



Measurement of RF Emissions from a ShowLink Access Point Model No. AD610 Transmitter

For	Shure Incorporated 5800 West Touhy Avenue Niles, IL 60714-4608
P.O. Number	4500352314
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Test Specification	FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.247 for Digital Modulation Intentional Radiators Operating within The band 2400-2483.5MHz Industry Canada RSS-GEN Industry Canada RSS-247

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REVISION HISTORY

Revision	Date	Description
—	03 Mar 2017	Initial release
A	4 Apr 2017 By TJ	- Changed report header to 1604644-01 Rev. A on each page. - Changed Band Edge compliance data to match test description, where the conducted Band Edge data for the High Band Edge is replaced with the radiated data. The section now displays the peak and average readings. (Change is located on Page 83.)

Measurement of RF Emissions from a ShowLink Access Point, Model No. AD610 Transmitter

1. INTRODUCTION

1.1. Scope of Tests

This report represents the results of the series of radio interference measurements performed on a Shure Incorporated ShowLink Access Point, Model No. AD610, Serial No. AD2-4162933258, transmitter (hereinafter referred to as the EUT). The EUT is a digital modulation transmitter. The transmitter was designed to transmit in the 2400-2483.5 MHz band using an external omnidirectional antenna. The EUT was manufactured and submitted for testing by Shure Incorporated located in Niles, IL.

1.2. Purpose

The test series was performed to determine if the EUT meets the conducted and radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.247 for Intentional Radiators. The test series was also performed to determine if the EUT meets the conducted RF emission requirements of the Industry Canada Radio Standards Specification, RSS-Gen, Section 7.2.4 and the radiated RF emission requirements of the Industry Canada Radio Standards Specification, RSS-210, Annex 8 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 Certificate Number: 1786.01.

1.5. Laboratory Conditions

The temperature at the time of the test was 23.8°C and the relative humidity was 17%.

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, Subpart C, dated 1 October 2016
- 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"
- Federal Communications Commission Office of Engineering and Technology Laboratory Division Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under Section 15.247, October 4, 2012
- Industry Canada Radio Standards Specification, RSS-Gen, "General Requirements for Compliance of Radio Apparatus", Issue 4, November 2014

- Industry Canada Radio Standards Specification, RSS-247, "Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices", Issue 1, May 2015

3. EUT SETUP AND OPERATION

3.1. General Description

The EUT is a Shure Incorporated, ShowLink Access Point, Model No. AD610, Serial No. AD2-4162933258. A block diagram of the EUT setup is shown as Figure 1.

3.1.1. Power Input

The EUT was powered by 120V AC from a Cisco Gigabit POE Smart Switch.

3.1.2. Peripheral Equipment

The following peripheral equipment was submitted with the EUT:

Item	Description
Cisco Gigabit POE Smart Switch	Used to connect EUT to compute (used as power source in POE).
Laptop	Used to operate Terra Term software to control EUT.
AC Power Adapter	Used to connect EUT to 120VAC outlets.

3.1.3. Signal Input/Output Leads

The following interconnect cables were submitted with the EUT:

Item	Description
Ethernet Cables	Used to connect Smart Switch to Laptop and Smart Switch to EUT.

3.1.4. Grounding

The EUT was ungrounded during the tests.

3.2. Operational Mode

For all tests, the EUT and all peripheral equipment were placed on an 80cm high non-conductive stand. The EUT and all peripheral equipment were energized.

For all tests, the EUT was placed on an 80cm high non-conductive stand. The EUT was energized. The unit was programmed to operate in one of the following modes:

- Transmit at 2405MHz
- Transmit at 2445MHz
- Transmit at 2480MHz

Tx – The EUT was powered and set to transmit one of 3 different frequencies: 2405, 2445, and 2480MHz.

Antenna 1 – The EUT is running Tx mode through Antenna 1.

Antenna 2 – The EUT is running Tx mode through Antenna 2.

3.3. EUT Modifications

No modifications were required for compliance to the FCC Part 15, Subpart C, Section 15.247 requirements.

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.

Conducted and radiated emission measurements were performed with a spectrum analyzer. This receiver allows measurements with the bandwidths and detector functions listed in the requirement. The receiver bandwidth was 120kHz for the 30MHz to 1000MHz radiated emissions data and 1MHz for the 1000MHz to 5000MHz radiated emissions data.

4.3. Calibration Traceability

Test equipment is maintained and calibrated on a regular basis with a calibration interval not greater than two years. 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.

The measurement uncertainty for these tests is presented below:

Conducted Emissions Measurements		
Combined Standard Uncertainty	1.07	-1.07
Expanded Uncertainty (95% confidence)	2.1	-2.1

Radiated Emissions Measurements		
Combined Standard Uncertainty	2.26	-2.18
Expanded Uncertainty (95% confidence)	4.5	-4.4

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) and Industry Canada RSS-Gen section 7.2.4, 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.

- The EUT was operated in the Tx mode, connected to the AC adapter.
- Measurements were first made on the 120V AC high line.
- The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands.
- Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.
- 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.)
- 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.
- Steps (c) through (f) were repeated on the 120V AC return line.
- Steps (a) through (f) were repeated on the EUT, now connected to the Cisco Gigabit POE Smart Switch.

5.1.3.Results

The plots of the peak, quasi-peak, and average conducted voltage levels acquired and the tabular quasi-peak and average results from each input power line with the EUT operated in the Tx mode are shown on pages 22 through 29. All power line conducted emissions measured from the EUT were within the specification limits. The emissions level closest to the limit (worst case) occurred at 2.786MHz. The emissions level at this frequency was 47.9dB μ V within the limit. Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown on Figure 2.

5.2. 6dB Bandwidth

5.2.1.Requirement

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 output of the EUT was connected to the spectrum analyzer through 20dB of attenuation.

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 and the span was set to greater than 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. This was done for both Antenna 1 and Antenna 2.

5.2.3.Results

The plots on pages 30 through 37 show that the minimum 6 dB bandwidth for Antenna 1 was 1.961MHz and for Antenna 2 was 1.6471MHz, which are greater than minimum allowable 6dB bandwidth requirement of 500kHz for systems using digital modulation techniques. The 99% bandwidth was measured to be 1.8713MHz for both Antenna 1 and Antenna 2.

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

For the conducted emissions test method, the output of the EUT was connected to the spectrum analyzer through 30dB of attenuation. The maximum meter reading was recorded. The peak power output was calculated for the low, middle and high channels.

The output of the EUT was connected to the spectrum analyzer through 30dB 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.

For the radiated emissions test method, 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.

5.3.3.Results

For antenna conducted emissions method, the results are presented on pages 38 through 41. The maximum peak conducted output power from the transmitter was 0.0955W (19.8dBm) for both Antenna 1 and Antenna 2, which is below the 1 Watt limit.

For radiated emissions method, the results are presented on page 42. The maximum EIRP measured from the transmitter was 0.1072 W (20.3dBm), which is below the 1 Watt limit.

5.4. Duty Cycle Factor Measurements

5.4.1.Requirements

The duty cycle refers to the fraction of time over which the transmitter is on and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than ± 2 percent, otherwise the duty cycle is considered to be non-constant. Preferably, the EUT shall be transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous transmission cannot be achieved a duty cycle correction will be required.

5.4.2.Procedures

The antenna port of the EUT was connected to the spectrum analyzer through 39.6 dB of attenuation.

- Set center frequency to the transmit frequency of the EUT.
- Set span to 0Hz
- Set RBW $\geq$ OBW if possible; otherwise, set RBW to the largest available value.
- Set detector = peak or average.
- Measure the fraction of time over which the transmitter is on and is transmitting at its maximum power control level.

5.4.3.Results

For the duty cycle measurement, the result is presented on page 43. The EUT was programmed to run at 100% duty cycle. The duty cycle results are 100%. Since the duty cycle is greater than 98%, no duty cycle correction factor (0dB) will be added to the emission measurements where average detection is used to correct for the maximum power control level.

5.5. Antenna Conducted Spurious Emissions

5.5.1.Requirements

Per section 15.247(c), the spurious emissions in any 100 kHz BW outside the frequency band must be at least 20dB below the highest 100 kHz BW level measured within the band.

