Washington Laboratories, Ltd.
www.wll.com
7560 Lindbergh Drive . Gaithersburg, MD 20879
301.216.1500 . info@wll.com

FCC & Industry Canada Certification Test Report

For the

Melnor, Inc.

Wi-Fi Aquatimer Control Unit (Model 15043C)

FCC ID: VAF-15043C

IC ID: 7111A-15043C

WLL JOB# 13637-01 Rev 2
December 22, 2014
Revised March 11, 2015

Prepared for:

Melnor, Inc.
109 Tyson Drive
Winchester, VA 22603

Prepared By:

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

ACLASS ACCREDITED TESTING

Testing Certificate AT-1448

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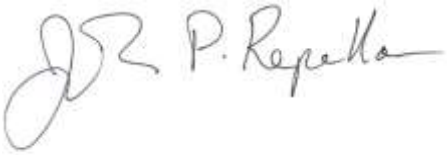
Prepared by:

Steven Dovell
Compliance Engineer

Reviewed by:



John P. Repella
EMC & Wireless Lab Manager

Abstract

This report has been prepared on behalf of Melnor, 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 Melnor, Inc. Wi-Fi Aquatimer Control Unit.

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 Melnor, Inc. Wi-Fi Aquatimer Control Unit 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 22, 2014
Rev1	Changed model in Table 1 to 15043C	March 3, 2015
Rev 2	Removed references to Frequency hopping	March 11, 2015

Table of Contents

List of Tables

List of Figures

1 Introduction

1.1 Compliance Statement

The Melnor, Inc. Wi-Fi Aquatimer Control Unit 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 "D01 DTS Meas. 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:	Melnor, Inc. 109 Tyson Drive Winchester, VA 22603
Purchase Order Number:	Deposit Terms (Check)
Quotation Number:	68340

1.4 Test Dates

Testing was performed on the following date(s):

1.5 Test and Support Personnel

Washington Laboratories, LTD	Steven Dovell
Customer Representative	Ha, Duong, Stephen Brass

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 Melnor, Inc. Wi-Fi Aquatimer Control Unit is a radio controlled water value unit used in lawn care systems.

Table 1: Device Summary

ITEM	DESCRIPTION
Manufacturer:	Melnor, Inc.
FCC ID:	VAF-15043C
IC:	7111A-15043C
Model:	15043C
FCC Rule Parts:	§15.247
Industry Canada:	RSS210
Frequency Range:	915MHz
Maximum Output Power:	6.07mW (7.83dBm)
Modulation:	FSK
Occupied Bandwidth:	517.38kHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	1
Power Output Level	Fixed
Antenna Connector	None - integral
Antenna Type	-5.0dBi inverted F PC Trace
Interface Cables:	None related to transmitter
Power Source & Voltage:	5VDC
Emission Designator	517KF1D
Highest TX spurious Emission	9150MHz @ 3m = 671.5uV/m
Highest RX Spurious Emission	45.54MHz @3m = 27.8uV/m

2.2 Test Configuration

The Wi-Fi Aquatimer Control Unit was configured with an AC/DC wall wart providing 5VDC to the board. The unit was programed to constantly transmit on a single frequency or receive only mode. The board has an 802.11 module (FCCID Z64-CC3000EM). The Control Unit program algorithm does not allow for both transmitters to operate at the same time.

2.3 Testing Algorithm

The Wi-Fi Aquatimer Control Unit was programmed for DTS operation. The unit was programed to constantly transmit on a single frequency or placed in receive only 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 ACLASS under Certificate AT-1448 as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

- D01 DTS Meas. Guidance v03r02 "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 ≤ 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

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: **Bench Conducted Emissions**		Test Date: **12/18/2014**	
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
823	AGILENT - N9010A	EXA SPECTRUM ANALYZER	6/6/2015

Test Name: **Radiated Emissions**		Test Date: **12/18/2014**	
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
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
382	SUNOL SCIENCES CORPORATION - JB1	ANTENNA BICONLOG	1/26/2015
626	ARA - DRG-118/A	ANTENNA HORN	1/6/2016
823	AGILENT - N9010A	EXA SPECTRUM ANALYZER	6/6/2015
66	B&Z - BZ-01002650-401545-282525	PRE-AMPLIFIER RF. 1-26.5GHZ	01/15/2015
281	ITC - 21A-3A1	WAVEGUIDE 4.51-10.0GHZ	04/19/2016
337	WLL - 1.2-5GHZ	FILTER BAND PASS	4/19/2016

Test Name: **Conducted Emissions Voltage**		Test Date: **12/18/2014**	
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
125	SOLAR - 8028-50-TS-24-BNC	LISN	8/1/2015
126	SOLAR - 8028-50-TS-24-BNC	LISN	8/1/2015
68	HP - 85650A	ADAPTER QP	1/2/2015
72	HP - 8568B	ANALYZER SPECTRUM	1/2/2015
53	HP - 11947A	LIMITER TRANSIENT	3/18/2015

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	Pass
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	Pass
15.209	RSS-210 sect 2.5 RSS-Gen [4.1]	General Field Strength Limits	Pass

5 Test Results

5.1 Occupied 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.

Method used: Section 8.1 (a) of DTS Meas Guidance

Table 5: Occupied Bandwidth Spectrum Analyzer Settings

Resolution Bandwidth	Video Bandwidth
100k	300k

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

Table 6 provides a summary of the Occupied Bandwidth Results.

