Measurement of RF Interference from the Falcon Weber Connect Controller Transceiver: 802.11b/g/n Report

For	Weber-Stephen Products LLC 1415 S Roselle Rd Palatine, IL 60067
P.O. Number	135046
Date Received	May 21, 2020
Date Tested	May 21 – 28, 2020
Test Personnel	Javier Cardenas
Specification	FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.247 for Digital Modulation Intentional Radiators Operating within the band 2400-2483.5MHz Industry Canada RSS-247 Industry Canada RSS-GEN

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REVISION HISTORY

Revision	Date	Description
—	29 May 2020	Initial release

Measurement of RF Emissions from the
Weber Connect Controller, Part No. Falcon Transceiver: 802.11b/g/n Report

1. INTRODUCTION

1.1 Scope of Tests

This document represents the results of the series of radio interference measurements performed on the 802.11b/g/n radio of a Weber-Stephen Products LLC Weber Connect Controller, Part No. Falcon, transceiver (hereinafter referred to as the EUT). The digital modulation transceiver was designed to transmit and receive in the 2400-2483.5 MHz band using an internal antenna. The EUT was manufactured and submitted for testing by Weber-Stephen Products LLC located in Palatine, IL.

1.2 Purpose

The test series was performed to determine if the EUT meets the conducted RF emission requirements, radiated RF emissions requirements, and additional provisions of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.247 for Intentional Radiators Operating within the 2400-2483.5 MHz band.

The test series was also performed to determine if the EUT meets the conducted RF emission requirements, radiated RF emissions requirements, and additional provisions of the Industry Canada Radio Standards Specification RSS-Gen Section 8.8 and Industry Canada Radio Standards Specification RSS-247 for Transmitters.

Testing was performed in accordance with ANSI C63.4-2014.

1.3 Deviations, Additions and Exclusions

There were no deviations, additions to, or exclusions from the test specification during this test series

1.4 EMC Laboratory Identification

This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by the American Association for Laboratory Accreditation (A2LA), A2LA Lab Code: 1786-01.

1.5 Laboratory Conditions

The temperature at the time of the test was 21°C and the relative humidity was 30%.

2. APPLICABLE DOCUMENTS

The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subparts B and C

- ANSI C63.4-2014, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”

- ANSI C63.10-2013, "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”

- Industry Canada RSS-247, Issue 2, February 2017, “Spectrum Management and Telecommunications Radio Standards Specification, Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs), and Licence-Exempt Local Area Network (LE-LAN) Devices”

- Industry Canada RSS-GEN, Issue 5, March 2019, “Spectrum Management and

Telecommunications Radio Standards Specification, General Requirements for Compliance of Radio Apparatus"

3. EUT SET-UP AND OPERATION

3.1 General Description

The EUT is a Weber Connect Controller, Part No. Falcon. A block diagram of the EUT setup is shown as Figure 1 and Figure 2.

3.1.1 Power Input

The EUT is powered with 5VDC obtained through a host device that gets 115V 60Hz power from the AC mains.

3.1.2 Peripheral Equipment

The following peripheral equipment was submitted with the EUT:

Item	Description
EX6	36" Grill Host

3.1.3 Grounding

Since only two wires were used to provide the input power, the EUT was ungrounded during the tests.

3.2 Operational Mode

The EUT was energized. The unit was programmed to operate in one of the following modes:

- 802.11b 1Mbps
  - Tx at 2412MHz
  - Tx at 2437MHz
  - Tx at 2462MHz
- 802.11g 6Mbps
  - Tx at 2412MHz
  - Tx at 2437MHz
  - Tx at 2462MHz
- 802.11n HT20 MCS0
  - Tx at 2412MHz
  - Tx at 2437MHz
  - Tx at 2462MHz

These modes were determined to be the worst case.

3.3 EUT Modifications

No modifications were required for compliance.

4. TEST FACILITY AND TEST INSTRUMENTATION

4.1 Shielded Enclosure

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. With the exception of the floor, the reflective surfaces of the shielded chamber are lined with ferrite tiles on the walls and ceiling. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2014 for site attenuation.

4.2 Test Instrumentation

The test instrumentation and auxiliary equipment used during the tests are listed in Table 9-1. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

Conducted and radiated emission tests were performed with an EMI receiver utilizes the bandwidths and detectors specified by the FCC.

4.3 Calibration Traceability

Test equipment is maintained and calibrated on a regular basis. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

4.4 Measurement Uncertainty

All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system.

Values of Expanded Measurement Uncertainty (95% Confidence) are presented below:

Measurement Type	Expanded Measurement Uncertainty
Conducted disturbance (mains port) (150 kHz – 30 MHz)	2.7
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2

5. TEST PROCEDURES

5.1 Powerline Conducted Emissions

5.1.1 Requirements

Per the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Per 15.207(a), all radio frequency voltages on the power lines of a transmitter shall be below the values shown below when using a quasi-peak or average detector:

Frequency MHz	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 – 0.5	66 decreasing with logarithm of frequency to 56	56 decreasing with logarithm of frequency to 46
0.5 - 5	56	46
5 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: If the levels measured using the QP detector meet both the QP and the Average limits, the EUT is considered to have met both requirements and measurements do not need to be performed using the Average detector.

5.1.2 Procedures

The interference on each power lead of the EUT was measured by connecting the measuring equipment to the appropriate meter terminal of the Line Impedance Stabilization Network (LISN). The meter terminal of the LISN

not under test was terminated with 50 ohms.

a) The EUT was operated in the Transmit mode.

b) Measurements were first made on the 120VAC,60Hz line.

c) The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands.

d) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.

e) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 10dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.)

f) Steps (d) and (e) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits.

g) Steps (c) through (f) were repeated on the return line.

5.1.3 Results

The plots and tabular results of the peak, quasi-peak, and average conducted voltage levels acquired from each input power line with the EUT operated in the Transmit mode are shown on pages 21 through 42. All power line conducted emissions measured from the EUT were within the specification limits. Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown on Figure 3.

5.2 6dB Bandwidth

5.2.1 Requirements

Per 15.247(a)(2),the minimum 6dB bandwidth shall be at least 500kHz for all systems using digital modulation techniques.

5.2.2 Procedures

The EUT was setup inside the chamber. The EUT was allowed to transmit continuously. The transmit channel was set separately to low, middle, and high channels. The resolution bandwidth (RBW) was set to 100kHz, the video bandwidth (VBW) was set to the same as or 3 times greater than the RBW, and the span was set to 3 times the RBW.

The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was plotted using a 'screen dump' utility.

5.2.3 Results

The plots on pages 25 through 42 show that the minimum 6 dB bandwidth was 7.49MHz which is greater than minimum allowable 6dB bandwidth requirement of 500kHz for systems using digital modulation techniques. The 99% bandwidth was measured to be 13.73MHz.

5.3 Peak Output Power

5.3.1 Requirements

Per section 15.247(b)(3), for systems using digital modulation the maximum peak output conducted power shall

not be greater than 1.0W (30dBm). Per section 15.247(b)(4), this limit is based on the use of antennas with directional gains that do not exceed 6dBi. Since the limit allows for a 6dBi antenna gain, the maximum EIRP can be increased by 6dB to 4 Watt (36dBm).

5.3.2 Procedures

The antenna port of the EUT was connected to the spectrum analyzer through 40dB of attenuation. The maximum meter reading was recorded. The peak power output was calculated for the low, middle and high channels.

The antenna port of the EUT was connected to the spectrum analyzer through 40dB of attenuation. The EUT was set to transmit separately at the low, middle, and high channels. The resolution bandwidth (RBW) was set to greater than the 6dB bandwidth. The 'Max-Hold' function was engaged. The maximum meter reading was recorded. The peak power output was calculated for the low, middle and high channels.

Additionally the EUT was placed on the non-conductive stand and set to transmit. A double ridged waveguide antenna was placed at a test distance of 3 meters from the EUT. The resolution bandwidth (RBW) of the spectrum analyzer was set to greater than the 6dB bandwidth. The EUT was maximized for worst case emissions (or maximum output power) at the measuring antenna. The maximum meter reading was recorded. The peak power output was measured for the low, middle and high channels.

The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, a double ridged waveguide antenna was then set in place of the EUT and connected to a calibrated signal generator. The output of the signal generator was adjusted to match the received level at the spectrum analyzer. The signal level was recorded. The reading was then corrected to compensate for cable loss and antenna gain, as required. The peak power output was calculated for low, middle, and high hopping frequencies.

5.3.3 Results

The results are presented on pages 43 and 51. The maximum peak conducted output power from the transmitter was 0.074W (18.68 dBm) which is below the 1 Watt limit.

The results are presented on pages 52 and 60. The maximum EIRP measured from the transmitter was 23.9 dBm or 0.246 W which is below the 4 Watt de facto limit.

5.4 Duty Cycle Factor Measurements

5.4.1 Procedures

The duty cycle factor is used to convert peak detected readings to average readings. This factor is computed from the time domain trace of the pulse modulation signal.

With the transmitter set up to transmit for maximum pulse density, the time domain trace is displayed on the spectrum analyzer. This trace is obtained by tuning center frequency to the transmitter frequency and then setting a zero span width with 1msec/div. The amplitude settings are adjusted so that the on/off transitions clear the 4th division from the bottom of the display. The markers are set at the beginning and end of the “on-time”. The trace is recorded.

Next the spectrum analyzer center frequency is set to the transmitter frequency with a zero span width and 10msec/div. This shows if the word is longer than 100msec or shorter than 100msec. If the word period is less than 100msec, the display is set to show at least one word. The on-time and off-time are then measured. The on-time is total time signal level exceeds the 4th division. Off-time is time under for the word period. The duty cycle is then computed as the (On-time/ word period) where the word period = (On-time + Off-time).

5.4.2 Results

The plots of the duty cycle are shown on data pages 61 and 64.

5.5 Radiated Spurious Emissions Measurements

5.5.1 Requirements

Per section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated emissions measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emission limits specified in §15.209(a).

Paragraph 15.209(a) has the following radiated emission limits:

Frequency MHz	Field Strenght (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	3
30.0-88.0	100	3
88.0-216.0	150	3
216.0-960.0	200	3
Above 960	500	3

5.5.2 Procedures

Radiated measurements were performed in a 32ft. x 20ft. x 14ft. high shielded enclosure. The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

Preliminary radiated emissions tests were performed to determine the emission characteristics of the EUT. For the preliminary test, a broadband measuring antenna was positioned at a 3 meter distance from the EUT. The entire frequency range from 30MHz to 25GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 25GHz.

1) For all harmonics not in the restricted bands, the following procedure was used:
   a) The field strength of the fundamental was measured using a double ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on a 1.5 meter high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
   b) The field strengths of all of the harmonics not in the restricted band were then measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on a 1.5 meter high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
   c) To ensure that maximum or worst case emission levels at the fundamental and harmonics were measured, the following steps were taken when measuring the fundamental emissions and the spurious emissions:
      i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
      ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
      iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.
      iv) In instances where it was necessary to use a shortened cable between the measuring antenna and

the spectrum analyzer. The measuring antenna was not raised or lowered to ensure maximized readings, instead the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.

d) All harmonics not in the restricted bands must be at least 20 dB below levels measured at the fundamental. However, attenuation below the general limits specified in §15.209(a) is not required.

2) For all emissions in the restricted bands, the following procedure was used:

a) The field strengths of all emissions below 1 GHz were measured using a bi-log antenna. The bi-log antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on an 80cm high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.

b) The field strengths of all emissions above 1 GHz were measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on a 1.5 meter high non-conductive stand. A peak detector with a resolution bandwidth of 1 MHz was used on the spectrum analyzer.

c) To ensure that maximum or worst case emission levels were measured, the following steps were taken when taking all measurements:

i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.

ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.

iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.

iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer. The measuring antenna was not raised or lowered to ensure maximized readings, instead the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.

d) For all radiated emissions measurements below 1 GHz, if the peak reading is below the limits listed in 15.209(a), no further measurements are required. If however, the peak readings exceed the limits listed in 15.209(a), then the emissions are remeasured using a quasi-peak detector.

e) For all radiated emissions measurements above 1 GHz, the peak readings must comply with the 15.35(b) limits. 15.35(b) states that when average radiated emissions measurements are specified, there also is a limit on the peak level of the radiated emissions. The limit on the peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1 GHz must be no greater than 20 dB above the limits specified in 15.209(a).

f) Next, for all radiated emissions measurements above 1GHz, the resolution bandwidth was set to 1MHz. The analyzer was set to linear mode with a 10Hz video bandwidth in order to simulate an average detector. An average reading was taken.

5.5.3 Results

Final radiated emissions results with the EUT transmitting at 2412MHz, 2437MHz, and 2462MHz are shown on pages 65 through 91. As can be seen from the data, all emissions measured from the EUT were within the specification limits. Photographs of the test configuration which yielded the highest, or worst case, radiated emission levels are shown on Figures 4 through 6.

5.6 Band Edge Compliance

5.6.1 Requirements

Per section 15.247(d), the emissions at the band-edges must be at least 20dB below the highest level measured within the band but attenuation below the general limits listed in 15.209(a) is not required.

5.6.2 Procedures

5.6.2.1 Low Band Edge

1) The EUT was setup inside the test chamber on a non-conductive stand.
2) A broadband measuring antenna was placed at a test distance of 3 meters from the EUT.
3) The EUT was set to transmit continuously at the channel closest to the low band-edge.
4) The EUT was maximized for worst case emissions at the measuring antenna. The maximum meter reading was recorded.
5) To determine the bandedge compliance, the following spectrum analyzer settings were used:
    a. Center frequency = low band-edge frequency.
    b. Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.
    c. Resolution bandwidth (RBW) ≥ 1% of the span.
    d. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.
    e. The marker was set on the peak of the in-band emissions. A display line was placed 20dB down from the peak of the in-band emissions. All emissions which fall outside of the authorized band of operation must be below the 20dB down display line. (All emissions to the left of the center frequency (band-edge) must be below the display line.)
    f. The analyzer's display was plotted using a 'screen dump' utility.

5.6.2.2 High Band Edge

1) The EUT was set to transmit continuously at the channel closest to the high band-edge.
2) A double ridged waveguide was placed 3 meters away from the EUT. The antenna was connected to the input of a spectrum analyzer.
3) The center frequency of the analyzer was set to the high band edge (2483.5MHz)
4) The resolution bandwidth was set to 1MHz.
5) To ensure that the maximum or worst case emission level was measured, the following steps were taken:

    a. The EUT was rotated so that all of its sides were exposed to the receiving antenna.
    b. Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
    c. The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

6) The highest measured peak reading was recorded.
7) The highest measured average reading was recorded.