5.5.2.Procedures

The output of the EUT was connected to the spectrum analyzer through 0 to 10dB of attenuation (10dB was only used for the 2405MHz measurements, while 2445MHz and 2480MHz used 0dB). The resolution bandwidth (RBW) was set to 100kHz. The peak detector and 'Max-Hold' function were engaged. The emissions in the frequency range from 30MHz to 25GHz were observed and plotted separately with the EUT transmitting at low, middle and high channels.

5.5.3.Results

The results of the antenna conducted emissions levels were plotted. These plots are presented on pages 44 through 47. These plots show that the spurious emissions were at least 20 dB below the level of the fundamental.

5.6. Radiated Spurious Emissions Measurements

5.6.1.Requirements

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 Strength (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

5.6.2.Procedures

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. 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.

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 26.5GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 26.5GHz.

- 1) 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. 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. 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 axes 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 average detector was selected on the analyzer. An average reading was taken. If the duty cycle is less than 98% , a duty cycle correction factor of $20 \log (1/x)$ where x is the duty cycle is added to the measurement results prior to comparing to the emissions limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.

5.6.3.Results

Preliminary radiated emissions plots with the EUT transmitting at 2405MHz, 2445MHz, and 2480MHz are shown on pages 48 through 71. Final radiated emissions data are presented on data pages 72 through 80. As can be seen from the data, all emissions measured from the EUT were within the specification limits. The

emissions level closet to the limit (worst case) occurred at 12225MHz. The emissions level at this frequency was -17.9dBm within the limit. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figures 3 through 5.

5.7. Band Edge Compliance

5.7.1.Requirement

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.

5.7.2.Procedures

5.4.2.1 Low Band Edge

- 1) The output of the EUT was connected to the spectrum analyzer through 20dB of attenuation.
- 2) The EUT was set to transmit continuously at the channel closest to the low band-edge.
- 3) To determine the band edge 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) $\geq 1\%$ 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.

5.4.2.2 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.

5.7.3.Results

Pages 81 through 83 show the band-edge compliance results. As can be seen from these plots, the conducted 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.

5.8. Power Spectral Density

5.8.1.Requirements

Per section 15.247(d), 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.

5.8.2.Procedures

- 1) The output of the EUT was connected to the spectrum analyzer through 20dB of attenuation.
- 2) The EUT was set to transmit at 2405MHz.
- 3) To determine the power spectral density, the following spectrum analyzer settings were used:
 - a. Center frequency = transmit frequency
 - b. Resolution bandwidth (RBW) greater than the 20dB bandwidth.
 - c. Sweep time = auto
 - d. The peak detector and 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.
 - e. The analyzer's display was plotted using a 'screen dump' utility.
- 4) This reading corresponds to the peak EIRP measured for the mid channel.
- 5) Turn on Display Line 1 and place it at the peak of the measured level. Turn on Display Line 2 and place it at the corresponding +8dBm level (e.g. if the peak output power is +18dBm then the +8dBm level will be 10dB down from the radiated level and if the peak output power is +6dBm then the +8dBm level will be 2dB above the radiated level.)
- 6) The EUT was then placed in the normal operation mode.
- 7) To determine the power spectral density, the following spectrum analyzer settings were used:
 - a. Center frequency = transmit frequency
 - b. Span = 1.5 times the channel bandwidth
 - c. Resolution bandwidth (RBW) $\geq 3\text{kHz}$
 - d. Video bandwidth (VBW) $\geq 3 \times \text{RBW}$
 - e. Sweep time = auto couple
 - f. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The peak detector and 'Max-Hold' function was engaged.
 - g. The analyzer's display was plotted using a 'screen dump' utility.
 - h. If the measured value exceeds the +8dBm limit, reduce the RBW (no less than 3kHz) and repeat step (7).
- 8) Repeat steps (2) through (7) for the EUT transmitting at 2445MHz.
- 9) Repeat steps (2) through (7) for the EUT transmitting at 2480MHz.

5.8.3.Results

Pages 84 through 87 show the power spectral density results. As can be seen from the plots, the peak power density is less than 8dBm in a 3kHz band during any time interval of continuous transmission.

6. OTHER TEST CONDITIONS

6.1. Test Personnel and Witnesses

All tests were performed by qualified personnel from Elite Electronic Engineering Incorporated.

6.2. Disposition of the EUT

The EUT and all associated equipment were returned to Shure Incorporated upon completion of the tests.

7. CONCLUSIONS

It was determined that the Shure Incorporated ShowLink Access Point, Model No. AD610, Serial No. AD2-4162933258, digital modulation transmitter, 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 Shure Incorporated ShowLink Access Point, Model No. AD610, Serial No. AD2-4162933258, digital modulation transmitter, did fully meet the conducted and radiated RF emission requirements of the Industry Canada Radio Standards Specification, and RSS-247 Section 5.2 for transmitters, when tested per ANSI C63.4-2014.



8. 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.