Table 6: Occupied Bandwidth Results

Frequency	Bandwidth	Limit	Pass/Fail
Channel: 915MHz	517.38kHz	>500kHz	Pass

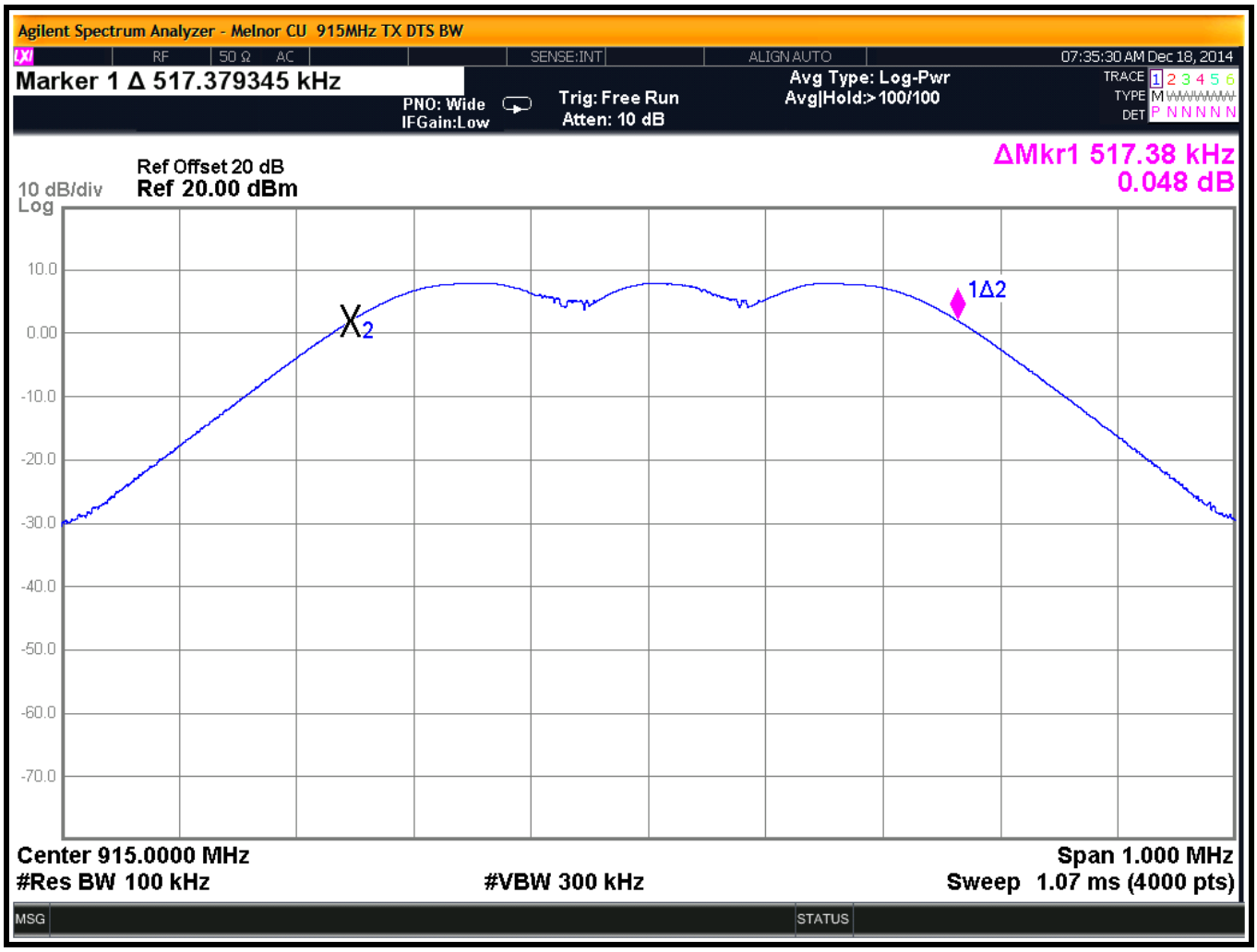


Figure 1: Occupied Bandwidth

5.2 RF Power Output:

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

Method used: Section 9.1.1 of DTS Meas. Guidance

Table 7: Spectrum Analyzer Settings

Resolution Bandwidth	Video Bandwidth
1MHz	3MHz

Table 8: RF Power Output

Frequency	Level	Limit	Pass/Fail
Channel: 915MHz	7.834 dBm	30 dBm	Pass

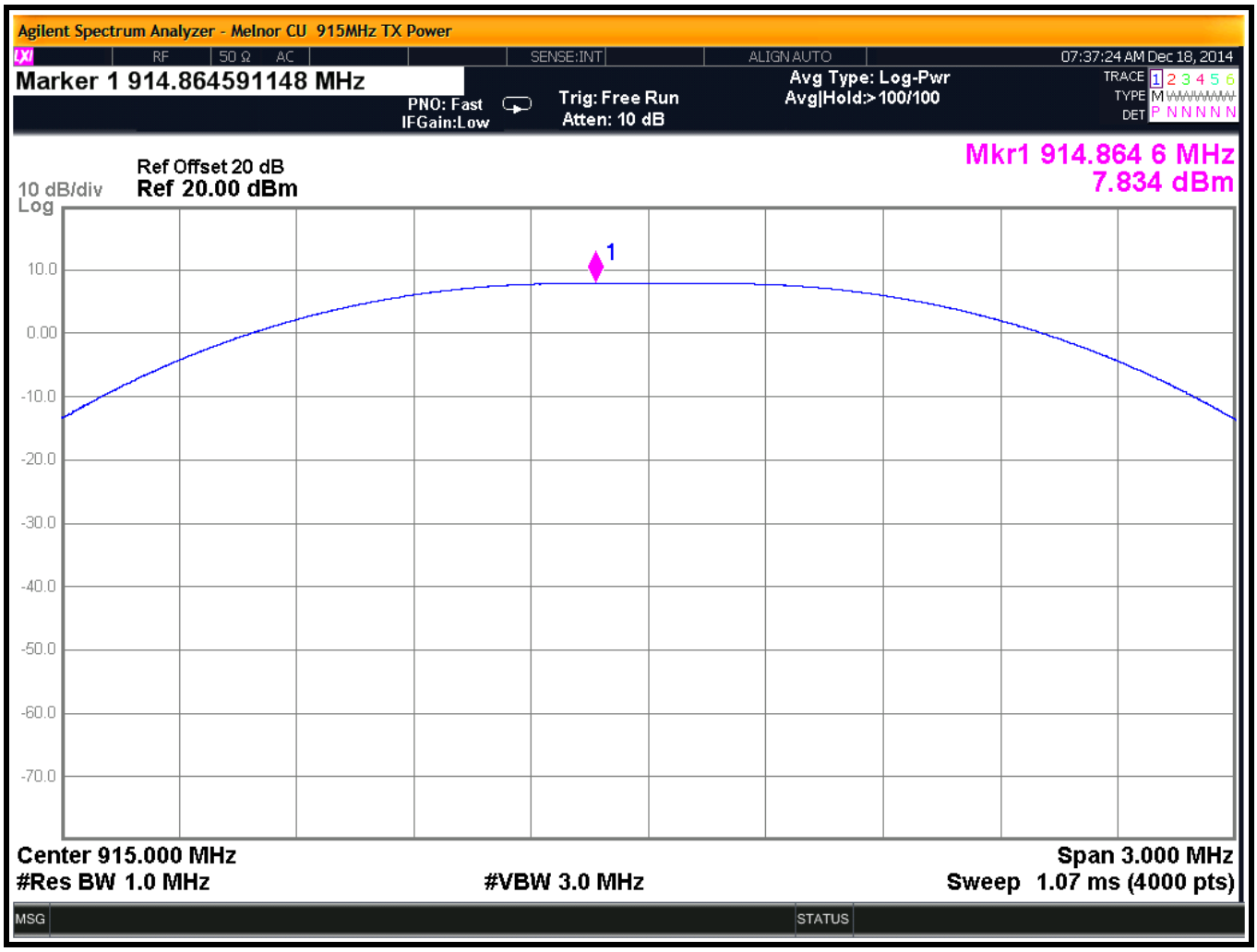


Figure 2: RF Peak Power, Low Channel

5.3 Power Spectral Density