5.6.3 Results

Pages 92 through 97 show the radiated band-edge compliance results. As can be seen from these plots, the radiated emissions at the low end band edge are within the 20 dB down limits. The radiated emissions at the high end band edge are within the general limits.

5.7 Power Spectral Density

5.7.1 Requirement

Per section 15.247(e), the peak power spectral density from the intentional radiator shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

5.7.2 Procedures

1) The antenna port of the EUT was connected to the spectrum analyzer through a 40dB pad.
2) The EUT was set to transmit at a low, mid and high channel.

3) To determine the power spectral density, the following spectrum analyzer settings were used:
   a. Center frequency = transmit frequency
   b. Span = 1.5 times the DTS (6 dB) bandwidth
   c. Resolution bandwidth (RBW): 3kHz ≤ RBW ≤ 100kHz
   d. Sweep time = auto
   e. The peak detector and 'Max-Hold' function was engaged.
   f. The display line represents the 8 dBm limit
   g. The analyzer's display was plotted using a 'screen dump' utility.

4) If measured value exceeds limit, reduce RBW (no less than 3kHz) and repeat.

Results

Pages 98 through 106 show the power spectral density results. As can be seen from this plot, the peak power density is less than 8dBm in a 3kHz band during any time interval of continuous transmission.

6. CONCLUSIONS

It was determined that the 802.11b/g/n radio of the Weber-Stephen Products LLC Weber Connect Controller, Part No. Falcon digital modulation transceiver, did fully meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.247 for Intentional Radiators Operating within the 2400-2483.5 MHz band, when tested per ANSI C63.4-2014.

It was also determined that the 802.11b/g/n radio of the Weber-Stephen Products LLC Weber Connect Controller, Part No. Falcon digital modulation transceiver, did fully meet the conducted and radiated RF emission requirements of the Industry Canada Radio Standards Specification RSS-Gen Section 8.8 and Radio Standards Specification RSS-247 for transmitters, when tested per ANSI C63.4-2014.

7. CERTIFICATION

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications.

The data presented in this test report pertains to the EUT at the test date. Any electrical or mechanical modification made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

8. ENDORSEMENT DISCLAIMER

This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST or any agency of the Federal Government.

9. EQUIPMENT LIST

Table 9-1 Equipment List

Eq ID	Oper	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW1		PREAMPLIFIER	PLANAR ELECTRONICS	PE2-30-20G20R6G-3R0-10-12-SFF	PL162015/1446	20GHZ-26.5GHZ	10/2/2019	10/2/2020
APW11		PREAMPLIFIER	PMI	PE2-35-120-5R0-10-12-SFF	PL11685/1241	1GHZ-20GHZ	4/2/2020	4/2/2021
CDX8		COMPUTER	ELITE	WORKSTATION			N/A	
GRE2		SIGNAL GENERATOR	AGILENT	E4438C	MY42081749	250KHZ-6GHZ	3/20/2020	3/20/2021
MEA0		MICRO-OHM METER	KEITHLEY	580	674866	10UOHM-200KOHM	7/13/2019	7/13/2020
NHG1		STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ	NOTE 1	
NSDS1		UNIVERSAL SPHERICAL DIPOLE SOURCE	AET	USDS-H	AET-1116		NOTE 1	
NTA4		BILOG ANTENNA	TESEQ	6112D	46660	20-2000GHZ	9/23/2019	9/23/2020
NWQ0		DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66657	1GHZ-18GHZ	5/13/2020	5/13/2022
NWQ1		DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS-LINDGREN	3117	66655	1GHZ-18GHZ	4/28/2020	4/28/2022
PLF1		CISPR16 50UH LISN	ELITE	CISPR16/70A	001	.15-30MHz	4/24/2020	4/24/2021
PLF3		CISPR16 50UH LISN	ELITE	CISPER16/70A	003	.15-30MHz	4/24/2020	4/24/2021
RBG2		EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	3/23/2020	3/23/2021
T1E0		10DB 25W ATTENUATOR	WEINSCHEL	46-10-43	AU1882	DC-18GHZ	3/19/2020	3/19/2022
T2DI		20DB, 25W ATTENUATOR	WEINSCHEL	46-20-34	BN1041	DC-18GHZ	9/20/2018	9/20/2020
T2DN		20DB, 25W ATTENUATOR	WEINSCHEL	46-20-34	BS2147	DC-18GHZ	1/10/2020	1/10/2022
VBR8		CISPR EN FCC CE VOLTAGE.exe					N/A	
VBV2		CISPR EN FCC ICES RE.EXE	ELITE	CISPR EN FCC ICES RE.EXE	---	---	N/A	
WKA1		SOFTWARE, UNIVERSAL RCV EMI	ELITE	UNIV_RCV_EMI	1	---	I/O	
XPR0		HIGH PASS FILTER	K&L MICROWAVE	11SH10-4800/X20000	001	4.8-20GHZ	9/6/2019	9/6/2021

N/A: Not Applicable I/O: Initial Only CNR: Calibration Not Required

NOTE 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

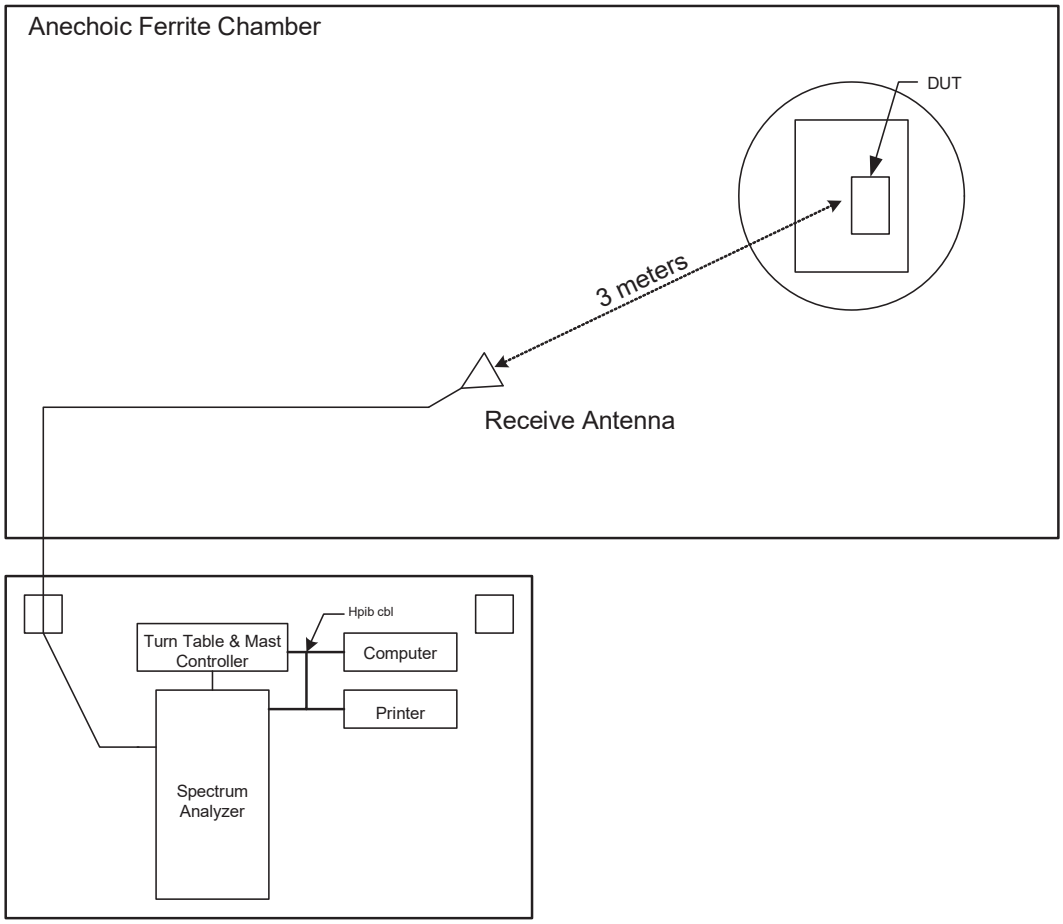


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

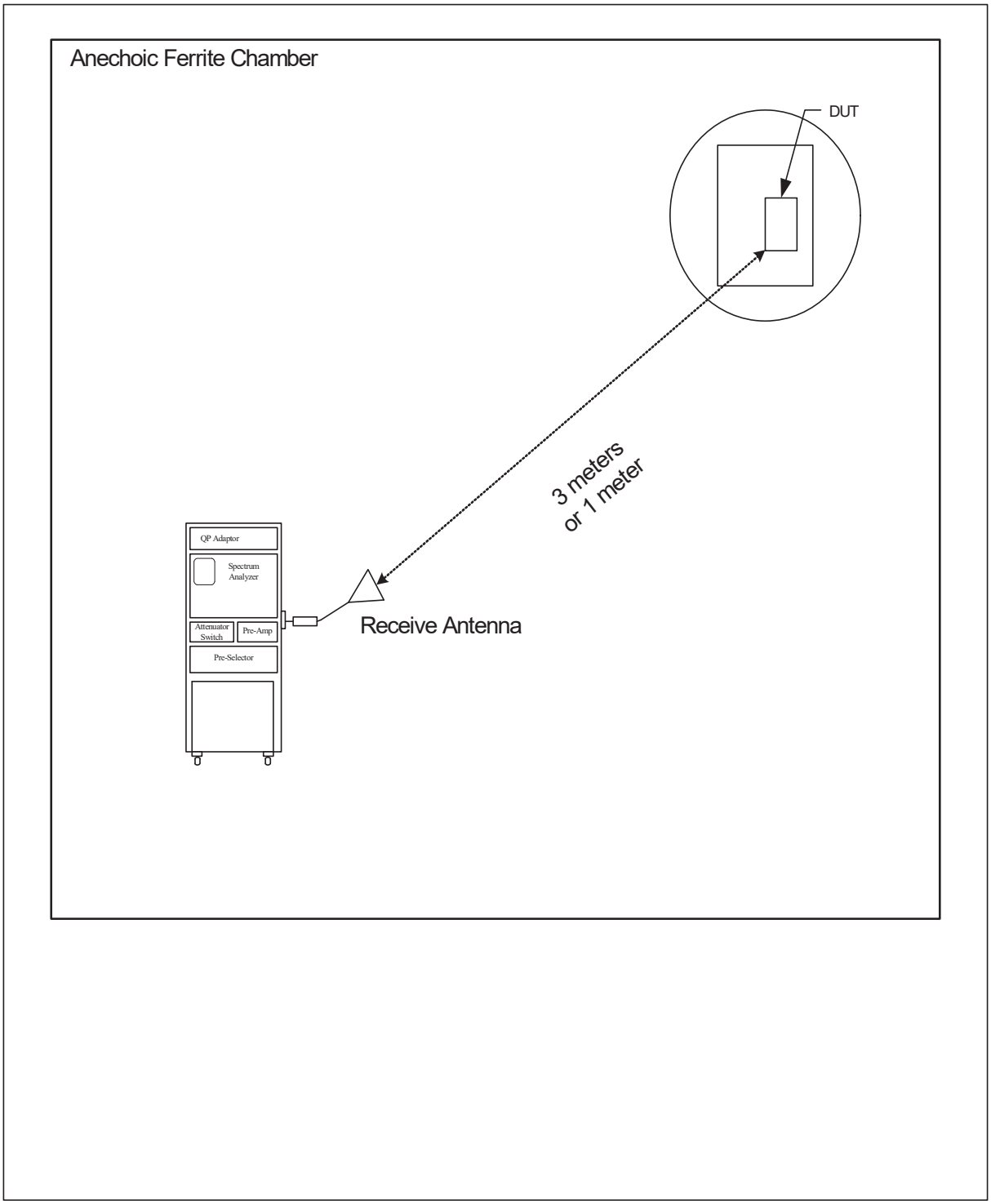
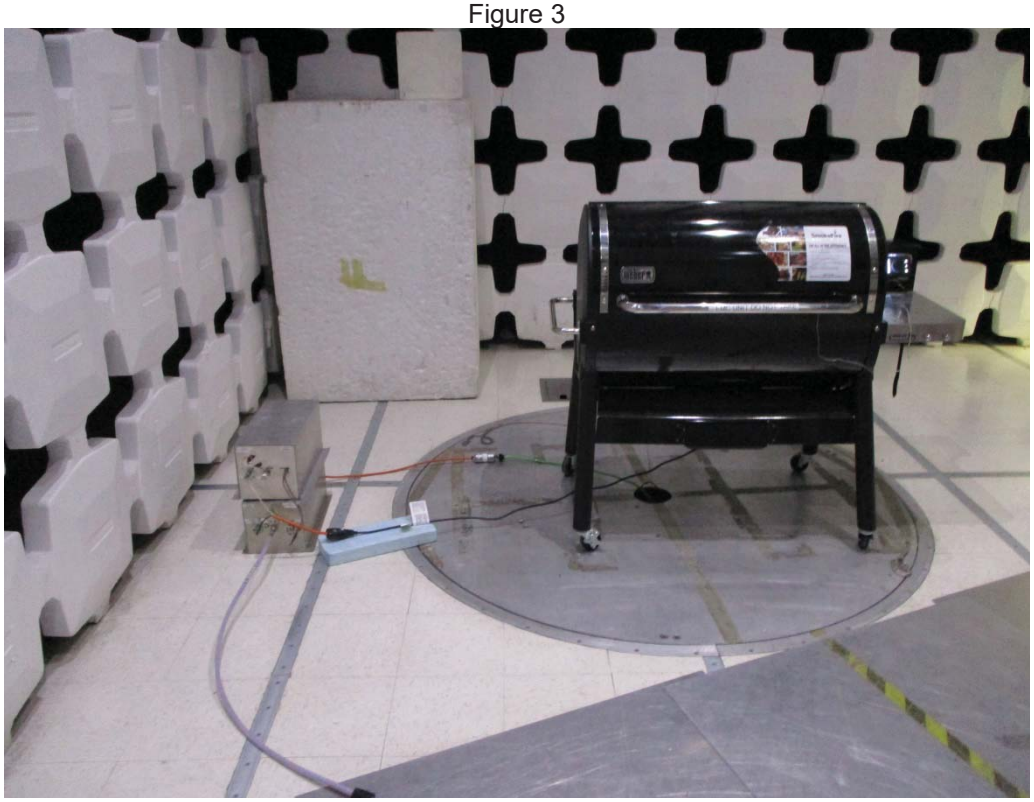