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



9. EQUIPMENT LIST

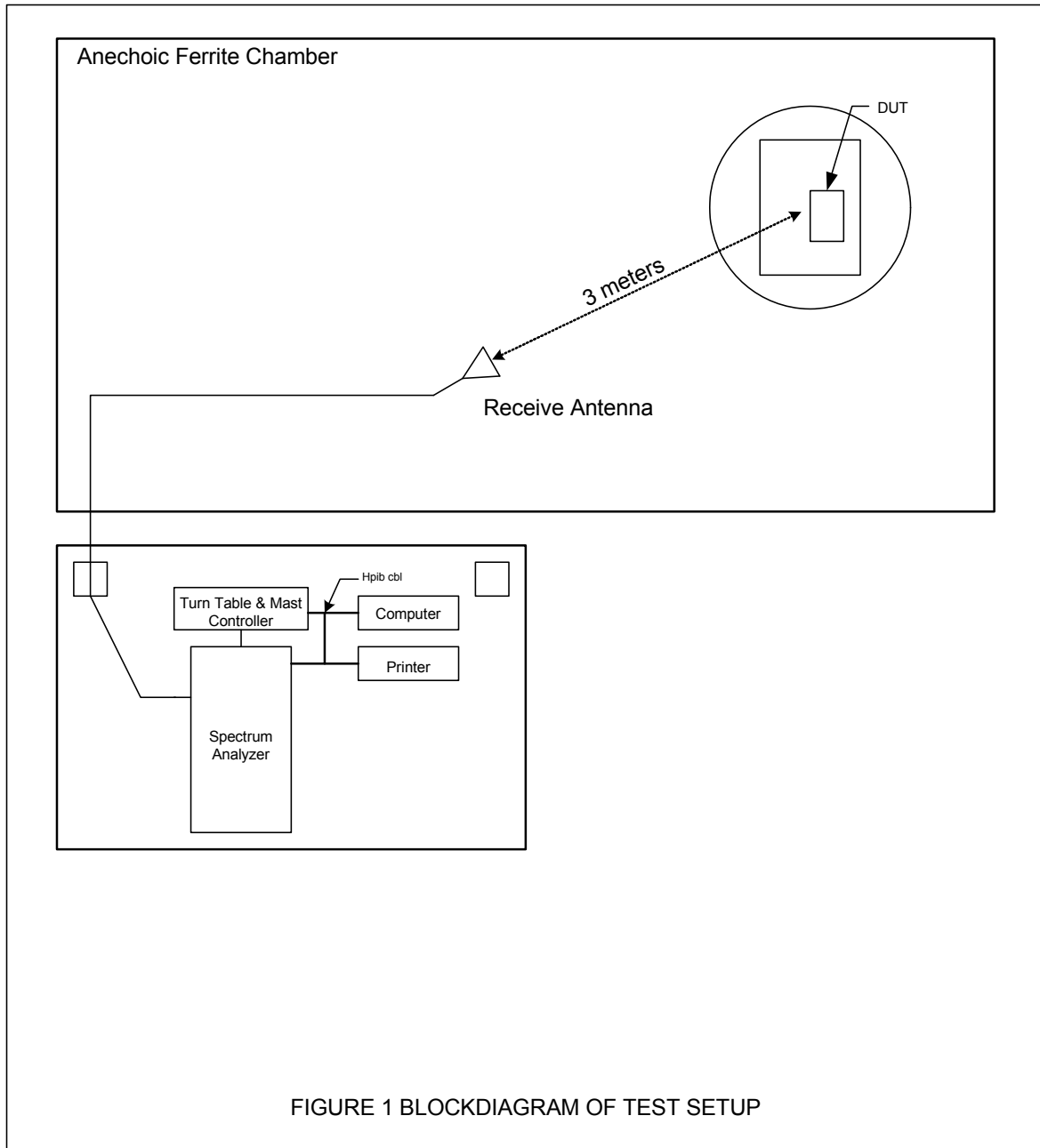
Table 9-1 Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW0	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-30-20G20R6G	PL2926/0646	20GHZ-26.5GHZ	3/2/2016	3/2/2017
APW3	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-35-120-5R0-10-12	PL2924	1GHZ-20GHZ	9/28/2016	9/28/2017
CDU4	LAPTOP COMPUTER						
CDW5	DESKTOP COMPUTER	ELITE	PENTIUM 4	006	3.8GHZ	N/A	
CDX4	COMPUTER	ELITE CUSTOM	WINDOW 7 PRO			NOTE 1	
CDY0	WORKSTATION	ELITE	WORKSTATION		WINDOWS 7	N/A	
GRB0	1MHZ, LISN SIGNAL CHECKER	ELITE	LISNCHKR1M	1	1MHZ	1/12/2017	1/12/2018
GSFA	OSP-B157 OSP MODULE	ROHDE & SCHWARZ	OSP-B157	100867		9/9/2016	9/9/2017
GSFB	OSP120 BASE UNIT	ROHDE & SCHWARZ	OSP120	101246	---	9/9/2016	9/9/2017
MEA0	MICRO-OHM METER	KEITHLEY	580	674866	10UOHM-200KOHM	7/19/2016	7/19/2017
NHG0	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ	NOTE 1	
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	3/23/2016	3/23/2017
NWQ2	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66659	1GHZ-18GHZ	3/2/2016	3/2/2018
PLF1	CISPR16 50UH LISN	ELITE	CISPR16/70A	001	.15-30MHz	5/16/2016	5/16/2017
PLF3	CISPR16 50UH LISN	ELITE	CISPR16/70A	003	.15-30MHz	5/16/2016	5/16/2017
RBA1	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB26	100146	20HZ-26.5GHZ	2/12/2016	2/12/2017
RBB0	EMI TEST RECEIVER 20HZ TO 40 GHZ.	ROHDE & SCHWARZ	ESIB40	100250	20 HZ TO 40GHZ	2/16/2016	2/16/2017
RBE1	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESU26	100096	20Hz-26GHz	10/18/2016	10/18/2017
RBG0	EMI ANALYZER	ROHDE & SCHWARZ	ESW500	101533	10HZ-44GHZ	11/10/2016	11/10/2017
SAA1	AC POWER SOURCE/ANALYZER	HEWLETT PACKARD	6813A	3524A-00446	0-300VRMS, 1750VA	NOTE 1	
SES1	24VDC POWER SUPPLY	P TRANS	FS-32024-1M	002	18-27VDC	NOTE 1	
T1D2	10DB 20W ATTENUATOR	NARDA	768-10	6	DC-11GHZ	1/29/2016	1/29/2018
T1EP	10DB 25W ATTENUATOR	WEINSCHEL	46-10-34	CD6792	DC-18GHZ	5/10/2016	5/10/2018
VBR8	CISPR EN FCC CE VOLTAGE.exe						
WKA1	SOFTWARE, UNIVERSAL RCV EMI	ELITE	UNIV_RCV_EMI	1	---	I/O	
XLJR	5W, 50 OHM TERMINATION	JFW INDUSTRIES	50T-052	---	DC-2GHZ	7/7/2016	7/7/2018
XOB2	ADAPTER	HEWLETT PACKARD	K281C,012	09407	18-26.5GHZ	NOTE 1	
XPB0	LOW PASS FILTER	MINI-CIRCUITS LAB.	NLP-50	---	DC-50MHZ	NOTE 1	

I/O: Initial Only

N/A: Not Applicable

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.