Measurements for power spectral density were taken in accordance with 15.247(e). The measurements were performed using D01 DTS Meas. Guidance v03r02 Section 10.2 PKPSD. The spectrum analyzer was set to peak detect mode with a RBW of 3kHz, VBW of 10kHz across a 768.2kHz span using auto sweeptime.

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 9: Power Spectral Density

Frequency	Peak Level	Limit	Pass/Fail
Channel : 915MHz	7.832dBm	8 dBm	Pass

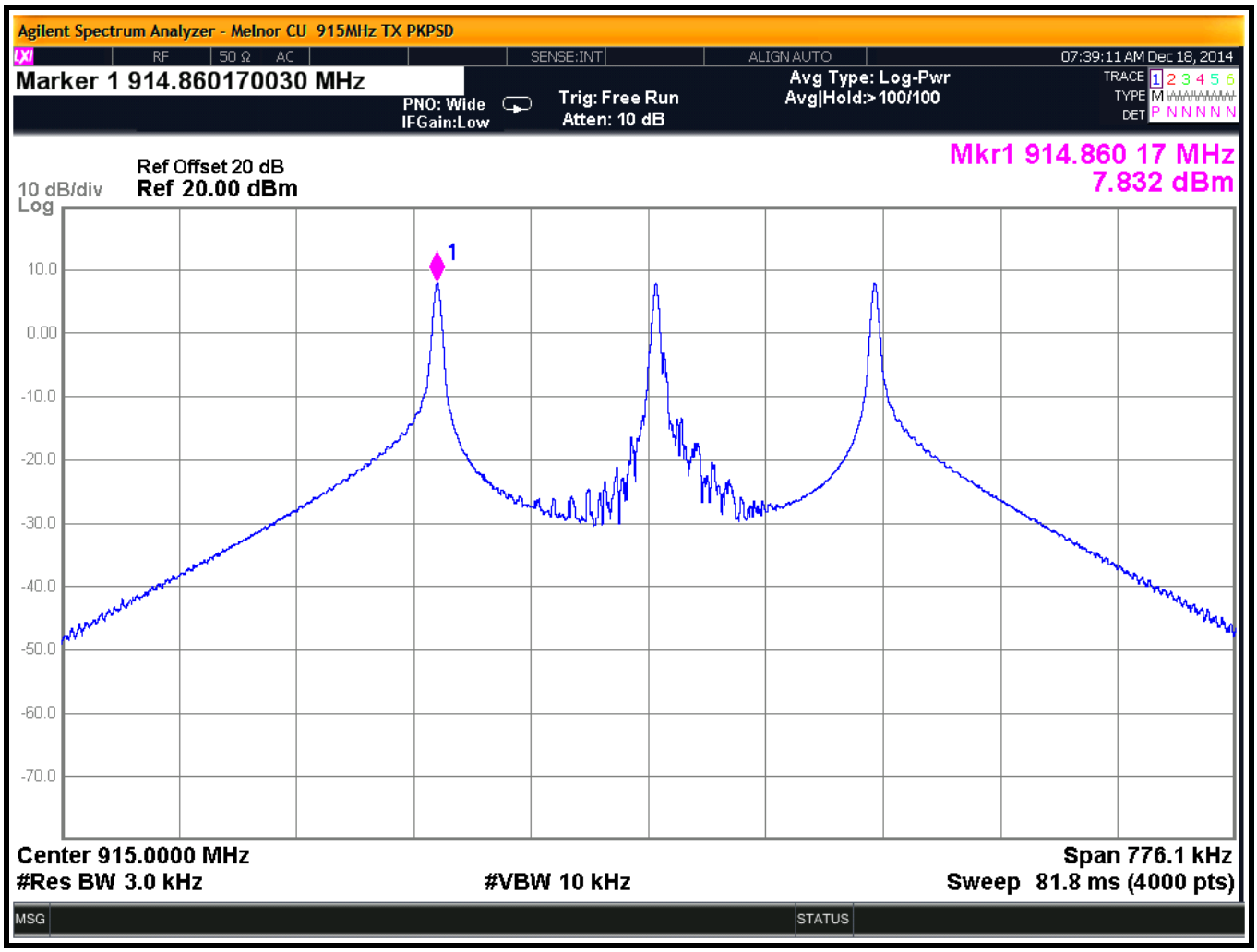


Figure 3: Power Spectral Density, Low Channel

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 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 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.