Figure 2: BLOCK DIAGRAM OF TEST SETUP FOR RADIATED EMISSIONS ABOVE 18GHZ

Figure 3



Test Setup for Conducted Emissions

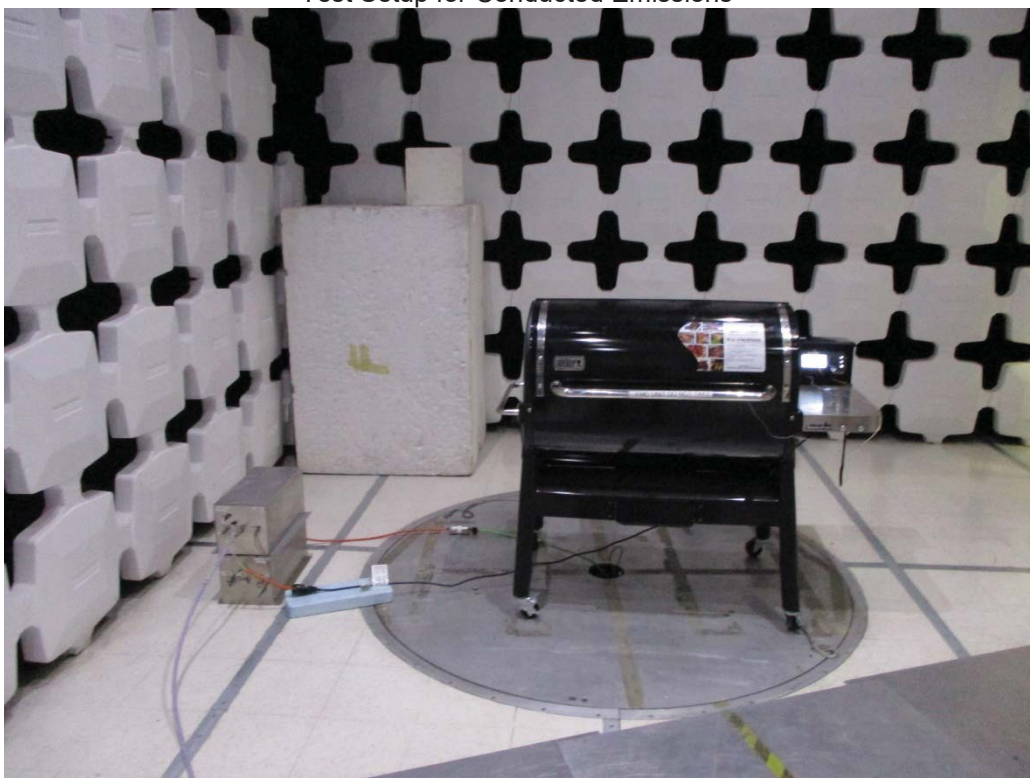
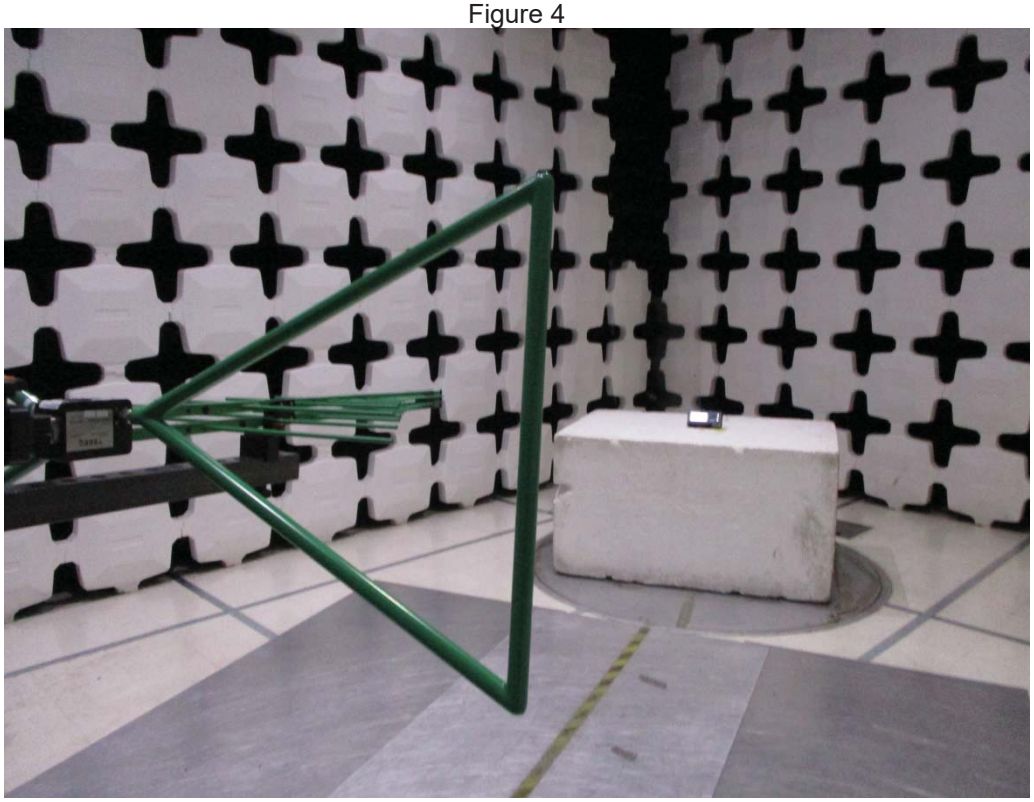
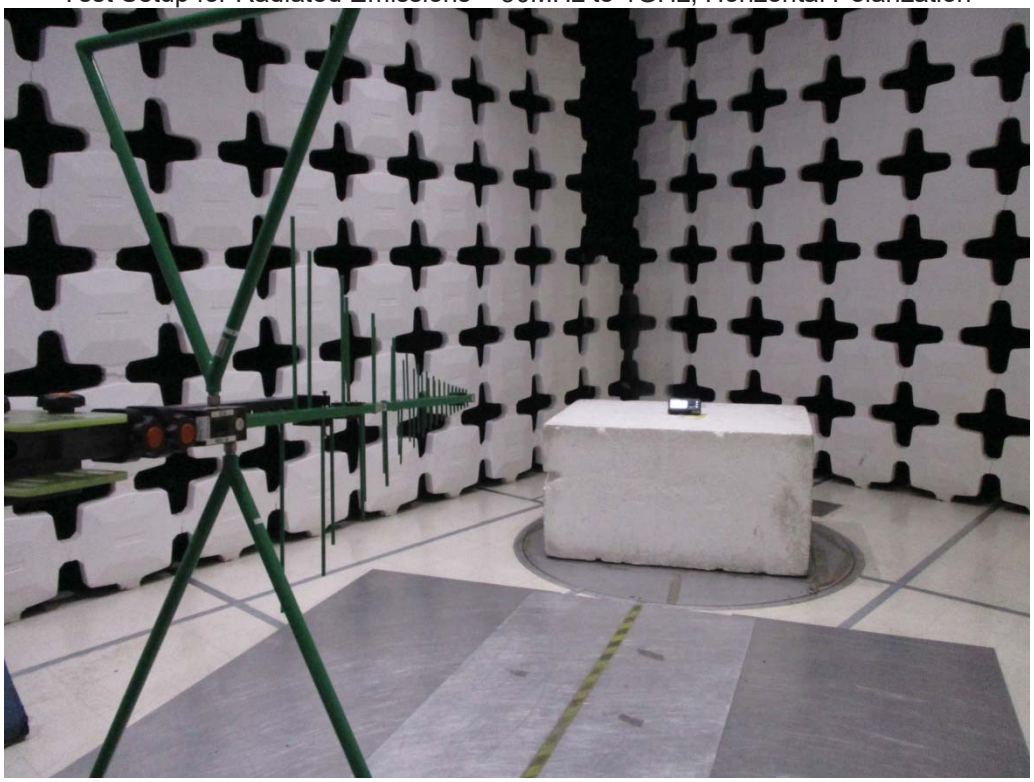