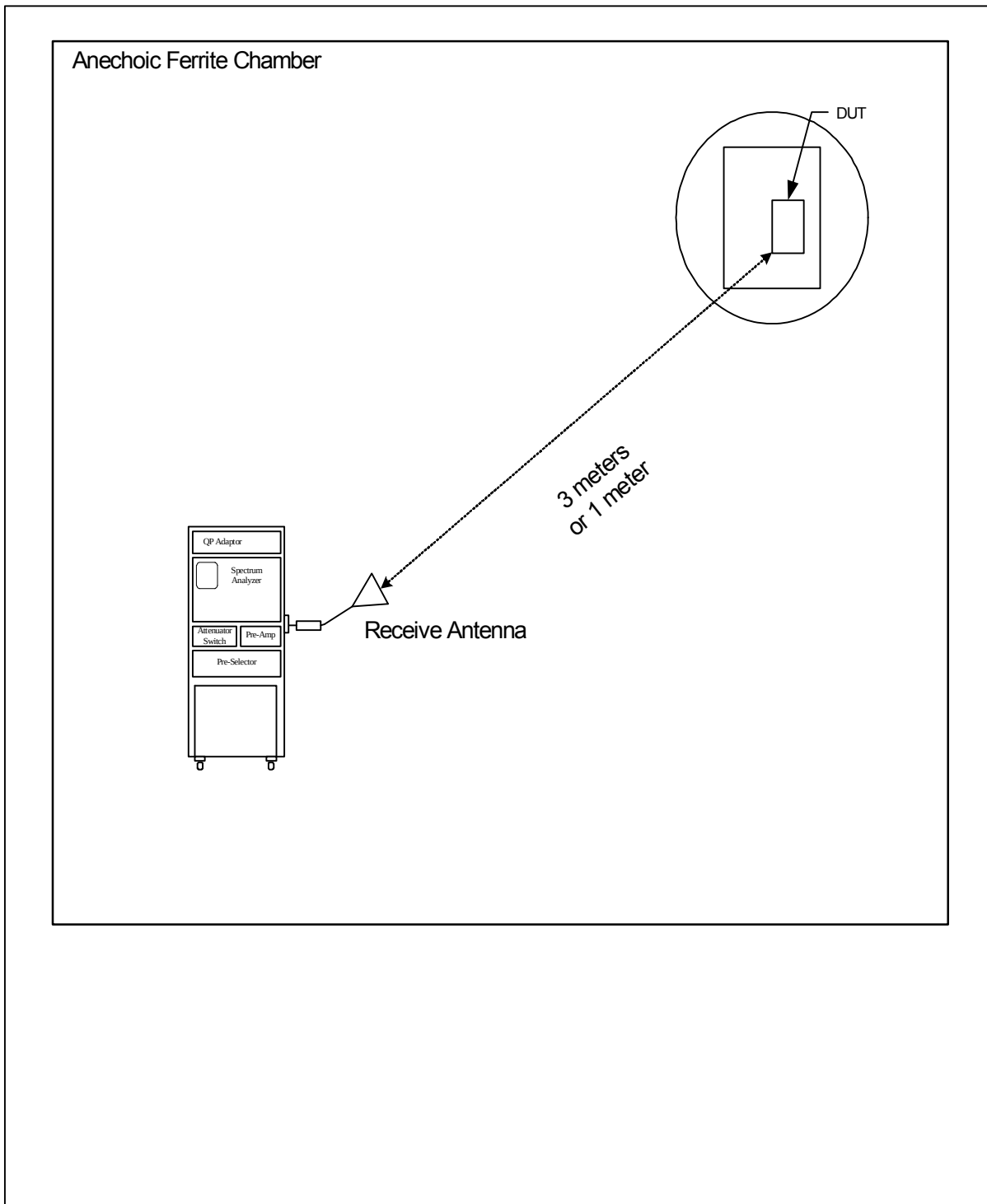


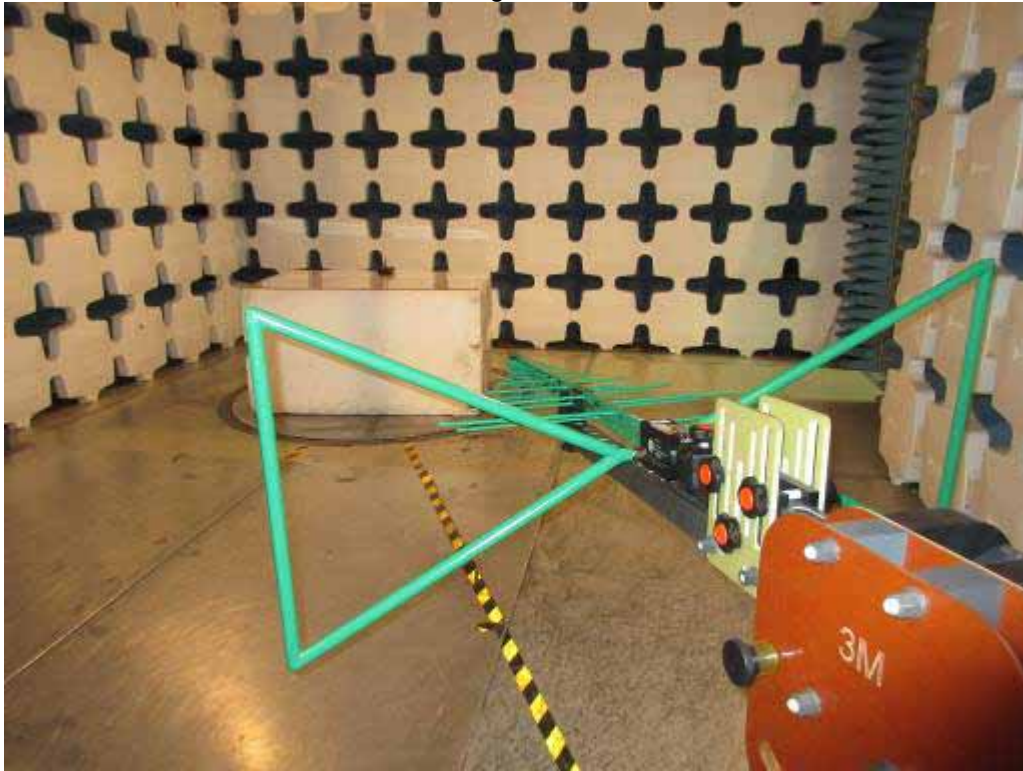
Figure 2



Test Setup for Conducted Emissions



Figure 3



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



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

Figure 4

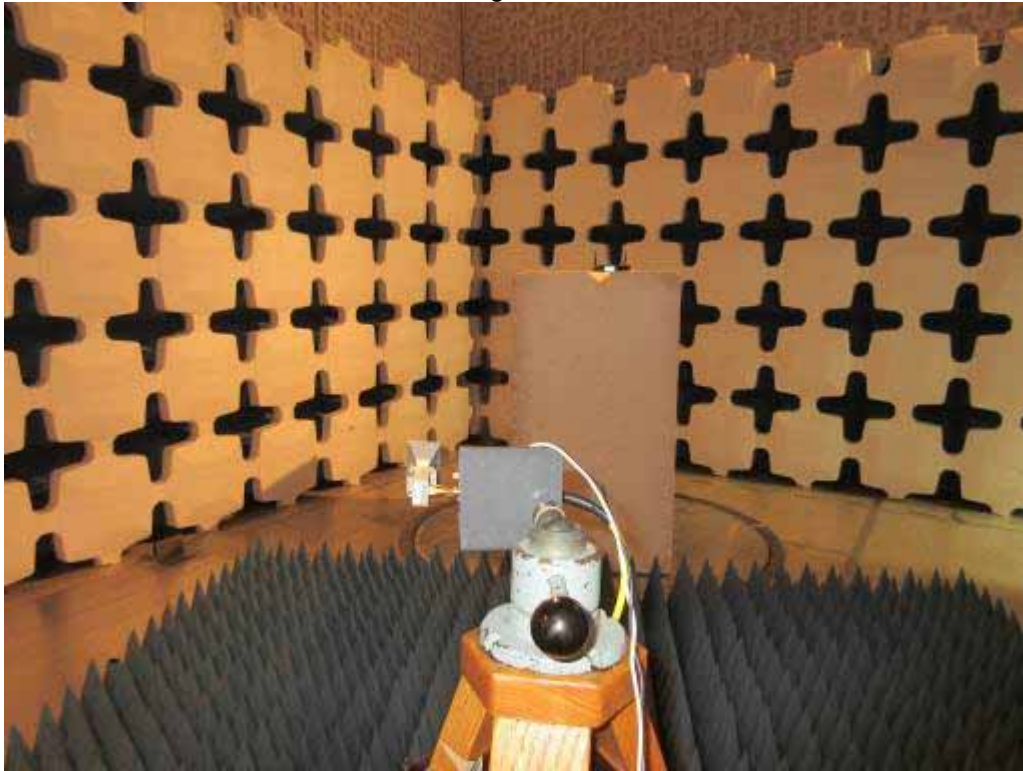


Test Setup for Radiated Emissions, 1GHz to 18GHz – Horizontal Polarization

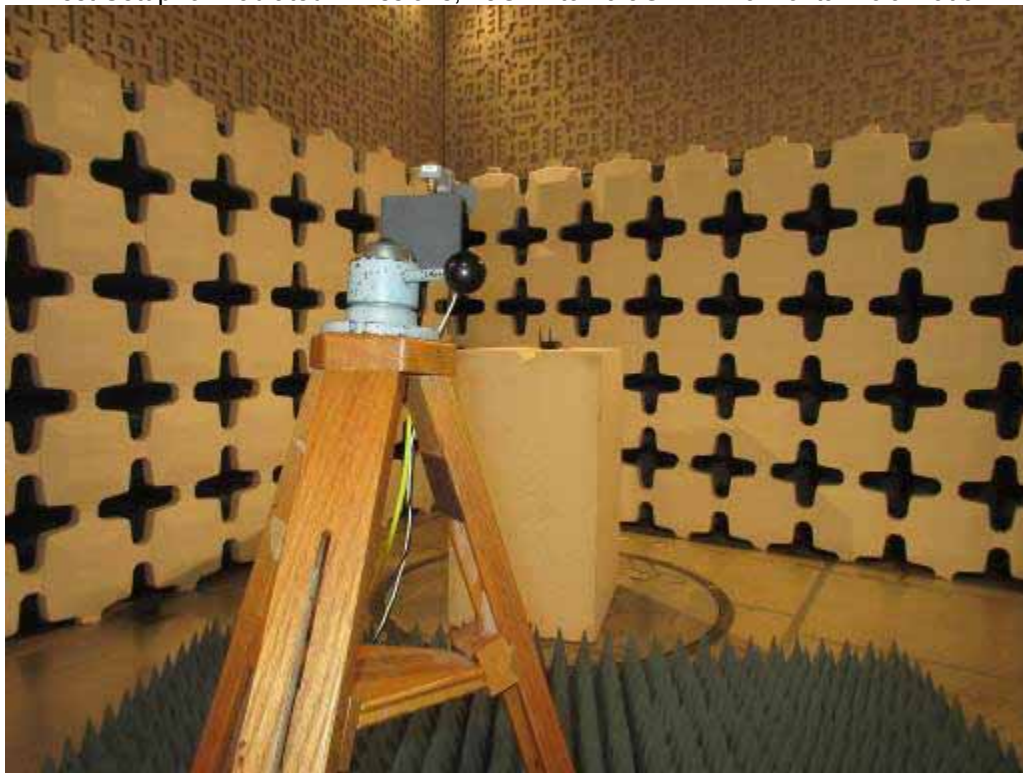


Test Setup for Radiated Emissions, 1GHz to 18GHz – Vertical Polarization

Figure 5



Test Setup for Radiated Emissions, 18GHz to 26.5GHz – Horizontal Polarization



Test Setup for Radiated Emissions, 18GHz to 26.5GHz – Vertical Polarization



FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer : SHURE INCORPORATED
Model : AD610
DUT Revision : 2.0
Serial Number :
DUT Mode : TX @ 2445 MHZ
Line Tested : 120V AC, 60HZ HIGH LINE
Scan Step Time [ms] : 30
Meas. Threshold [dB] : 0
Notes :
Test Engineer : T. Jozefczyk
Limit : Class B
Test Date : Feb 14, 2017 04:09:01 PM
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold

Freq MHz	Quasi-peak Level dB μ V	Quasi-peak Limit dB μ V	Excessive Quasi-peak Emissions	Average Level dB μ V	Average Limit dB μ V	Excessive Average Emissions
0.177	45.0	64.6		29.7	54.6	
0.473	41.3	56.5		33.3	46.5	
0.523	34.1	56.0		26.2	46.0	
0.903	28.4	56.0		20.7	46.0	
1.916	33.8	56.0		26.4	46.0	
2.615	41.7	56.0		37.4	46.0	
3.307	36.0	56.0		31.7	46.0	
9.090	48.2	60.0		41.5	50.0	
16.669	42.8	60.0		37.0	50.0	

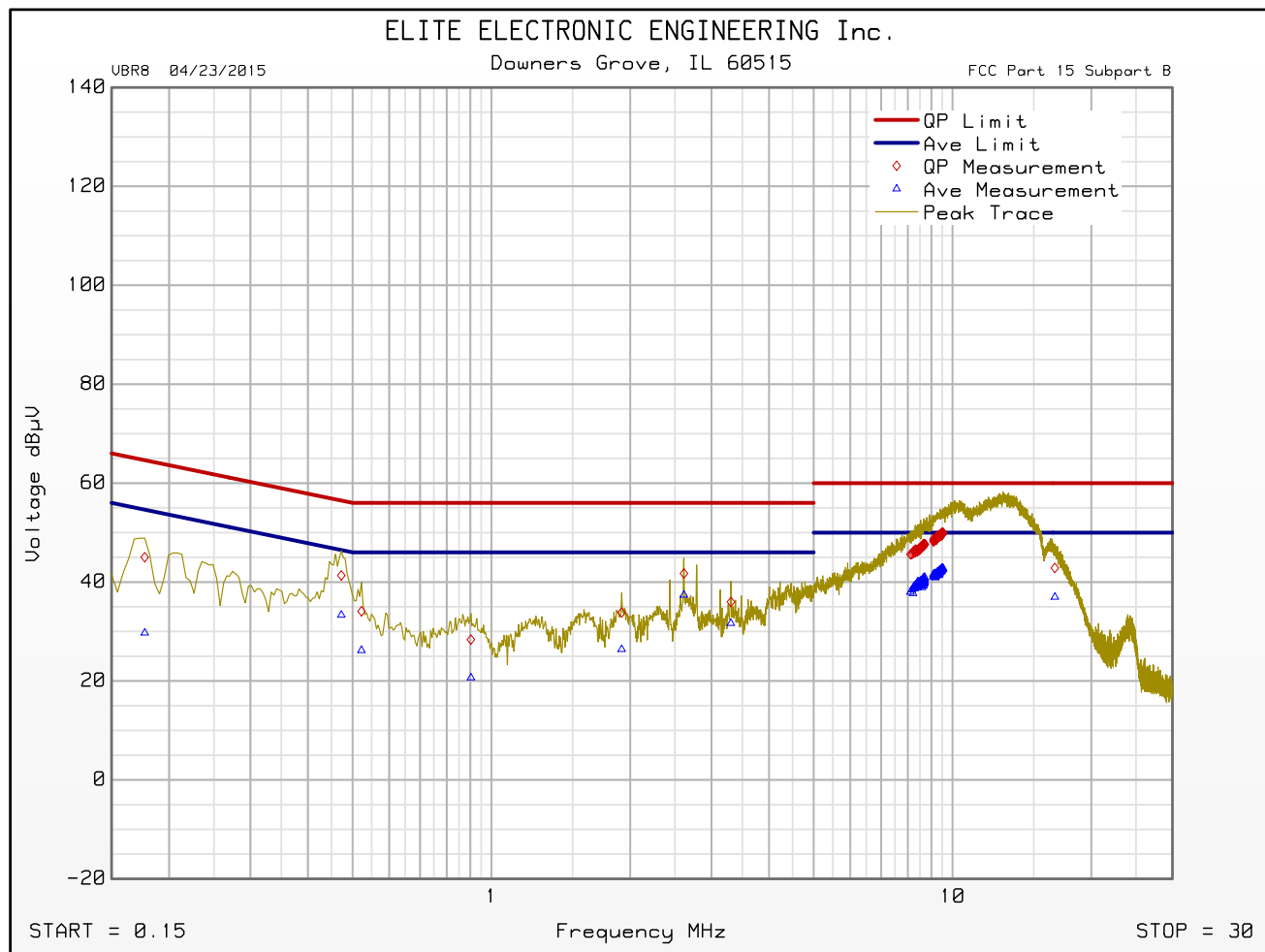


FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer : SHURE INCORPORATED
Model : AD610
DUT Revision : 2.0
Serial Number :
DUT Mode : TX @ 2445 MHZ
Line Tested : 120V AC, 60HZ HIGH LINE
Scan Step Time [ms] : 30
Meas. Threshold [dB] : 0
Notes :
Test Engineer : T. Jozefczyk
Limit : Class B
Test Date : Feb 14, 2017 04:09:01 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit



FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer : SHURE INCORPORATED
Model : AD610
DUT Revision : 2.0
Serial Number :
DUT Mode : TX @ 2445 MHZ
Line Tested : 120V AC, 60HZ NEUTRAL LINE
Scan Step Time [ms] : 30
Meas. Threshold [dB] : 0
Notes :
Test Engineer : T. Jozefczyk
Limit : Class B
Test Date : Feb 14, 2017 04:19:02 PM
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold

Freq MHz	Quasi-peak Level dB μ V	Quasi-peak Limit dB μ V	Excessive Quasi-peak Emissions	Average Level dB μ V	Average Limit dB μ V	Excessive Average Emissions
0.168	44.2	65.1		36.1	55.1	
0.473	47.5	56.5		39.8	46.5	
0.523	39.7	56.0		31.3	46.0	
0.871	34.8	56.0		27.3	46.0	
1.916	39.7	56.0		32.5	46.0	
2.786	47.9	56.0		43.9	46.0	
3.307	42.1	56.0		36.8	46.0	
9.090	47.6	60.0		40.8	50.0	
16.804	41.8	60.0		34.8	50.0	