Method used: Section 11.1 of DTS Meas. Guidance

Table 10: Conducted Spurious Spectrum Analyzer Settings

Resolution Bandwidth	Video Bandwidth
100kHz	300kHz

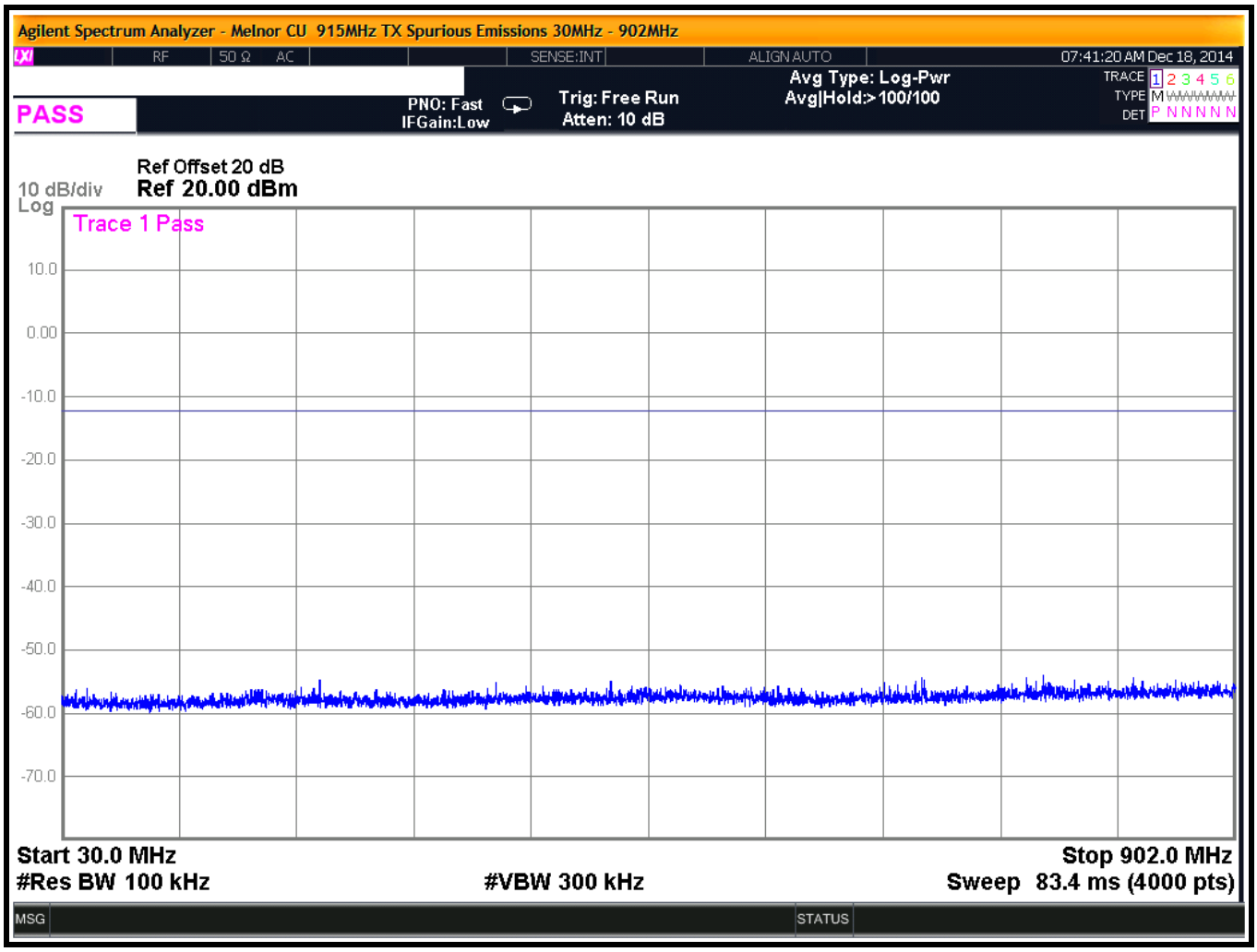


Figure 4: Conducted Spurious Emissions, 30MHz - 902MHz