Figure 4

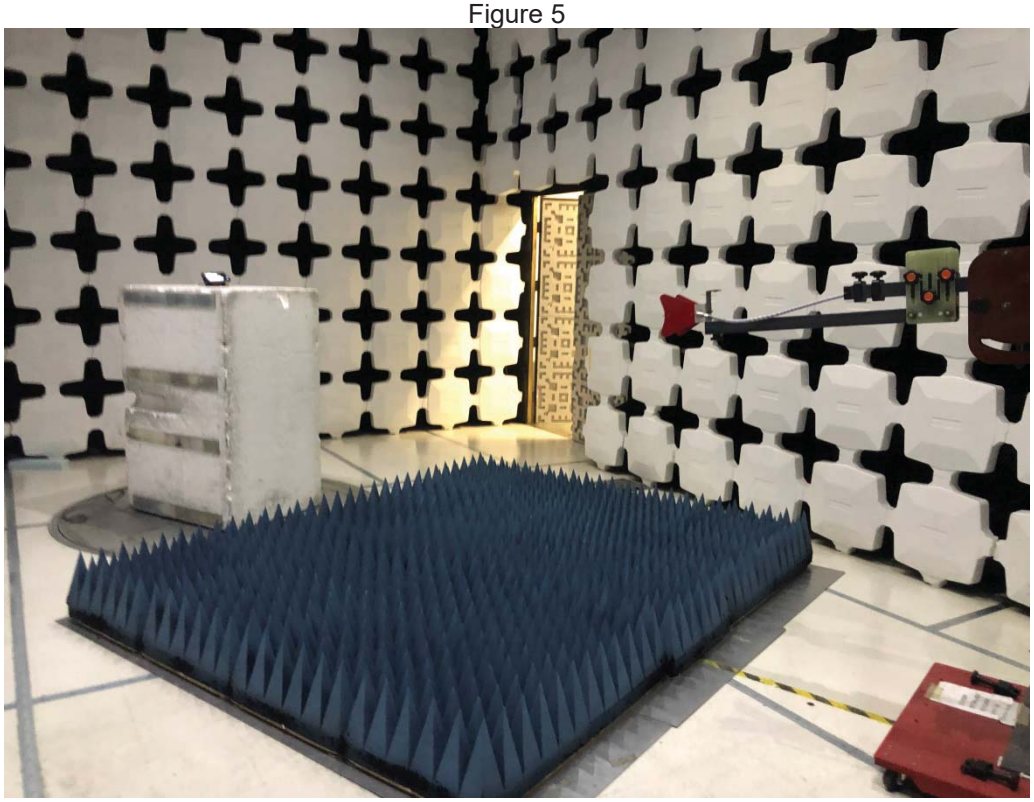


Test Setup for Radiated Emissions – 30MHz to 1GHz, Horizontal Polarization

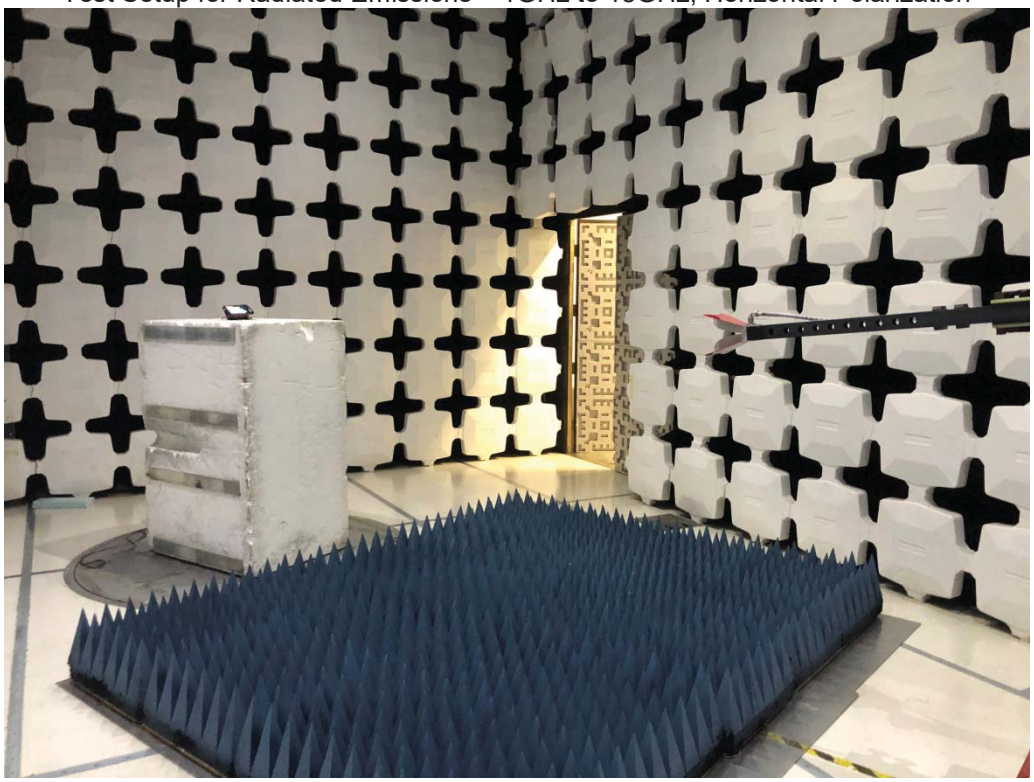


Test Setup for Radiated Emissions – 30MHz to 1GHz, Vertical Polarization

Figure 5

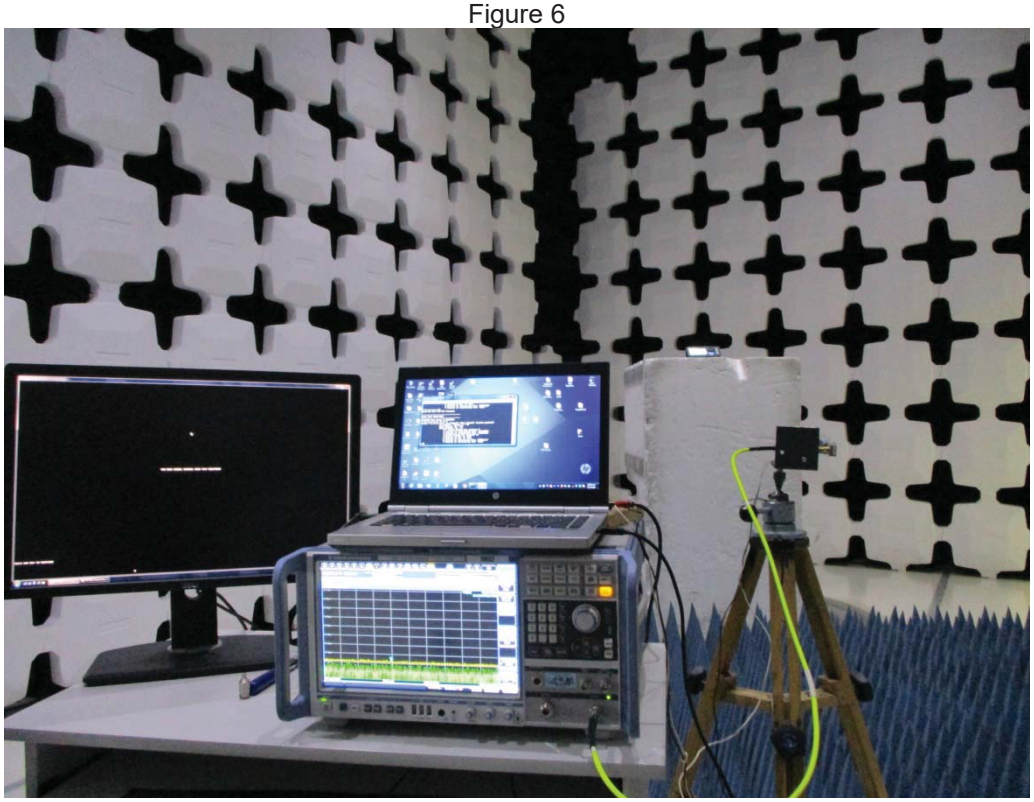


Test Setup for Radiated Emissions – 1GHz to 18GHz, Horizontal Polarization

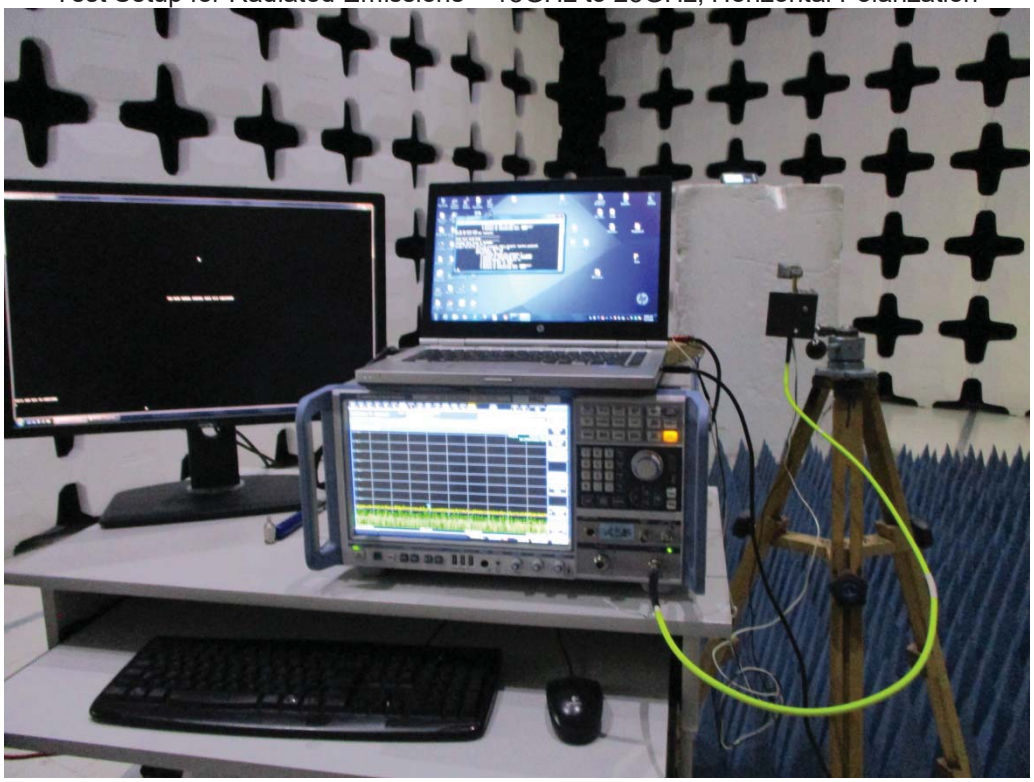


Test Setup for Radiated Emissions – 1GHz to 18GHz, Vertical Polarization

Figure 6



Test Setup for Radiated Emissions – 18GHz to 25GHz, Horizontal Polarization



Test Setup for Radiated Emissions – 18GHz to 25GHz, Vertical Polarization

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

Manufacturer	:	Weber-Stephen Products LLC
Model	:	Falcon
DUT Revision	:	
Serial Number	:	---
DUT Mode	:	Transmit: WiFi 802.11g Ch1
Line Tested	:	120VAC, 60Hz
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	w EX6
Test Engineer	:	J. Cardenas
Limit	:	FCC15.207
Test Date	:	May 28, 2020 01:02:57 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

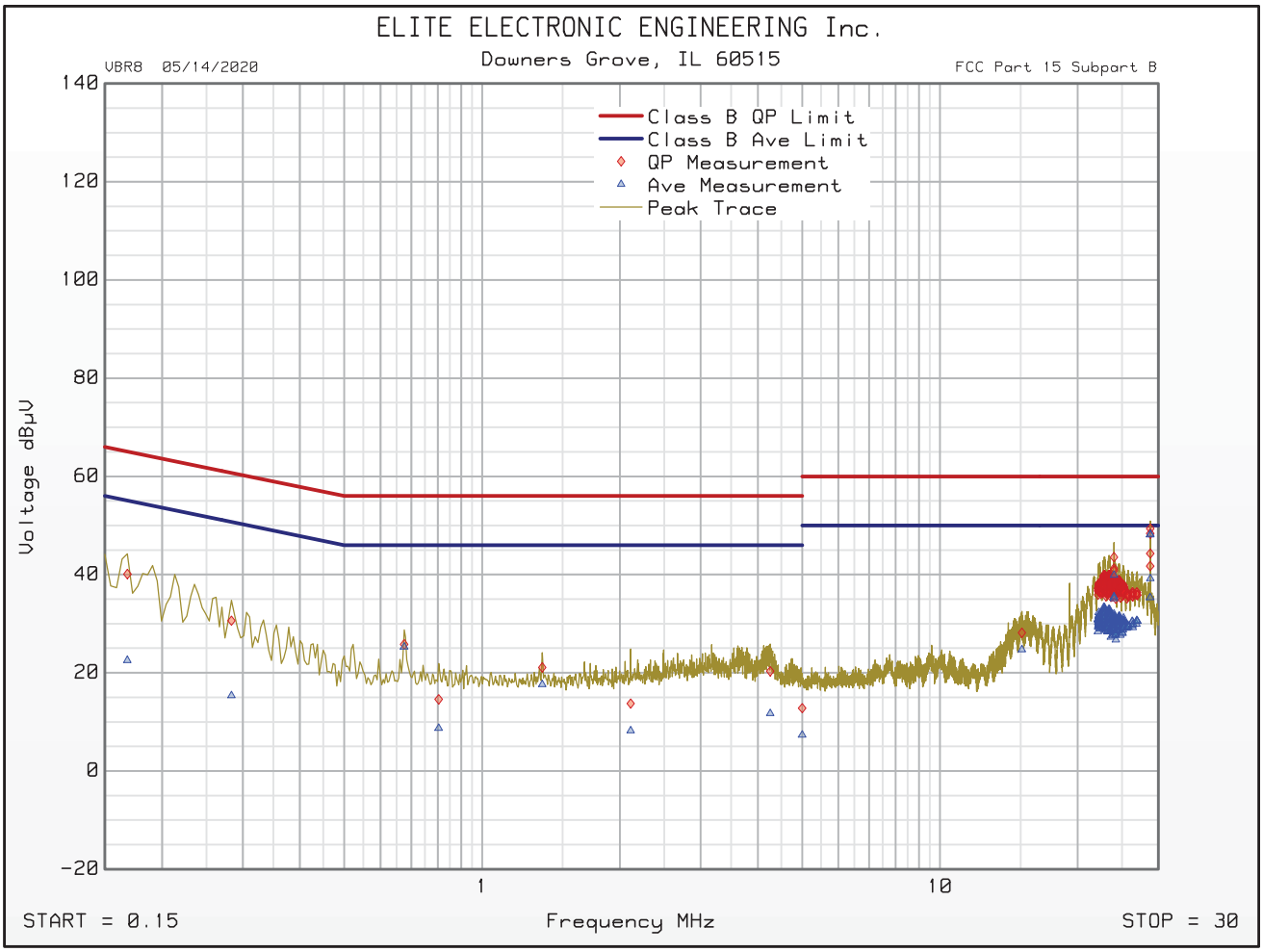
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.168	40.1	65.1		22.5	55.1	
0.284	30.6	60.7		15.3	50.7	
0.676	25.8	56.0		25.3	46.0	
0.804	14.6	56.0		8.7	46.0	
1.354	21.1	56.0		17.7	46.0	
2.111	13.7	56.0		8.2	46.0	
4.261	20.3	56.0		11.8	46.0	
5.000	12.8	56.0		7.4	46.0	
15.107	28.1	60.0		24.7	50.0	
28.801	49.3	60.0		48.2	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 05/14/2020

Manufacturer	:	Weber-Stephen Products LLC
Model	:	Falcon
DUT Revision	:	
Serial Number	:	---
DUT Mode	:	Transmit: WiFi 802.11g Ch1
Line Tested	:	120VAC, 60Hz
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	w EX6
Test Engineer	:	J. Cardenas
Limit	:	FCC15.207
Test Date	:	May 28, 2020 01:02:57 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

Manufacturer	:	Weber-Stephen Products LLC
Model	:	Falcon
DUT Revision	:	
Serial Number	:	---
DUT Mode	:	Transmit: WiFi 802.11g Ch1
Line Tested	:	Neutral
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	w EX6
Test Engineer	:	J. Cardenas
Limit	:	FCC15.207
Test Date	:	May 28, 2020 12:45:39 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

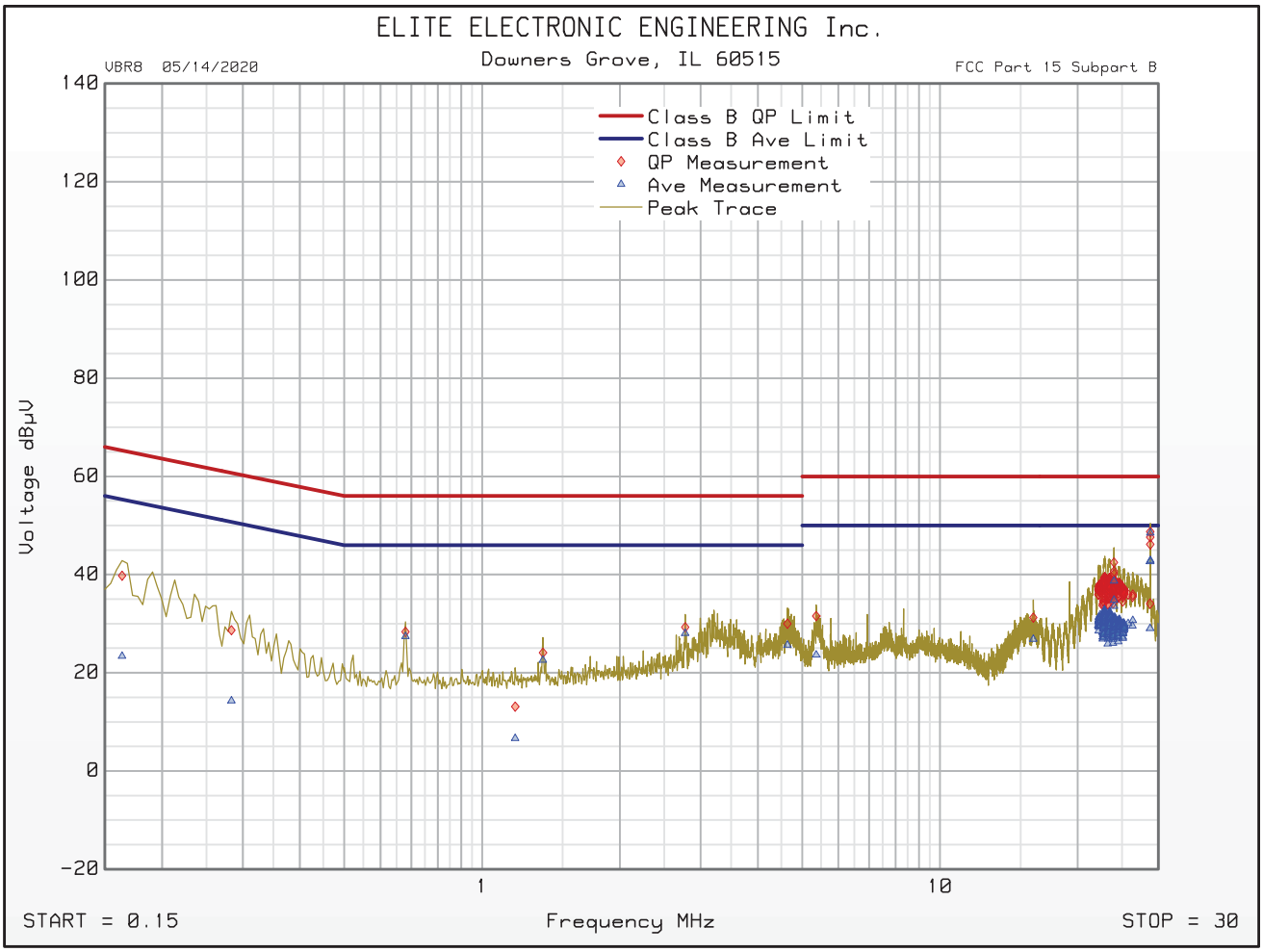
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.164	39.8	65.3		23.4	55.3	
0.284	28.7	60.7		14.3	50.7	
0.680	28.3	56.0		27.4	46.0	
1.182	13.1	56.0		6.7	46.0	
1.358	24.1	56.0		22.6	46.0	
2.777	29.3	56.0		28.0	46.0	
4.643	30.0	56.0		25.7	46.0	
5.369	31.5	60.0		23.6	50.0	
15.998	31.2	60.0		26.8	50.0	
28.801	48.7	60.0		48.5	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

