0	-19.6	
65.00	H	0.00	4.00	12.10	8.7	10.9	100.0	-19.2	
85.84	H	90.00	3.80	8.10	8.9	7.1	100.0	-23.0	
228.86	H	45.00	3.50	7.60	13.5	11.3	200.0	-24.9	

5.7 AC Conducted Emissions

5.7.1 Test Summary

As unit is solely battery powered this test is not required.