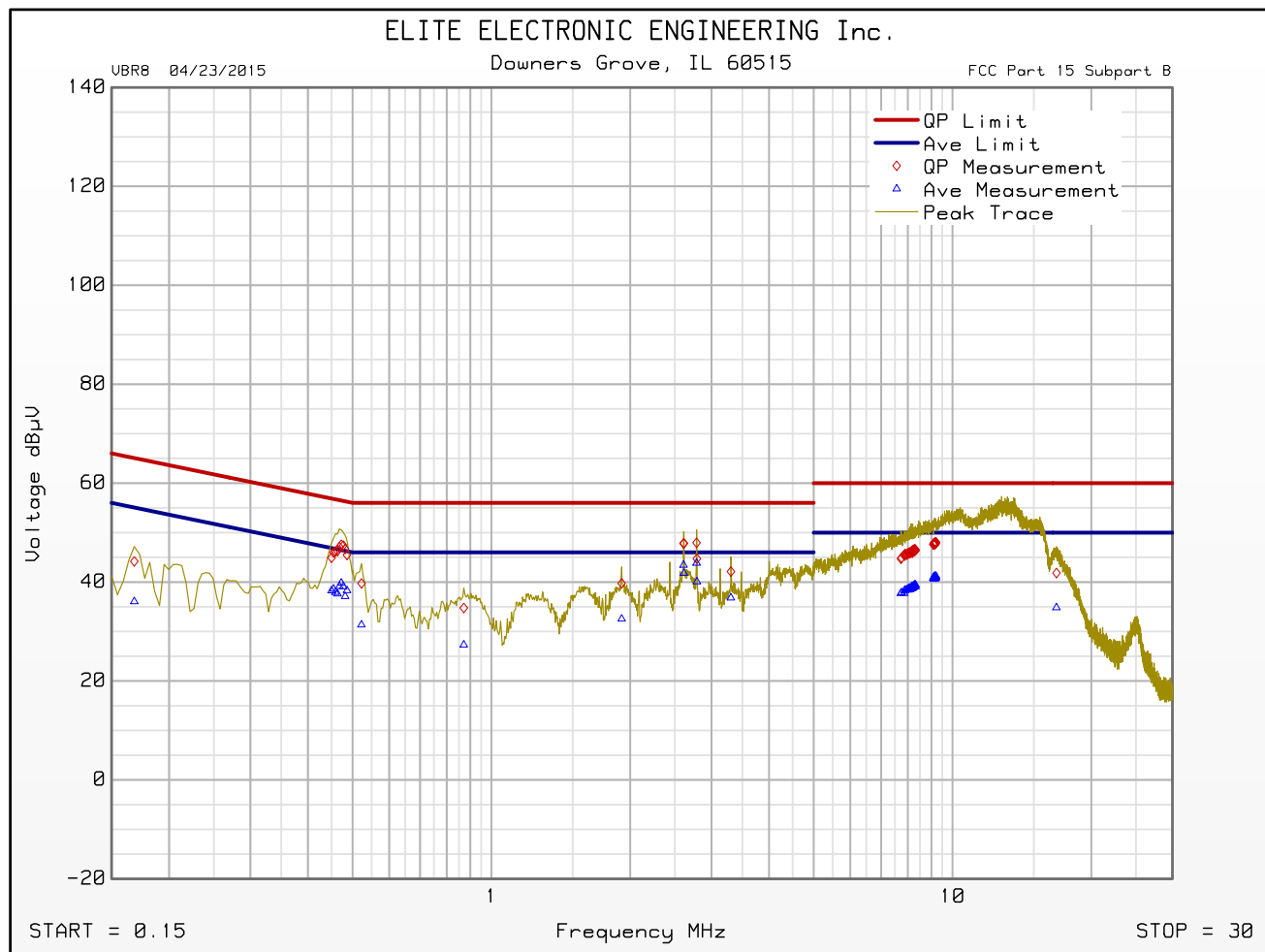


FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer : SHURE INCORPORATED
Model : AD610
DUT Revision : 2.0
Serial Number :
DUT Mode : TX @ 2445 MHZ
Line Tested : 120V AC, 60HZ NEUTRAL LINE
Scan Step Time [ms] : 30
Meas. Threshold [dB] : 0
Notes :
Test Engineer : T. Jozefczyk
Limit : Class B
Test Date : Feb 14, 2017 04:19:02 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit



FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer : SHURE INCORPORATED
Model : AD610 + CISCO GIGABIT POE SMART SWITCH
DUT Revision : 2.0
Serial Number : AD2-4162933258
DUT Mode : TX @ MID CHANNEL (2445MHZ)
Line Tested : 120VAC, 60HZ HIGH LINE
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -5
Notes :
Test Engineer : T. Jozefczyk
Limit : Class B
Test Date : Feb 13, 2017 11:46:53 AM
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 5 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	57.7	65.3		47.4	55.3	
0.329	43.3	59.5		38.6	49.5	
0.536	32.9	56.0		30.4	46.0	
1.218	31.1	56.0		26.3	46.0	
1.871	29.8	56.0		23.9	46.0	
2.615	37.4	56.0		36.8	46.0	
4.004	40.2	56.0		37.7	46.0	
7.489	29.8	60.0		24.8	50.0	
9.581	25.4	60.0		20.1	50.0	
21.889	17.0	60.0		11.2	50.0	

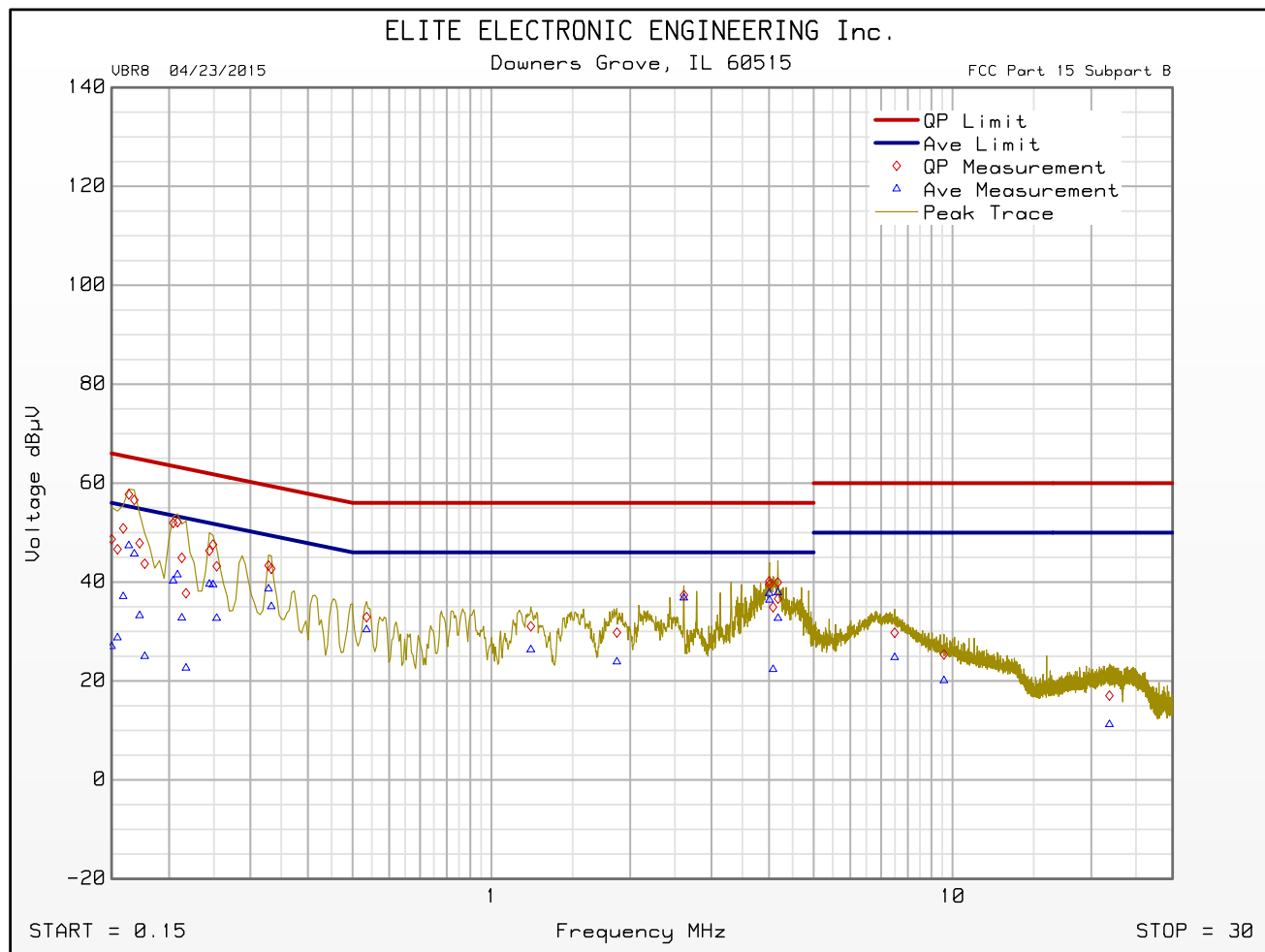


FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer : SHURE INCORPORATED
Model : AD610 + CISCO GIGABIT POE SMART SWITCH
DUT Revision : 2.0
Serial Number : AD2-4162933258
DUT Mode : TX @ MID CHANNEL (2445MHZ)
Line Tested : 120VAC, 60HZ HIGH LINE
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -5
Notes :
Test Engineer : T. Jozefczyk
Limit : Class B
Test Date : Feb 13, 2017 11:46:53 AM