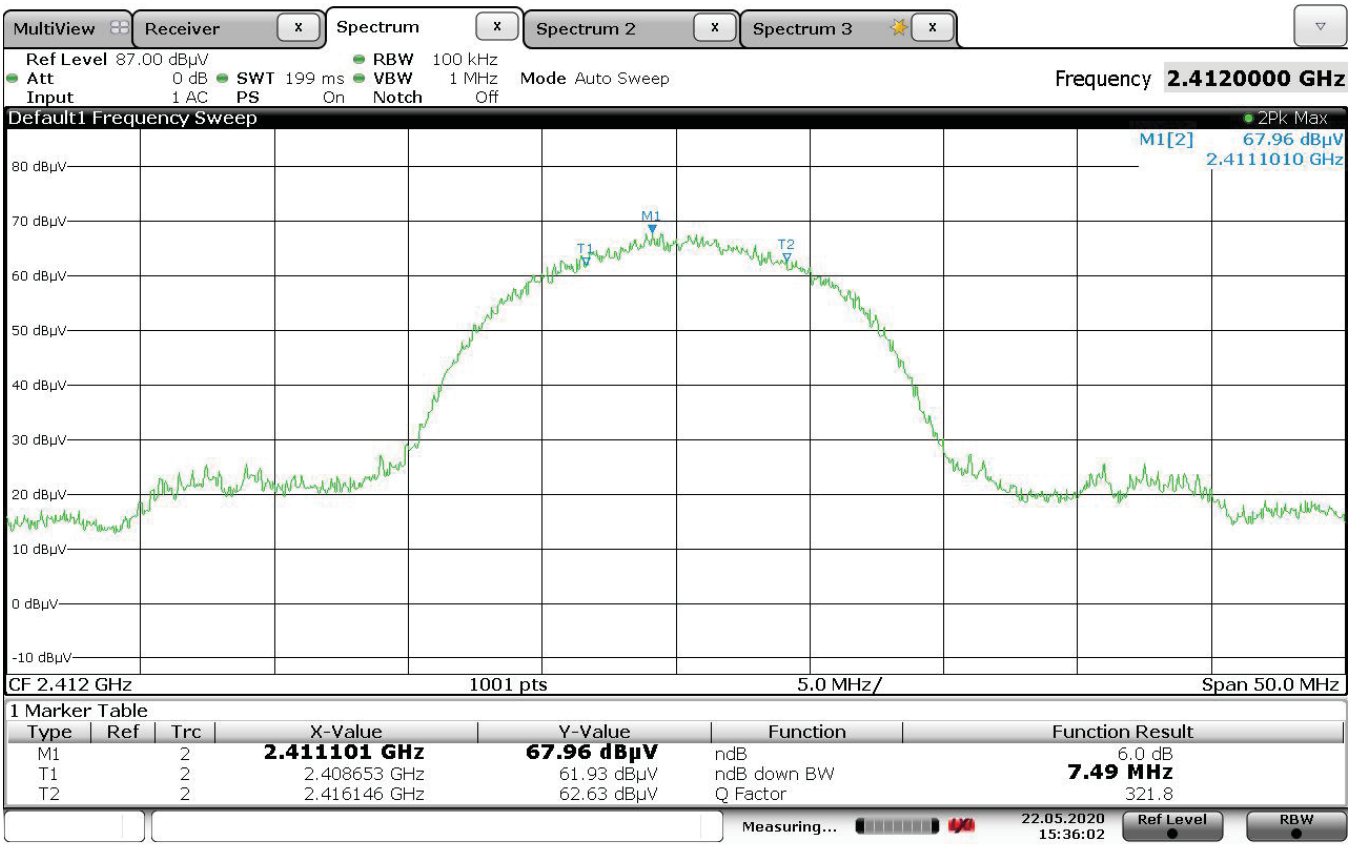
VBR8 05/14/2020

Manufacturer	:	Weber-Stephen Products LLC
Model	:	Falcon
DUT Revision	:	
Serial Number	:	---
DUT Mode	:	Transmit: WiFi 802.11g Ch1
Line Tested	:	Neutral
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	w EX6
Test Engineer	:	J. Cardenas
Limit	:	FCC15.207
Test Date	:	May 28, 2020 12:45:39 PM



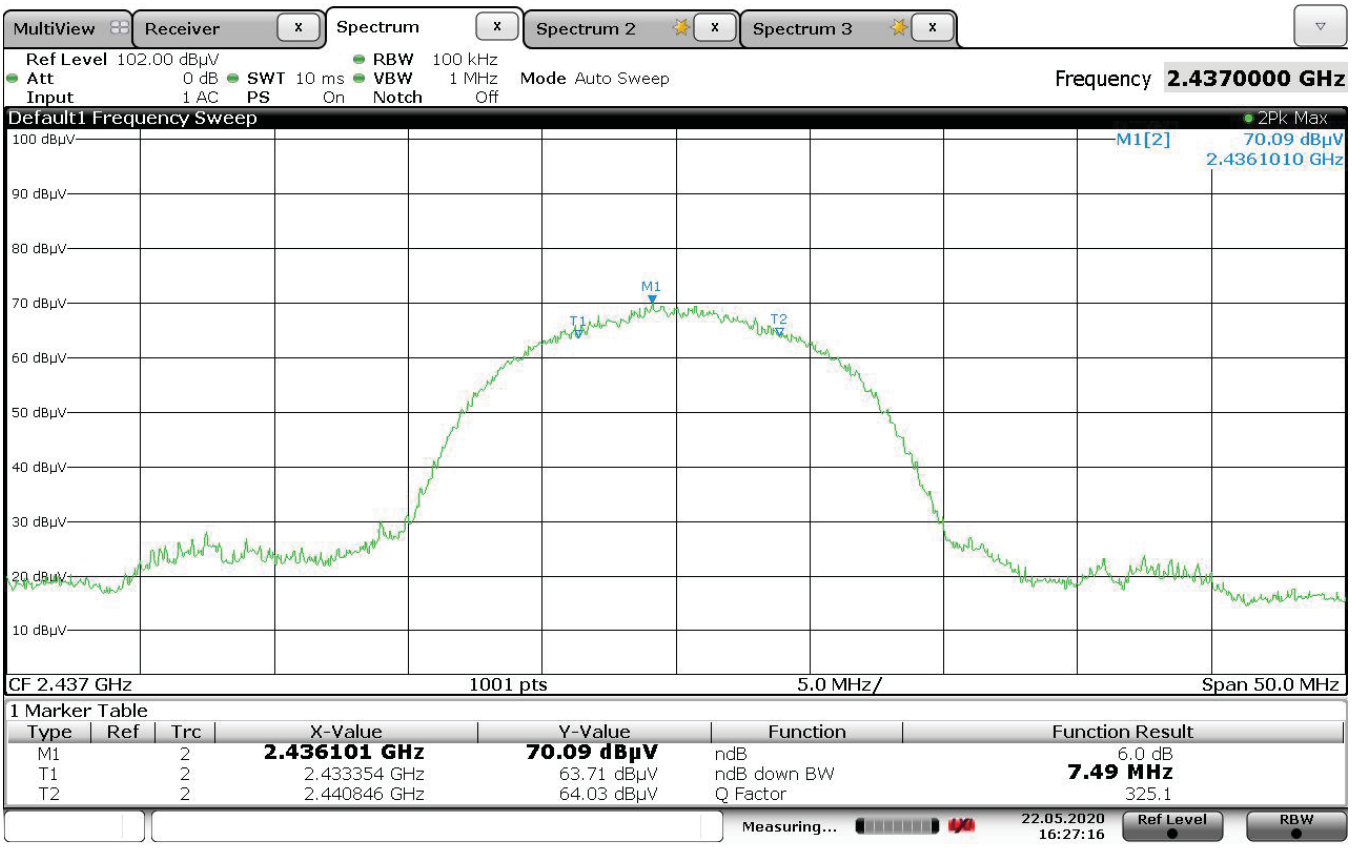
Emissions Meet QP Limit
Emissions Meet Ave Limit

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2412MHz
Parameters	6dB Bandwidth = 7.49MHz
Notes	802.11b 1Mbps



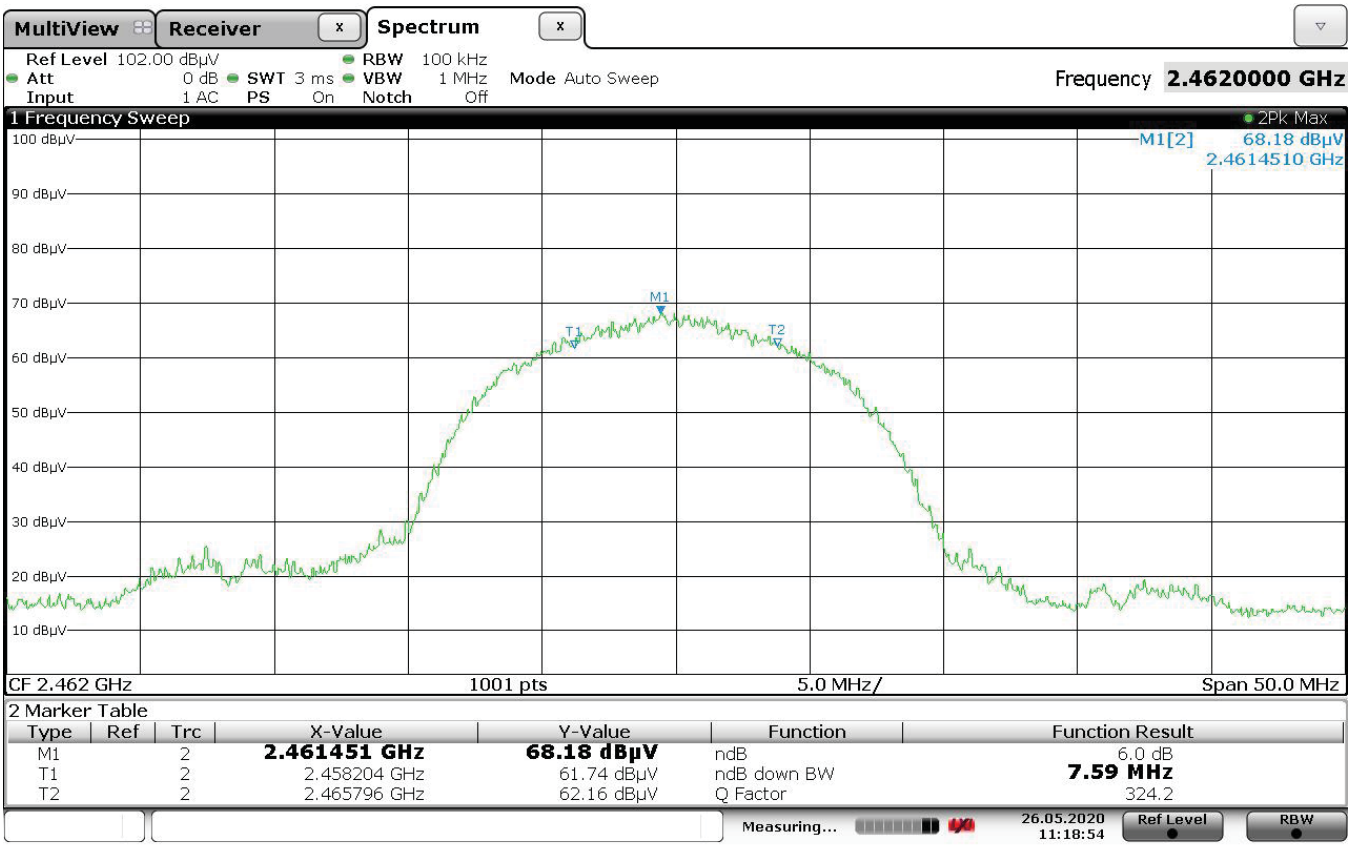
Date: 22.MAY.2020 15:36:03

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2437MHz
Parameters	6dB Bandwidth = 7.49MHz
Notes	802.11b 1Mbps



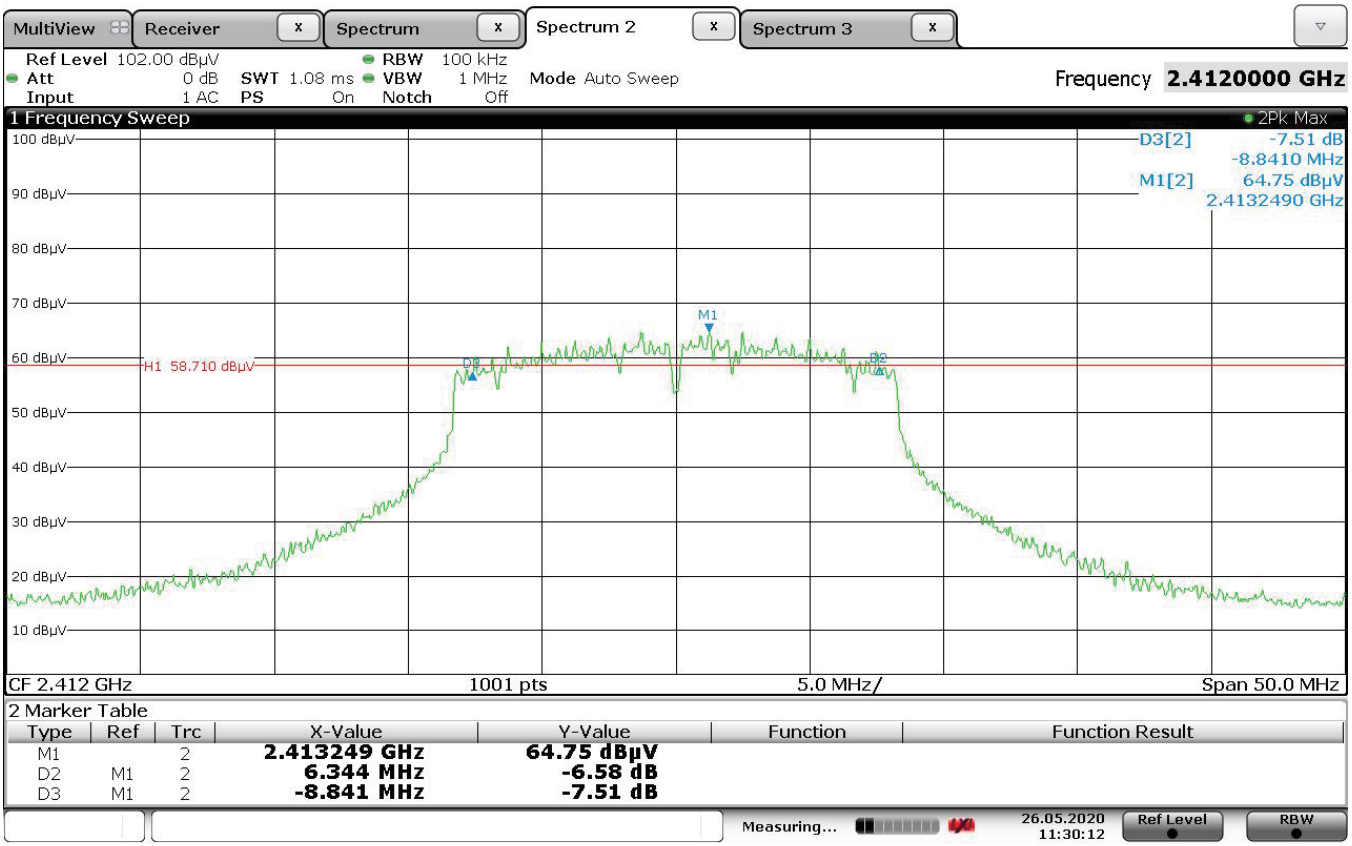
Date: 22.MAY.2020 16:27:15

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2462MHz
Parameters	6dB Bandwidth = 7.59MHz
Notes	802.11b 1Mbps