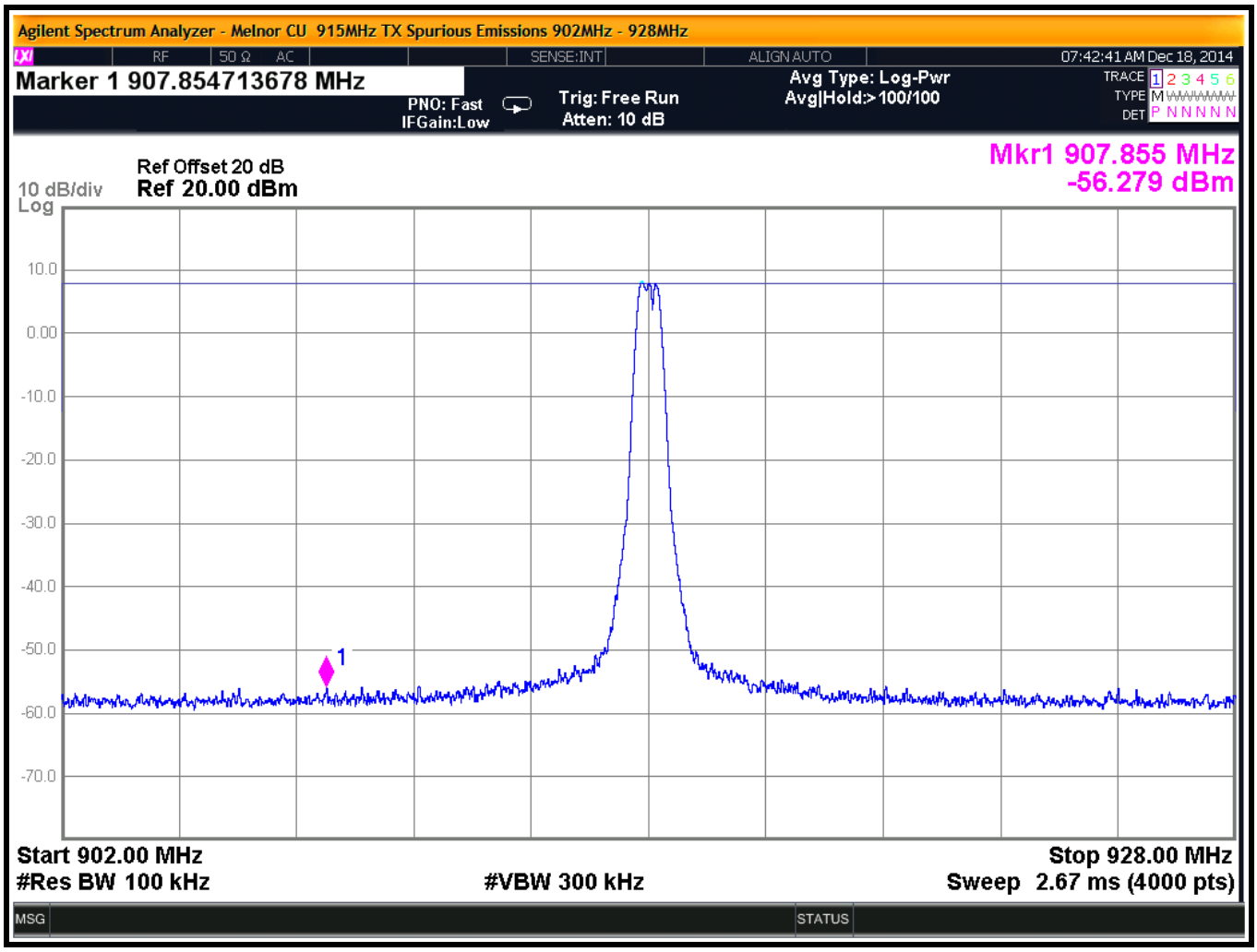


Figure 5: Conducted Spurious Emissions, 902MHz -928MHz

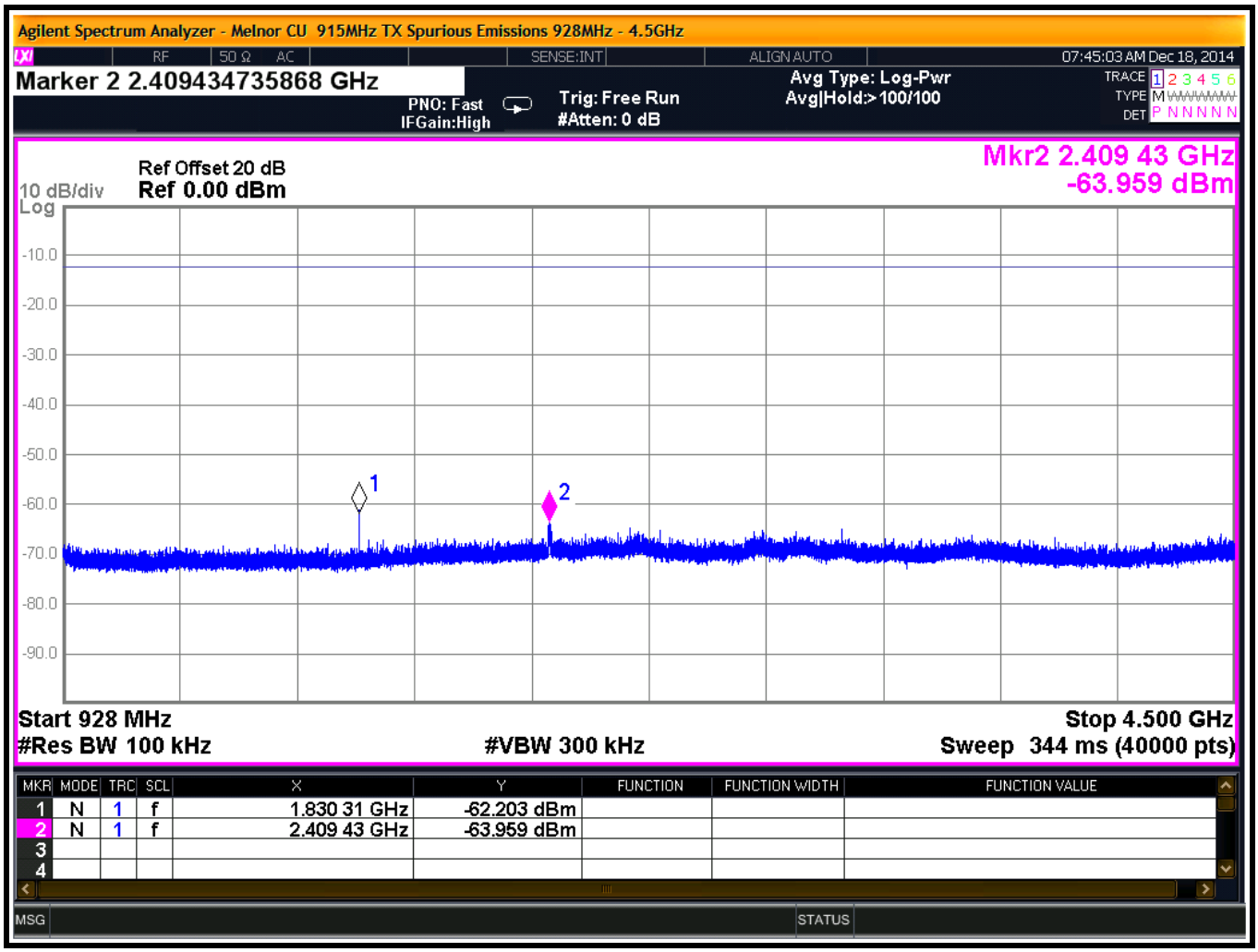


Figure 6: Conducted Spurious Emissions, 928MHz – 4.5GHz

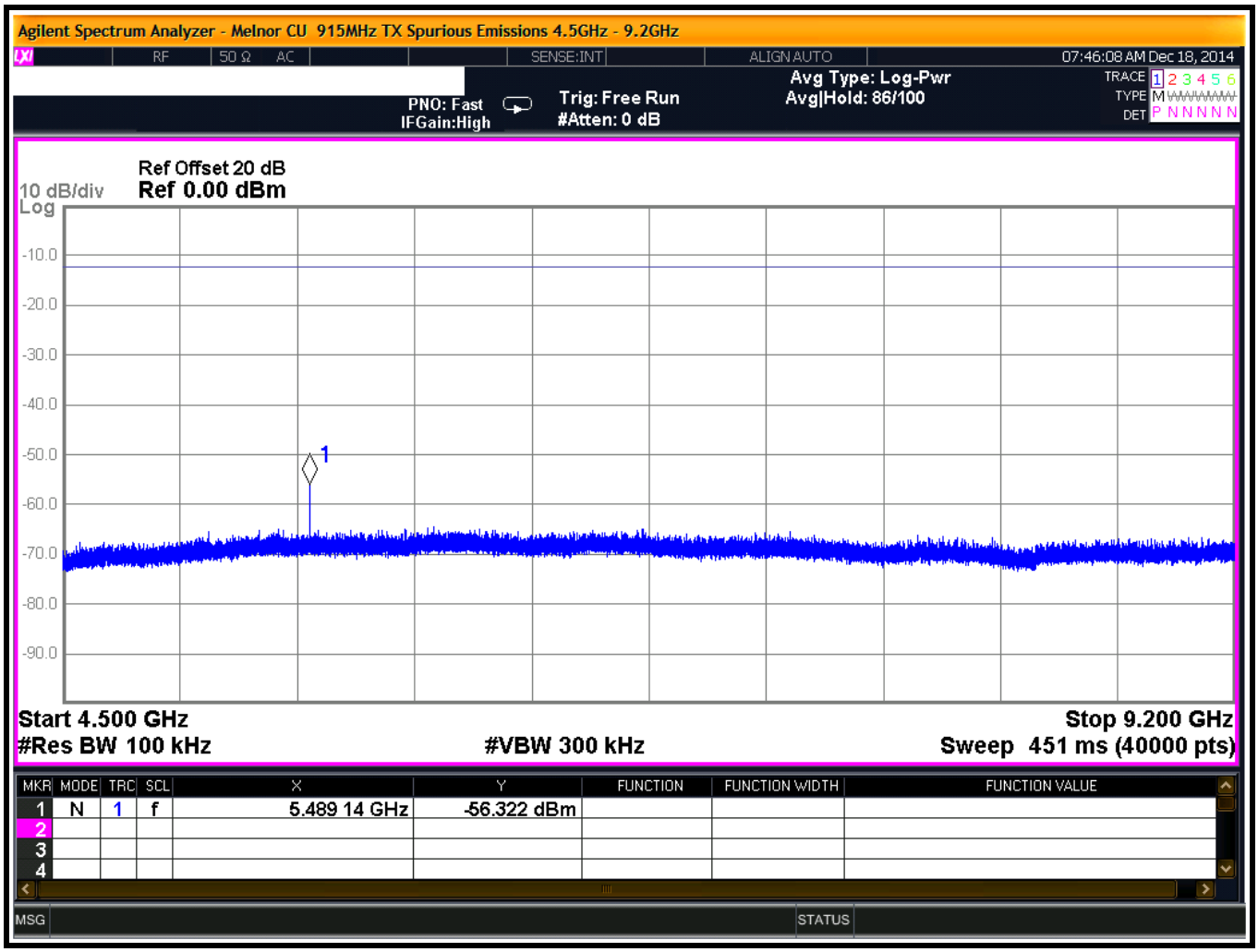