Emissions Meet QP Limit
Emissions Meet Ave Limit



FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer : SHURE INCORPORATED
Model : AD610 + CISCO GIGABIT POE SMART SWITCH
DUT Revision : 2.0
Serial Number : AD2-4162933258
DUT Mode : TX @ MID CHANNEL (2445MHZ)
Line Tested : 120VAC, 60HZ NEUTRAL LINE
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -5
Notes :
Test Engineer : T. Jozefczyk
Limit : Class B
Test Date : Feb 13, 2017 11:54:06 AM
Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold over 5 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	58.5	65.3		48.3	55.3	
0.288	46.0	60.6		39.1	50.6	
0.536	32.8	56.0		29.2	46.0	
0.871	32.0	56.0		27.1	46.0	
1.916	31.0	56.0		25.3	46.0	
2.615	37.4	56.0		36.4	46.0	
4.180	38.5	56.0		38.0	46.0	
5.000	34.8	56.0		24.6	46.0	
16.002	24.1	60.0		21.9	50.0	
21.074	18.6	60.0		12.3	50.0	

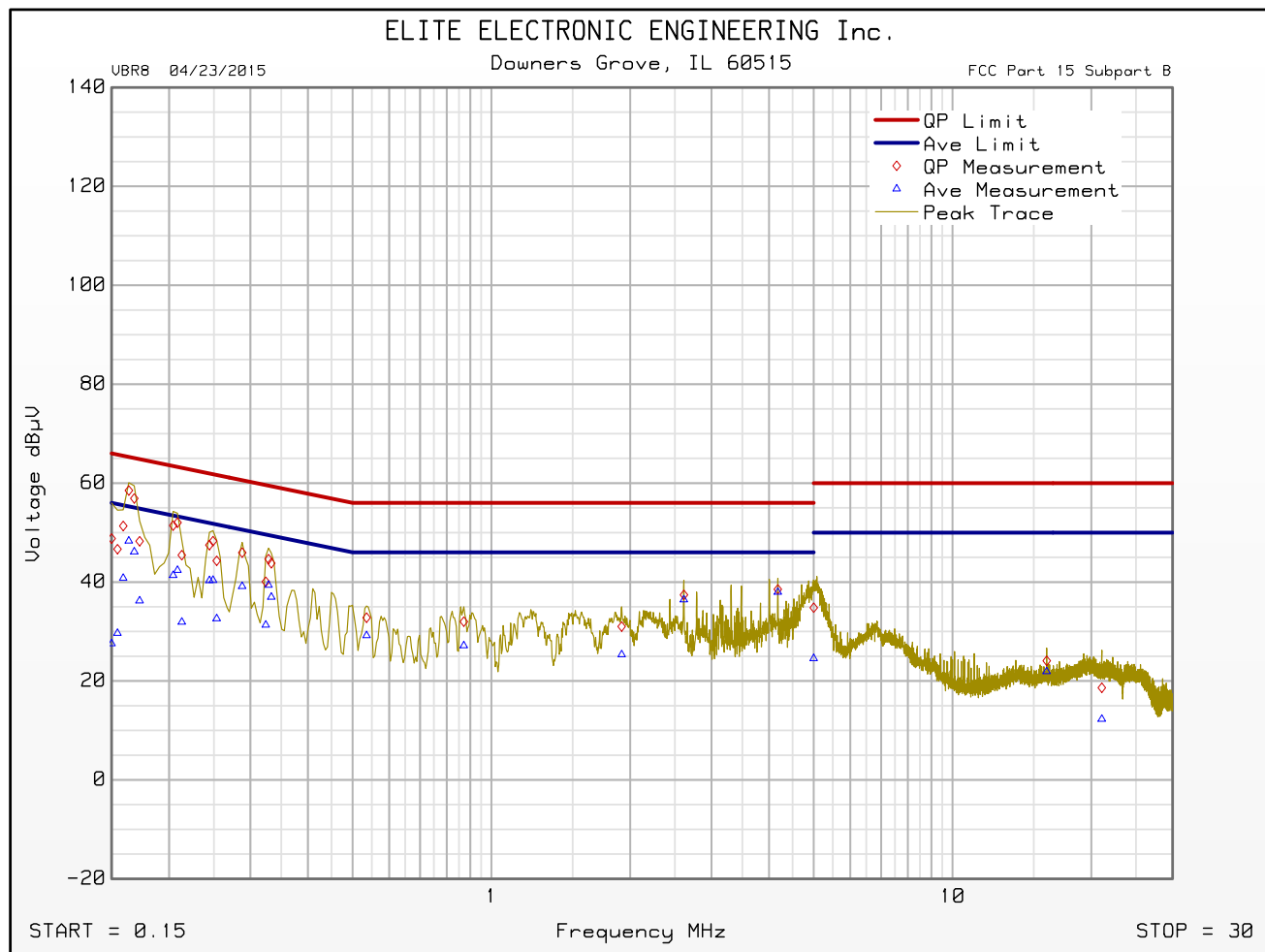


FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer : SHURE INCORPORATED
Model : AD610 + CISCO GIGABIT POE SMART SWITCH
DUT Revision : 2.0
Serial Number : AD2-4162933258
DUT Mode : TX @ MID CHANNEL (2445MHZ)
Line Tested : 120VAC, 60HZ NEUTRAL LINE
Scan Step Time [ms] : 30
Meas. Threshold [dB] : -5
Notes :
Test Engineer : T. Jozefczyk
Limit : Class B
Test Date : Feb 13, 2017 11:54:06 AM



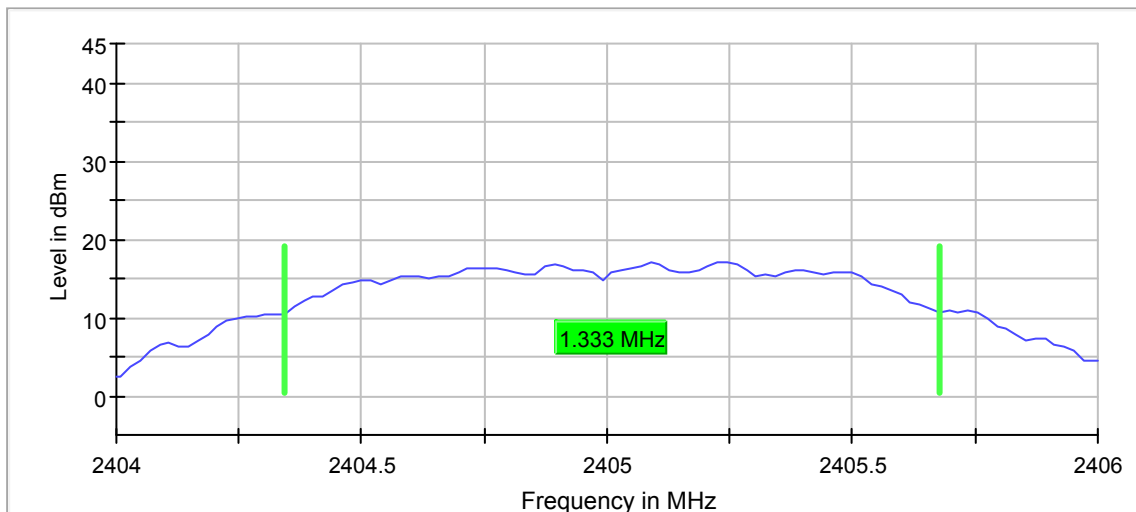
Emissions Meet QP Limit
Emissions Meet Ave Limit

Manufacturer : Shure Incorporated
 Test Item : Equipment Using Wide Band Modulations Other Than FHSS, Non-Adaptive
 : Transceiver
 Model No. : AD610
 Serial No. : AD2-4162933258
 Test Mode : Tx - Antenna 1
 Test Performed : 6dB Bandwidth
 Test Date : February 2, 2017