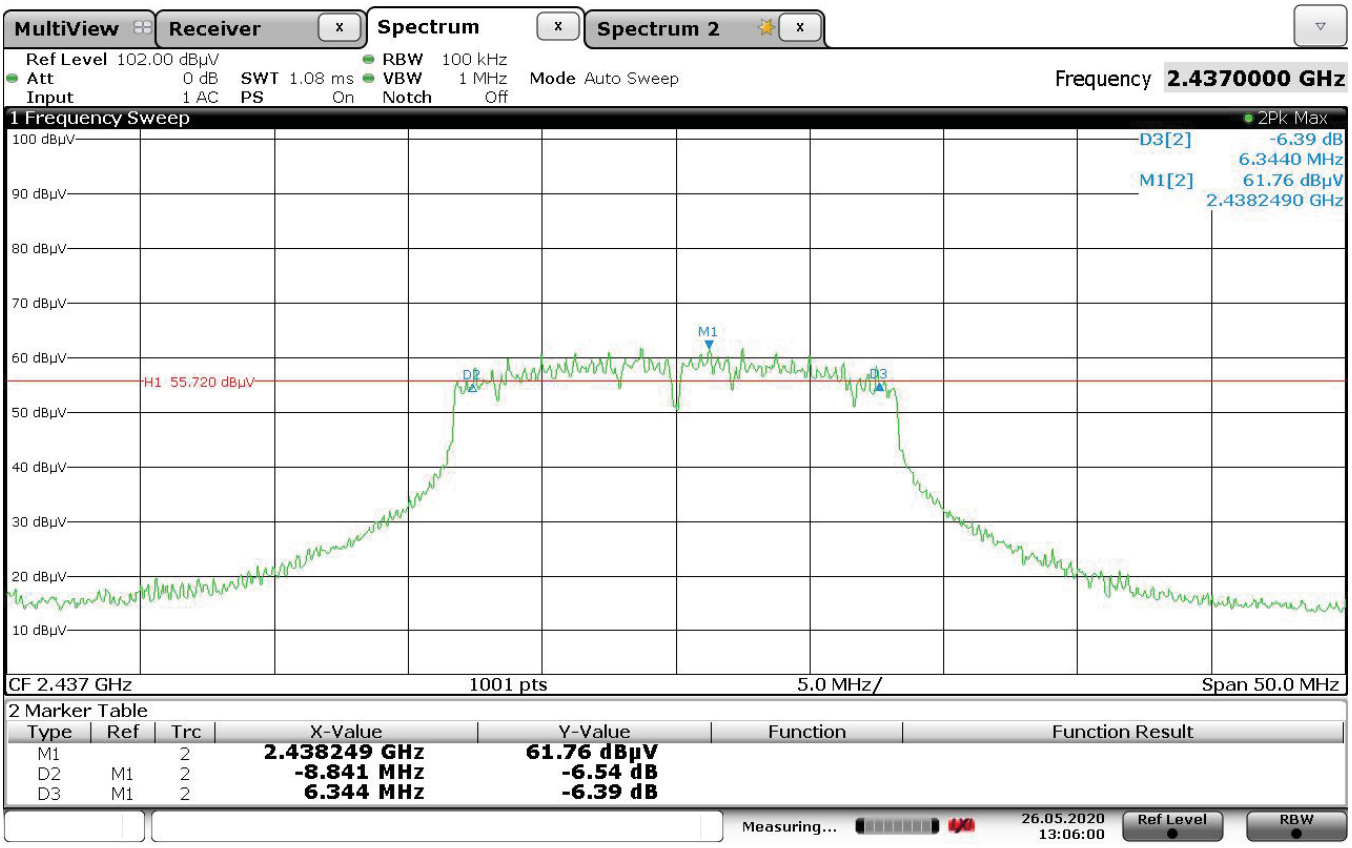
Date: 26.MAY.2020 11:18:55

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2412MHz
Parameters	6dB Bandwidth = 15.185MHz
Notes	802.11g 6Mbps



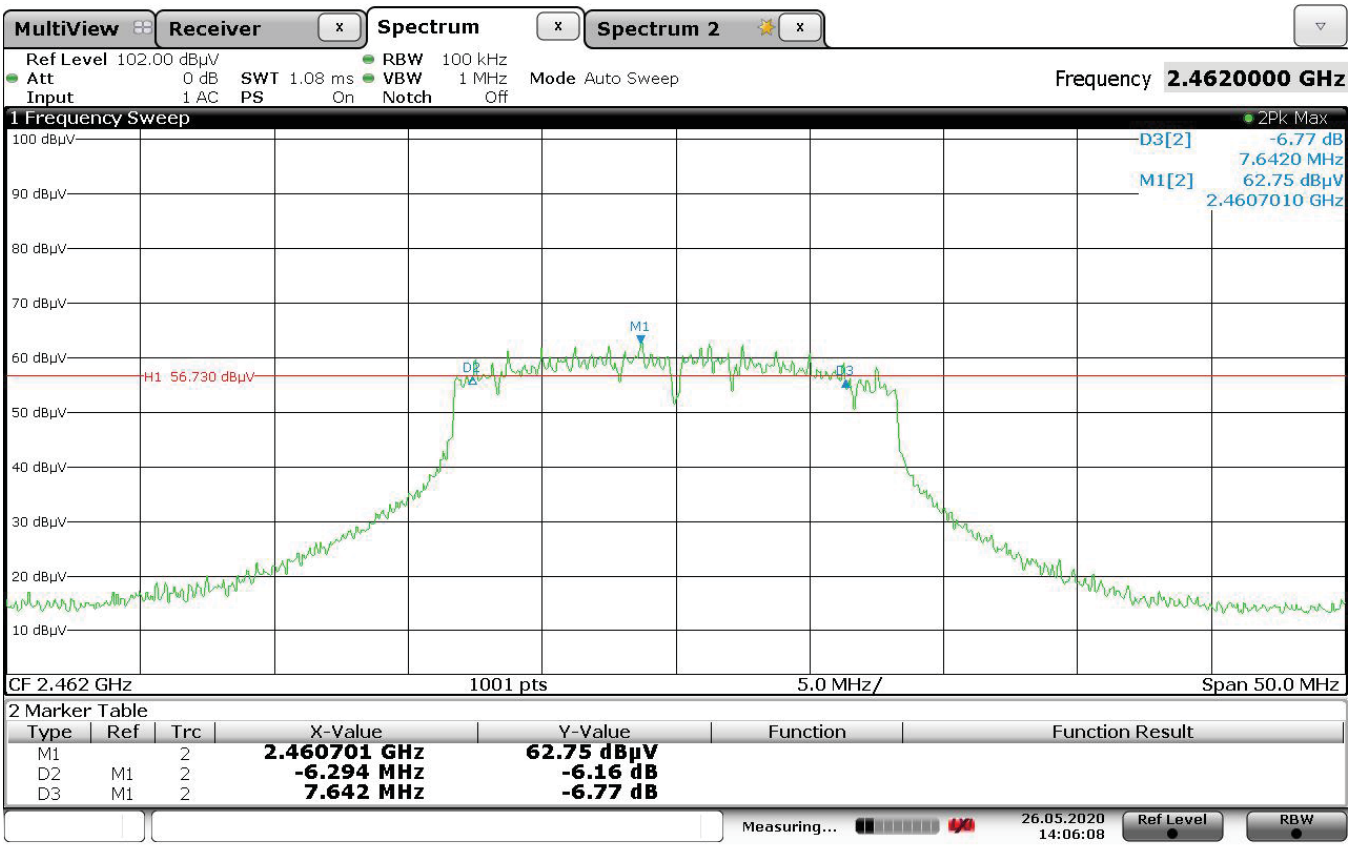
Date: 26.MAY.2020 11:30:12

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2437MHz
Parameters	6dB Bandwidth = 15.185MHz
Notes	802.11g 6Mbps



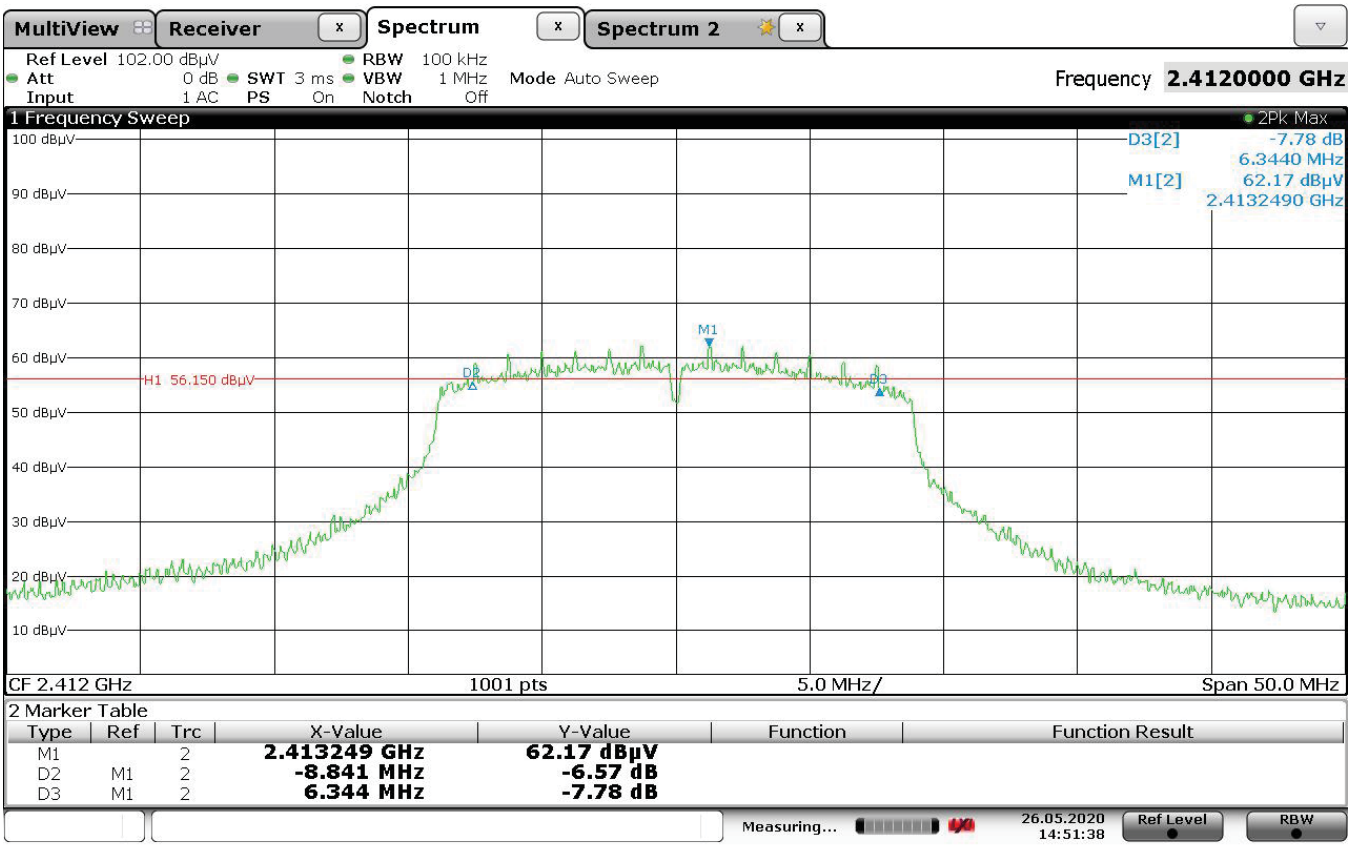
Date: 26.MAY.2020 13:06:00

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2462MHz
Parameters	6dB Bandwidth = 13.936MHz
Notes	802.11g 6Mbps



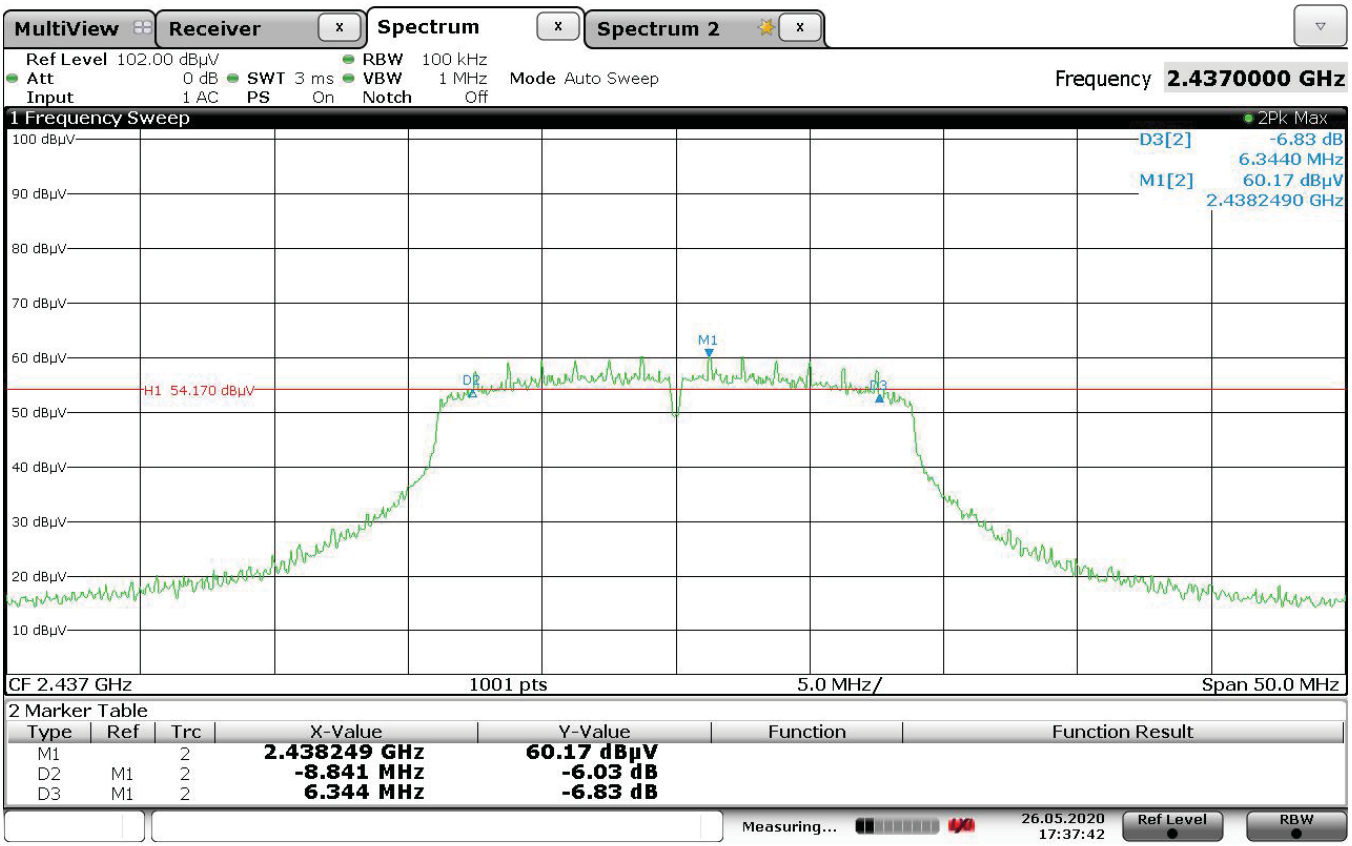
Date: 26.MAY.2020 14:06:08

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2412MHz
Parameters	6dB Bandwidth = 15.185MHz
Notes	802.11n HT20 MCS0