Figure 7: Conducted Spurious Emissions, 4.5GHz – 9.2GHz

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

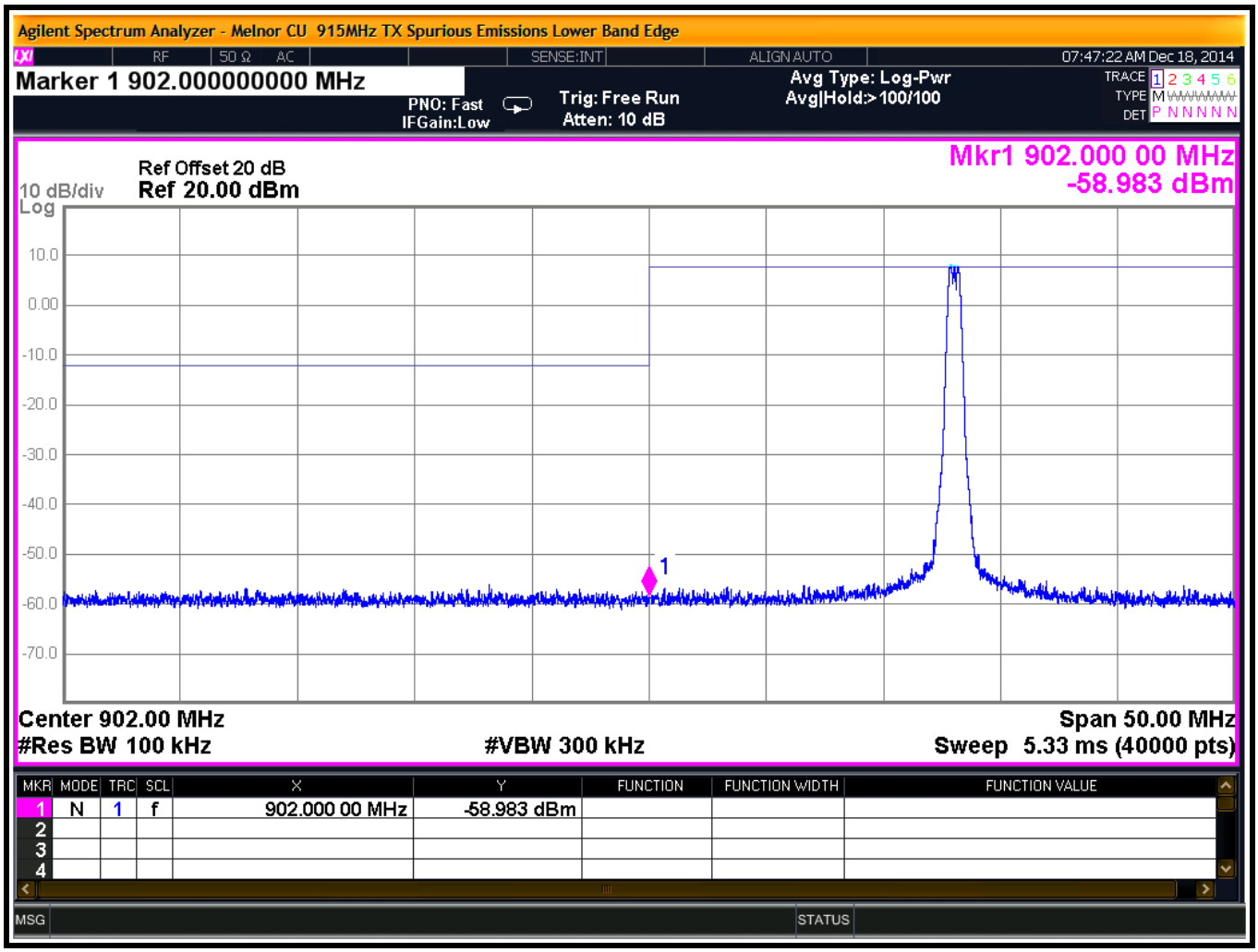


Figure 8: Lower Band-edge, Low Channel

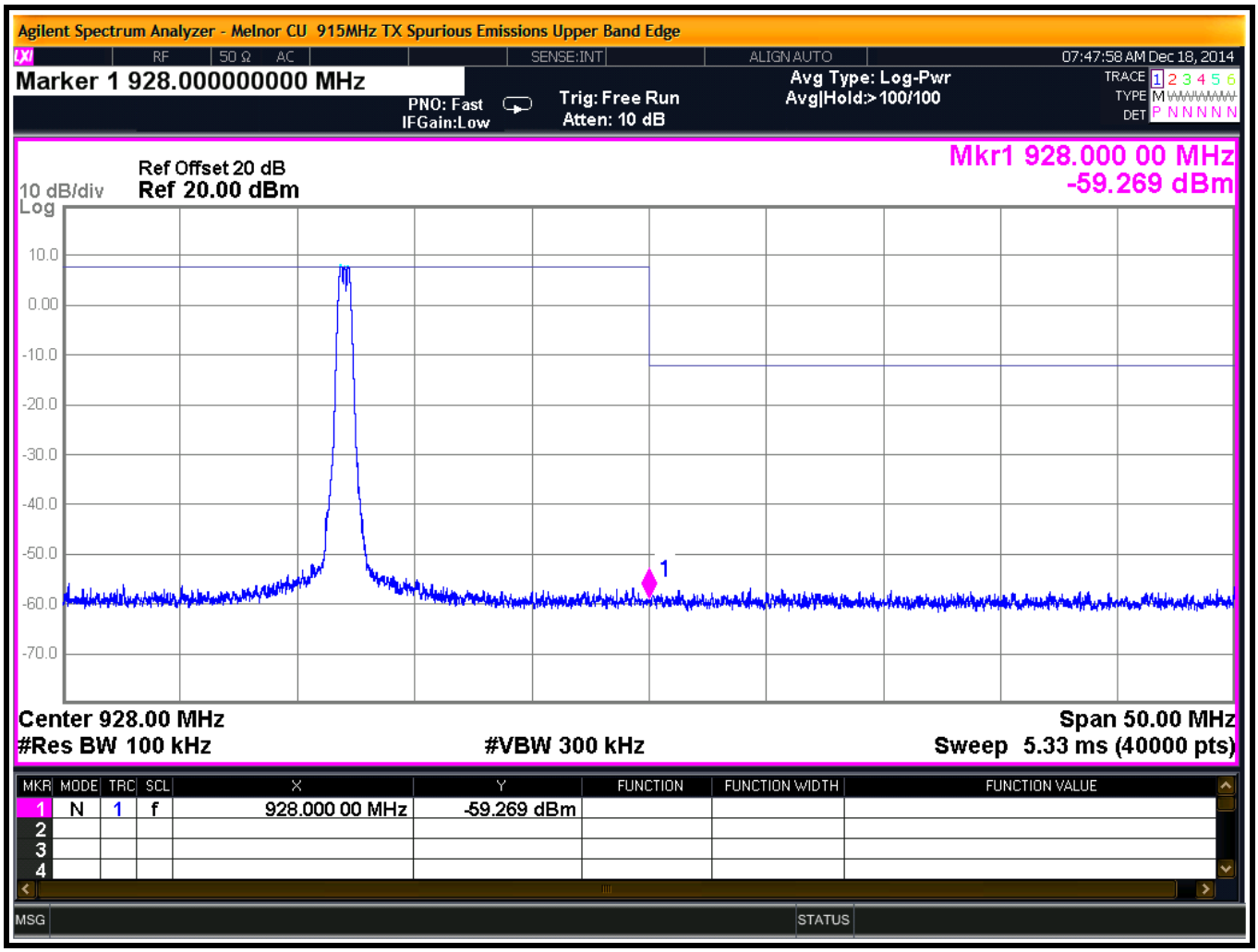


Figure 9: Upper Band-edge, High Channel

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. 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 11: 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 12: Radiated Emission Test Data