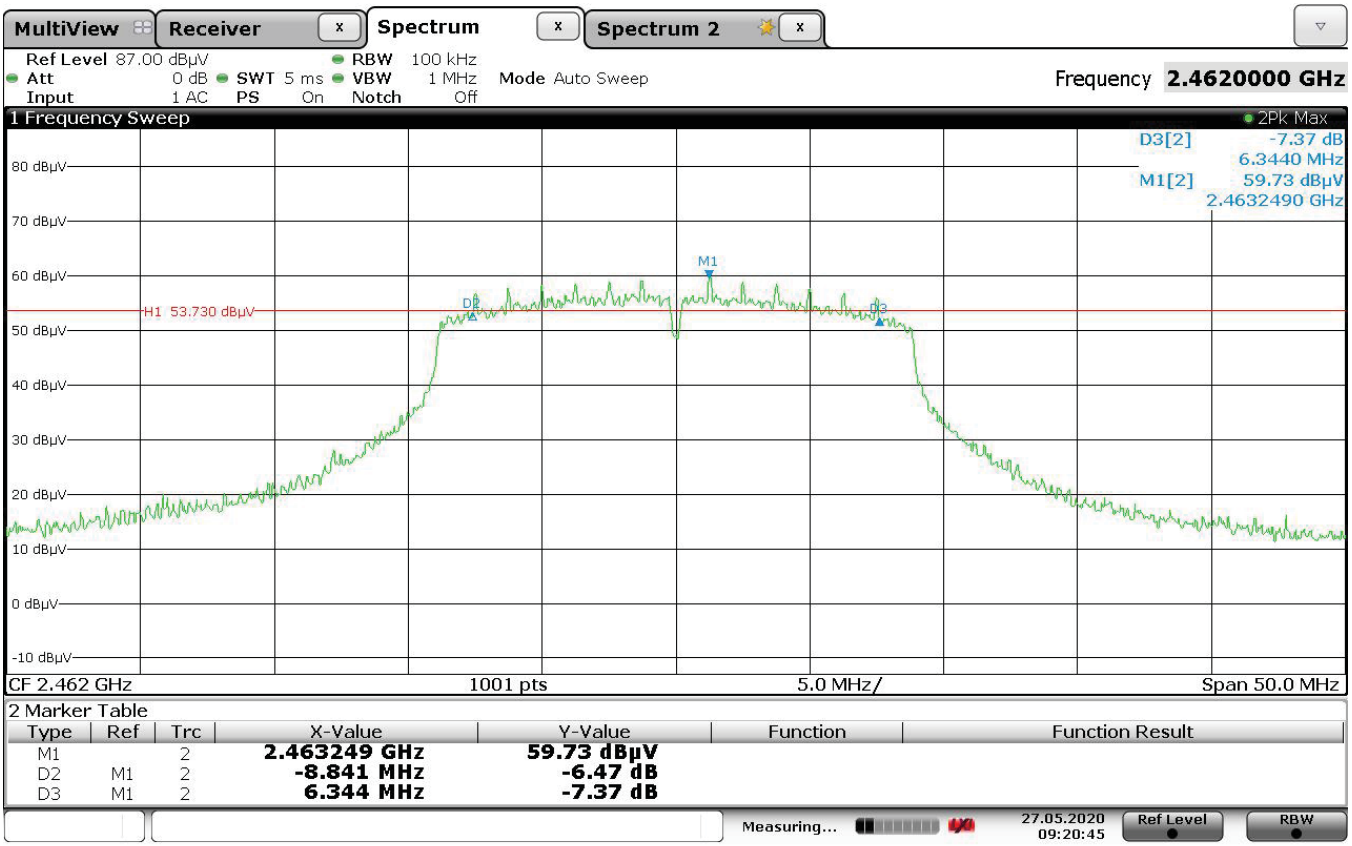
Date: 26.MAY.2020 14:51:37

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2437MHz
Parameters	6dB Bandwidth = 15.185MHz
Notes	802.11n HT20 MCS0



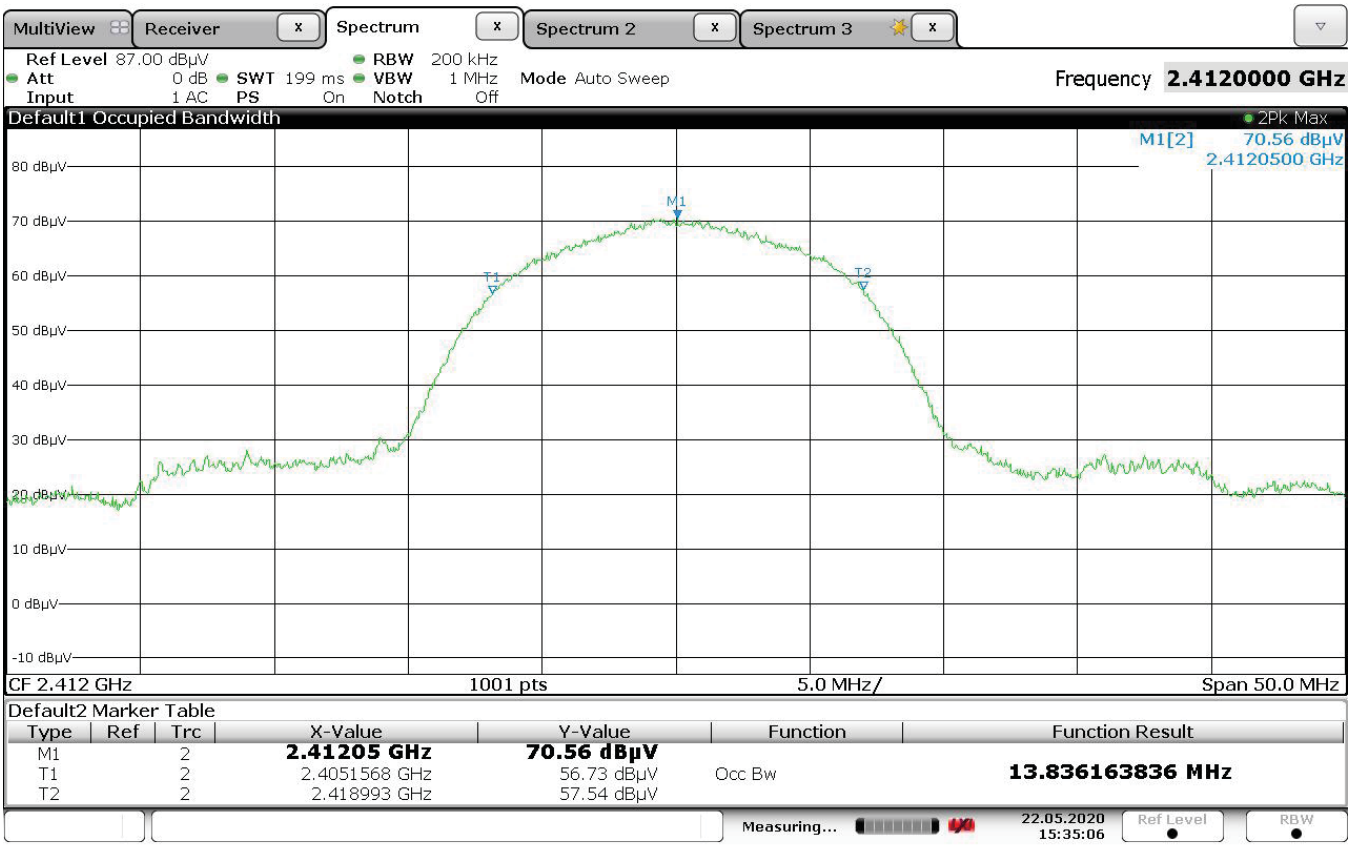
Date: 26.MAY.2020 17:37:42

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2462MHz
Parameters	6dB Bandwidth = 15.185MHz
Notes	802.11n HT20 MCS0



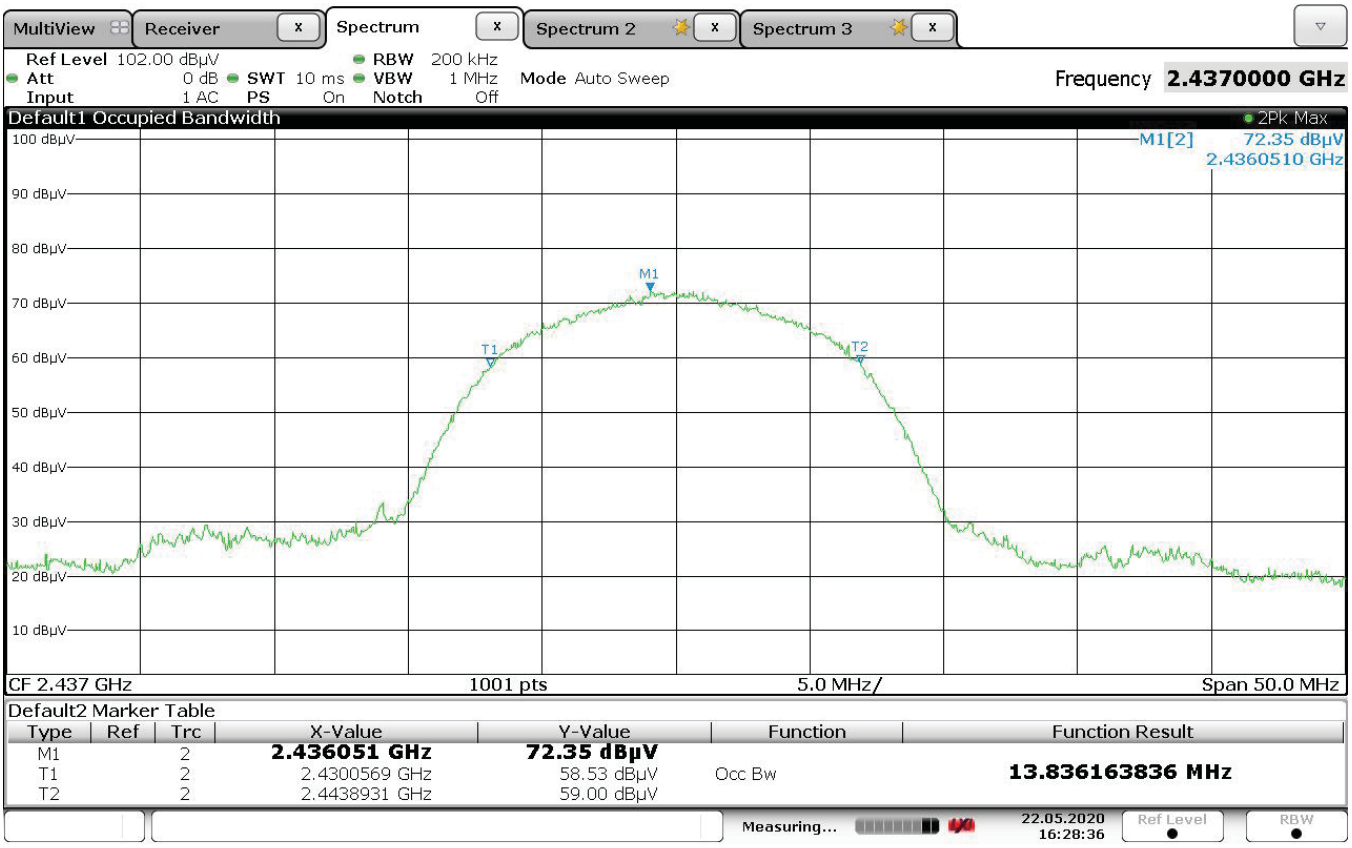
Date: 27.MAY.2020 09:20:45

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2412MHz
Parameters	99% Bandwidth = 13.83MHz
Notes	802.11b 1Mbps