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
73.68	V	300.00	1.00	15.20	9.2	16.6	100.0	-15.6	
109.70	V	270.00	1.00	5.90	14.0	9.8	150.0	-23.7	
120.05	V	185.00	1.00	4.10	15.3	9.4	150.0	-24.1	
123.98	V	45.00	1.00	7.00	15.5	13.3	150.0	-21.1	
125.00	V	45.00	1.00	7.40	15.5	13.9	150.0	-20.6	
172.13	V	180.00	1.00	6.60	13.5	10.1	150.0	-23.4	
250.00	V	90.00	2.50	11.90	14.1	20.0	200.0	-20.0	
902.00	V	0.00	1.00	3.50	28.7	40.9	200.0	-13.8	Band Edge
928.00	V	0.00	1.00	1.00	28.4	29.4	200.0	-16.7	Band Edge
1830.00	V	125.00	2.80	62.00	-20.3	121.5	5000.0	-32.3	Peak
1830.00	V	125.00	2.80	54.20	-20.3	49.5	500.0	-20.1	Average
2745.00	V	45.00	2.80	61.00	-15.9	178.9	5000.0	-28.9	Peak
2745.00	V	45.00	2.80	51.50	-15.9	59.9	500.0	-18.4	Average
3660.00	V	275.00	2.50	63.19	-13.4	309.4	5000.0	-24.2	Peak
3660.00	V	275.00	2.50	55.60	-13.4	129.1	500.0	-11.8	Average
4575.00	V	10.00	2.30	58.43	-10.7	244.2	5000.0	-26.2	Peak
4575.00	V	10.00	2.30	49.10	-10.7	83.4	500.0	-15.6	Average
7320.00	V	0.00	2.30	52.00	-2.0	314.4	5000.0	-24.0	Peak
7320.00	V	0.00	2.30	44.90	-2.0	138.8	500.0	-11.1	Average
8235.00	V	15.00	2.20	53.90	-1.2	431.0	5000.0	-21.3	Peak
8235.00	V	15.00	2.20	44.80	-1.2	151.2	500.0	-10.4	Average
9150.00	V	15.00	2.00	54.30	0.9	578.1	5000.0	-18.7	Peak
9150.00	V	15.00	2.00	43.00	0.9	157.4	500.0	-10.0	Average
73.00	H	90.00	4.00	7.90	9.2	7.2	100.0	-22.9	
114.32	H	180.00	4.00	5.80	14.7	10.6	150.0	-23.0	
123.99	H	45.00	4.00	7.60	15.5	14.2	150.0	-20.5	
125.00	H	45.00	4.00	6.50	15.5	12.6	150.0	-21.5	
172.13	H	270.00	4.00	8.70	13.5	12.9	150.0	-21.3	
250.00	H	180.00	2.50	7.70	14.1	12.3	200.0	-24.2	
902.00	H	180.00	1.25	1.00	28.7	30.7	200.0	-16.3	Band Edge
928.00	H	180.00	1.25	2.40	28.4	34.5	200.0	-15.3	Band Edge
1830.00	H	280.00	2.60	62.40	-20.3	127.2	5000.0	-31.9	Peak
1830.00	H	280.00	2.60	53.50	-20.3	45.7	500.0	-20.8	Average
2745.00	H	355.00	2.50	62.90	-15.9	222.6	5000.0	-27.0	Peak
2745.00	H	355.00	2.50	56.50	-15.9	106.5	500.0	-13.4	Average
3660.00	H	300.00	2.50	62.80	-13.4	295.8	5000.0	-24.6	Peak
3660.00	H	300.00	2.50	54.30	-13.4	111.2	500.0	-13.1	Average
4575.00	H	270.00	2.50	56.10	-10.7	186.8	5000.0	-28.6	Peak
4575.00	H	270.00	2.50	47.80	-10.7	71.8	500.0	-16.9	Average
7320.00	H	0.00	2.30	54.70	-2.0	429.1	5000.0	-21.3	Peak
7320.00	H	0.00	2.30	44.70	-2.0	135.7	500.0	-11.3	Average
8235.00	H	90.00	2.20	55.30	-1.2	506.4	5000.0	-19.9	Peak
8235.00	H	90.00	2.20	44.60	-1.2	147.7	500.0	-10.6	Average
9150.00	H	180.00	2.00	55.60	0.9	671.5	5000.0	-17.4	Peak
9150.00	H	180.00	2.00	43.00	0.9	157.4	500.0	-10.0	Average

5.6 Receiver 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.

5.6.1 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 13: 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 14: 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)
44.54	V	180.00	1.00	17.60	11.3	27.8	100.0	-11.1
47.62	V	180.00	1.00	19.30	9.4	27.3	100.0	-11.3
73.68	V	300.00	1.00	15.20	9.2	16.6	100.0	-15.6
80.24	V	125.00	1.00	17.10	9.0	20.1	100.0	-13.9
109.70	V	270.00	1.00	5.90	14.0	9.8	150.0	-23.7
120.05	V	185.00	1.00	4.10	15.3	9.4	150.0	-24.1
123.98	V	45.00	1.00	7.00	15.5	13.3	150.0	-21.1
125.00	V	45.00	1.00	7.40	15.5	13.9	150.0	-20.6
172.13	V	180.00	1.00	6.60	13.5	10.1	150.0	-23.4
218.97	V	45.00	1.00	3.10	13.1	6.4	200.0	-29.9
250.00	V	90.00	2.50	11.90	14.1	20.0	200.0	-20.0
40.26	H	90.00	4.00	4.10	14.2	8.3	100.0	-21.7
45.20	H	90.00	4.00	4.40	10.9	5.8	100.0	-24.7
51.56	H	180.00	4.00	8.30	8.1	6.6	100.0	-23.6
73.00	H	90.00	4.00	7.90	9.2	7.2	100.0	-22.9
80.00	H	95.00	4.00	11.90	9.0	11.1	100.0	-19.1
114.32	H	180.00	4.00	5.80	14.7	10.6	150.0	-23.0
123.99	H	45.00	4.00	7.60	15.5	14.2	150.0	-20.5
125.00	H	45.00	4.00	6.50	15.5	12.6	150.0	-21.5
172.13	H	270.00	4.00	8.70	13.5	12.9	150.0	-21.3
250.00	H	180.00	2.50	7.70	14.1	12.3	200.0	-24.2

5.7 AC Conducted Emissions

5.7.1 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

5.7.2 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

5.7.3 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 radio in the "transmit on" state.

Table 15: 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)
0.252	24.1	24.1	10.2	0.3	34.5	34.5	61.7	51.7	-27.2	-17.2
0.611	30.1	30.1	10.3	0.4	40.7	40.7	56.0	46.0	-15.3	-5.3
3.438	21.3	21.3	10.4	0.3	32.0	32.0	56.0	46.0	-24.0	-14.0
6.660	19.1	19.1	10.9	0.1	30.1	30.1	60.0	50.0	-29.9	-19.9
13.130	13.4	13.4	11.3	0.5	25.1	25.1	60.0	50.0	-34.9	-24.9
18.690	12.5	12.5	11.5	0.9	24.9	24.9	60.0	50.0	-35.1	-25.1
22.120	10.1	10.1	11.6	1.1	22.7	22.7	60.0	50.0	-37.3	-27.3
26.510	9.3	9.3	11.8	1.2	22.3	22.3	60.0	50.0	-37.7	-27.7

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)
0.383	24.8	24.8	10.2	0.3	35.2	35.2	58.2	48.2	-23.0	-13.0
0.591	29.0	29.0	10.2	0.5	39.7	39.7	56.0	46.0	-16.3	-6.3
1.139	29.4	29.4	10.3	0.3	39.9	39.9	56.0	46.0	-16.1	-6.1
6.600	18.3	18.3	10.9	0.0	29.2	29.2	60.0	50.0	-30.8	-20.8
10.630	14.4	14.4	11.1	0.3	25.8	25.8	60.0	50.0	-34.2	-24.2
18.900	10.7	10.7	11.5	0.6	22.8	22.8	60.0	50.0	-37.2	-27.2
28.630	18.3	18.3	11.9	1.4	31.6	31.6	60.0	50.0	-28.4	-18.4
30.000	17.0	17.0	12.0	1.5	30.5	30.5	60.0	50.0	-29.5	-19.5