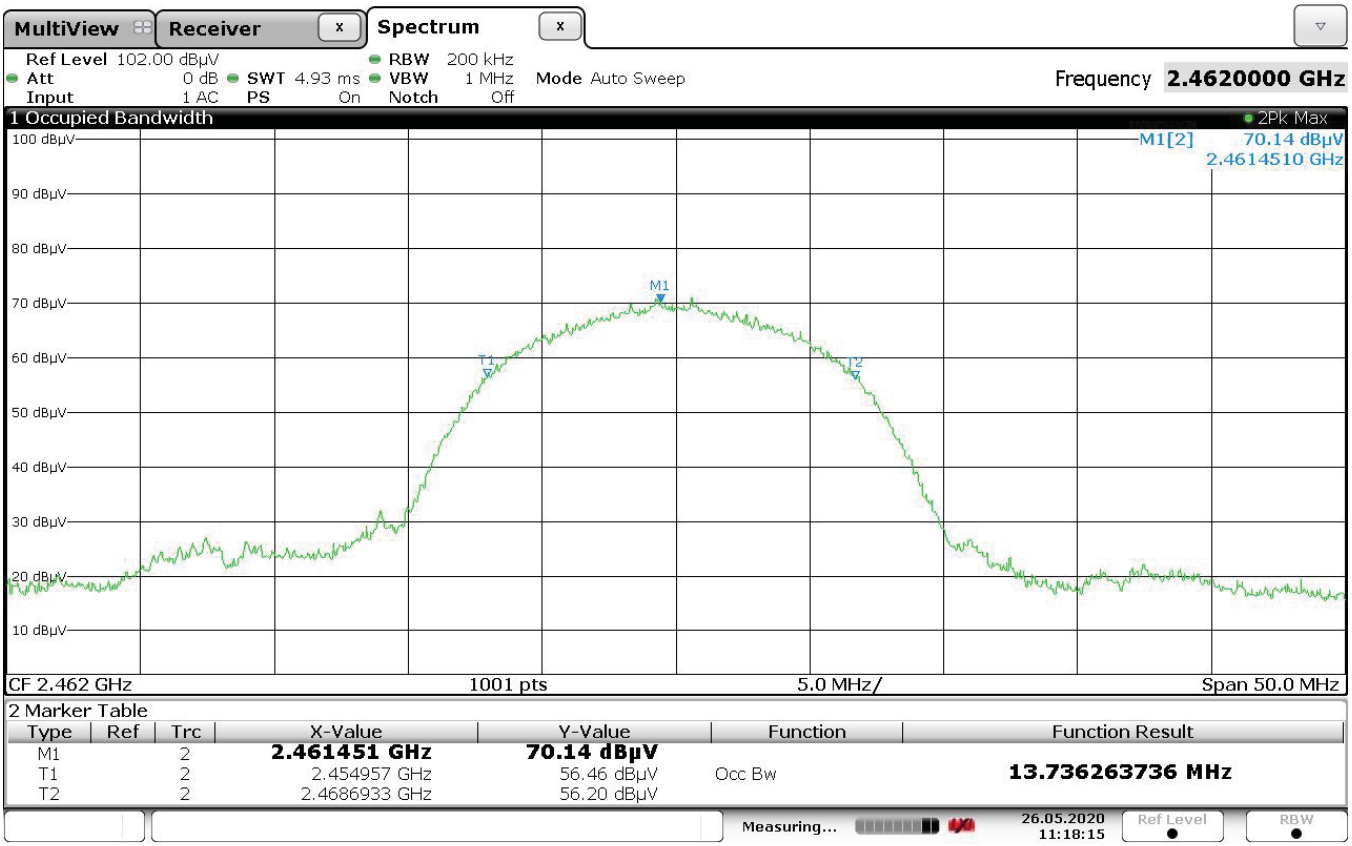
Date: 22.MAY.2020 15:35:07

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2437MHz
Parameters	99% Bandwidth = 13.83MHz
Notes	802.11b 1Mbps



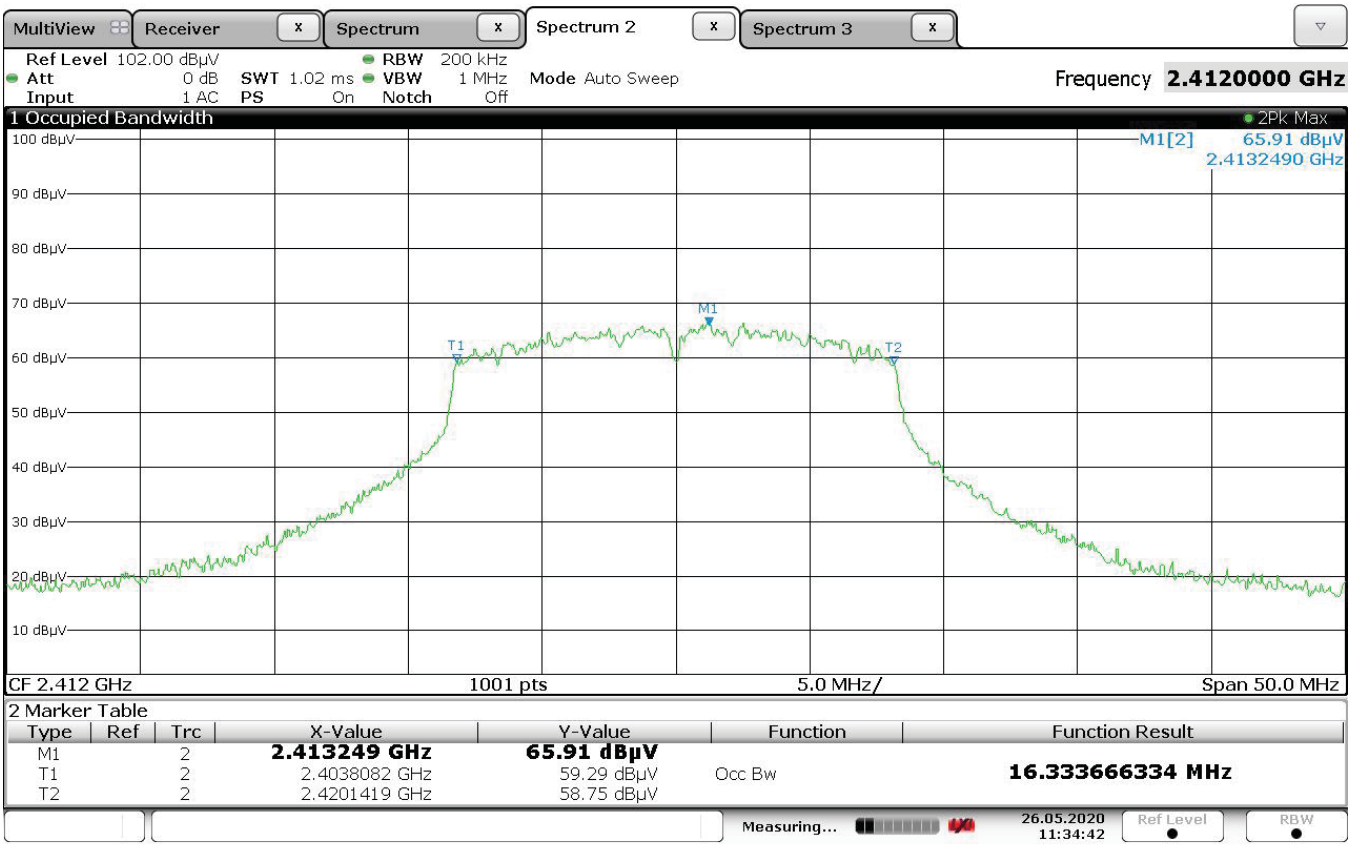
Date: 22.MAY.2020 16:28:36

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2462MHz
Parameters	99% Bandwidth = 13.73MHz
Notes	802.11b 1Mbps



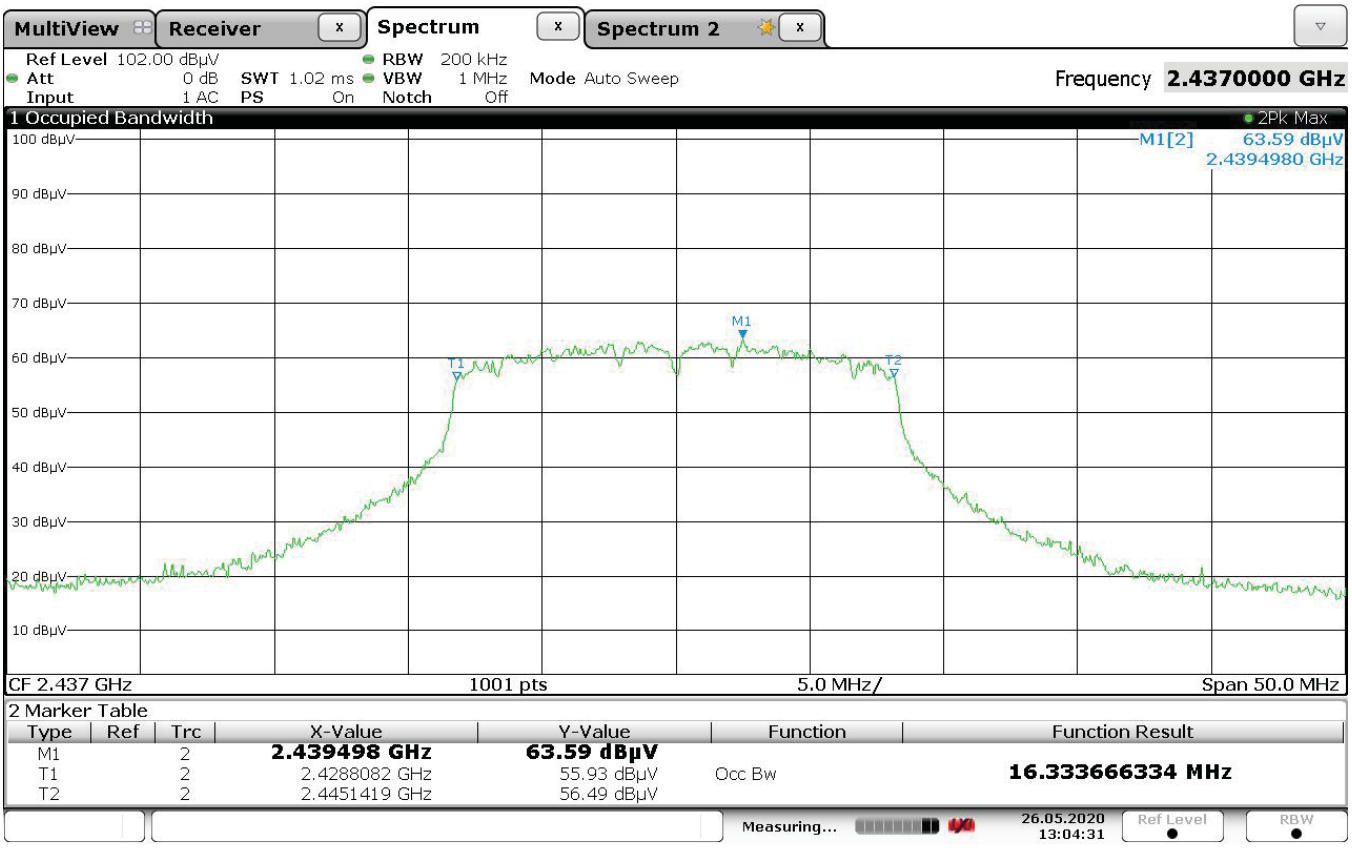
Date: 26.MAY.2020 11:18:15

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2412MHz
Parameters	99% Bandwidth = 16.33MHz
Notes	802.11g 6Mbps



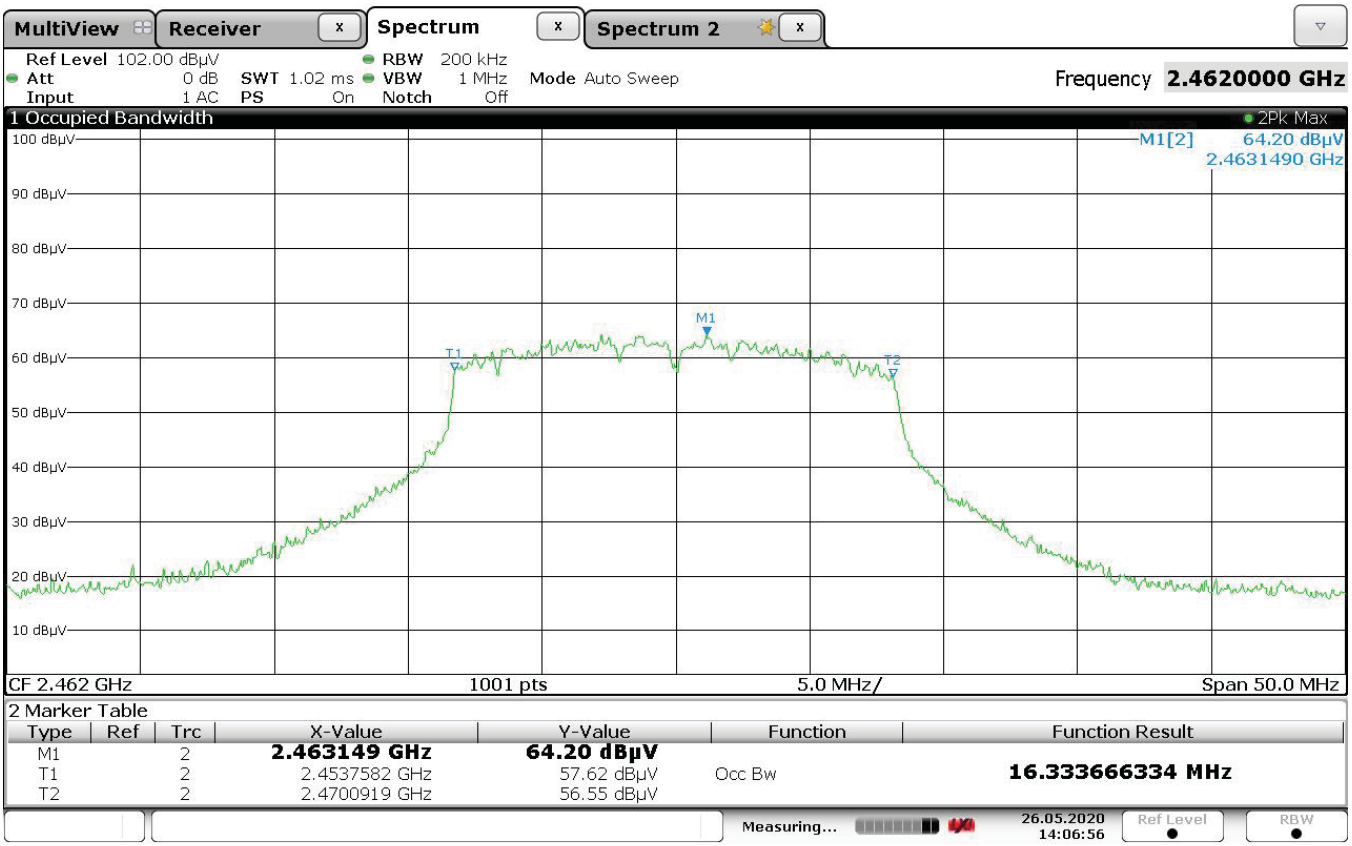
Date: 26.MAY.2020 11:34:42

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2437MHz
Parameters	99% Bandwidth = 16.33MHz
Notes	802.11g 6Mbps



Date: 26.MAY.2020 13:04:31

Test Details	
Manufacturer	Weber-Stephen Products LLC
Model	Falcon
S/N	NA
Mode	Transmit
Carrier Frequency	2462MHz
Parameters	99% Bandwidth = 16.33MHz
Notes	802.11g 6Mbps



Date: 26.MAY.2020 14:06:55