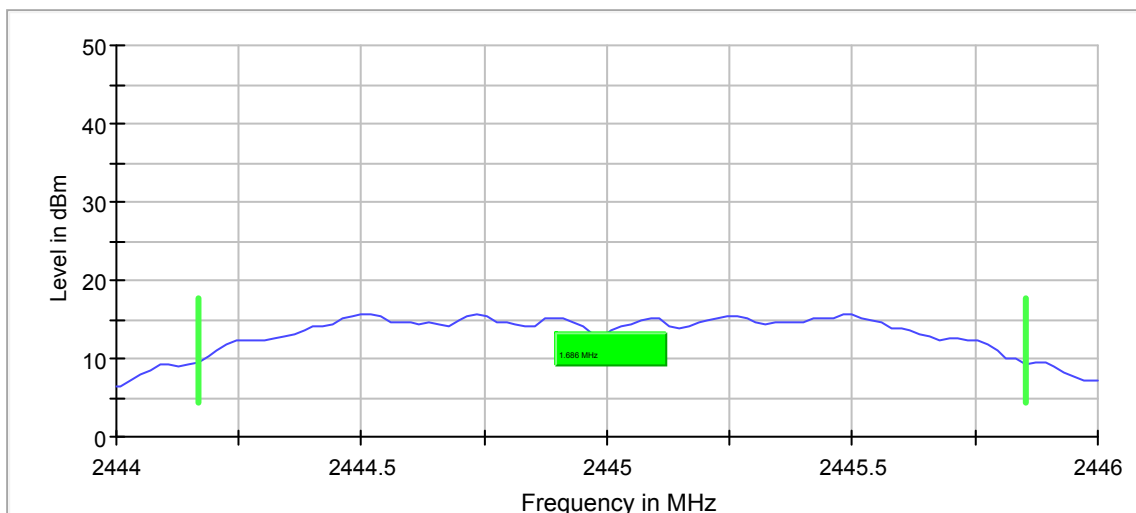
6 dB Bandwidth

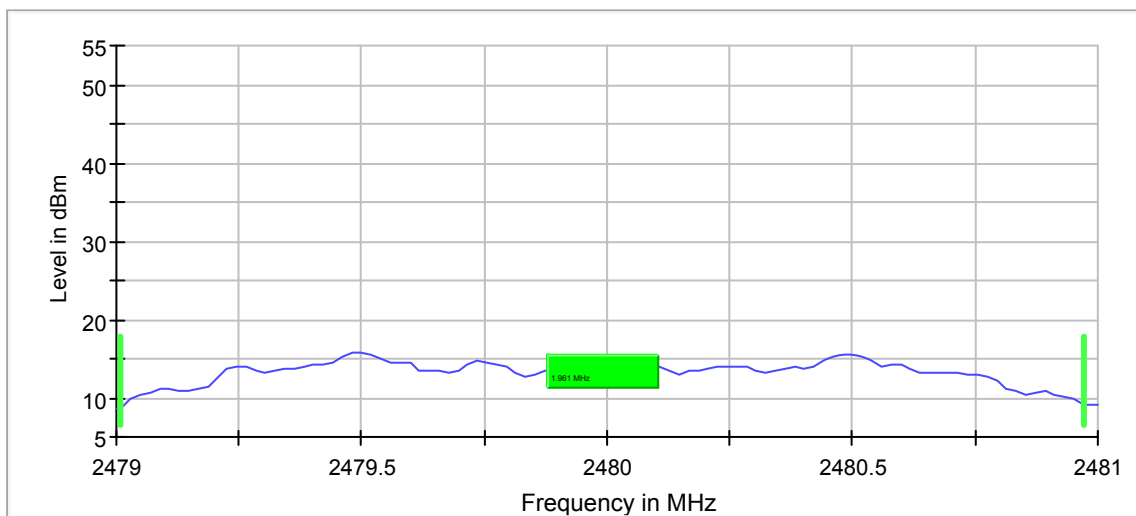
DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2405.000000	1.333334	0.500000	---	2404.343137	2405.676471	17.0	PASS
2445.000000	1.686274	0.500000	---	2444.166667	2445.852941	15.7	PASS
2480.000000	1.960784	0.500000	---	2479.009804	2480.970588	15.7	PASS

Low Frequency:



Mid Frequency:



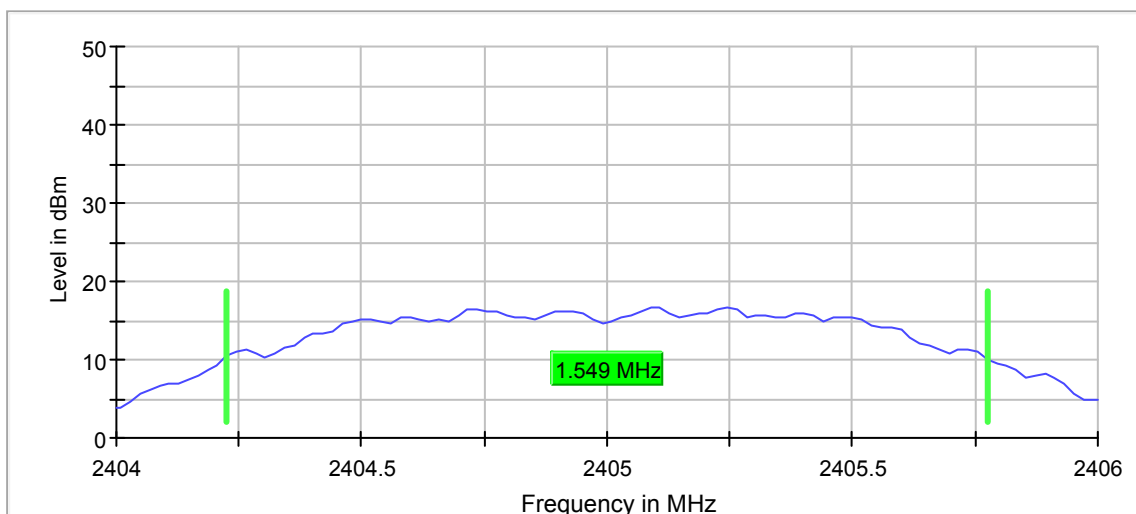
High Frequency:

Manufacturer : Shure Incorporated
 Test Item : Equipment Using Wide Band Modulations Other Than FHSS, Non-Adaptive
 : Transceiver
 Model No. : AD610
 Serial No. : AD2-4162933258
 Test Mode : Tx - Antenna 2
 Test Performed : 6dB Bandwidth
 Test Date : February 2, 2017

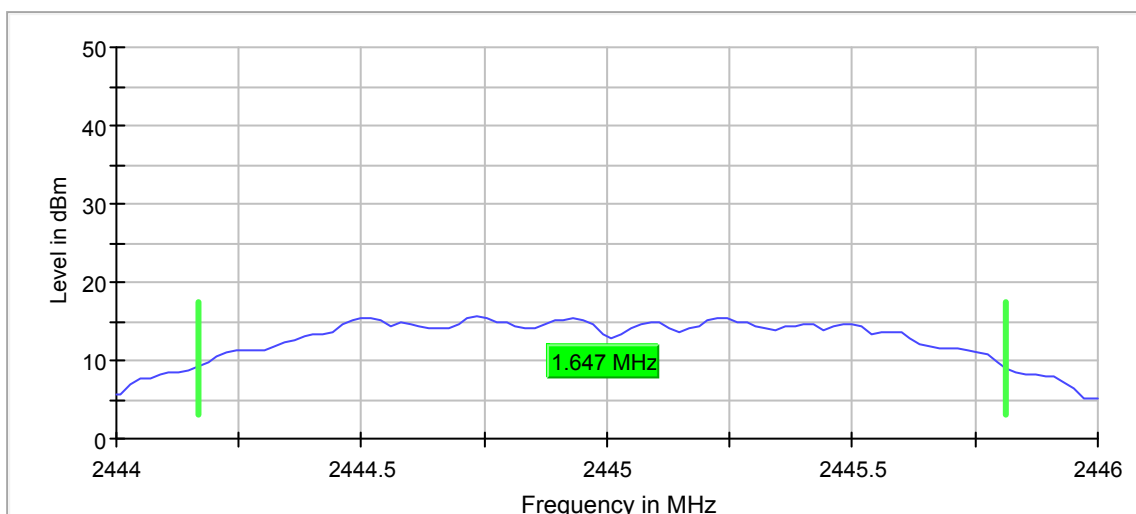
6 dB Bandwidth

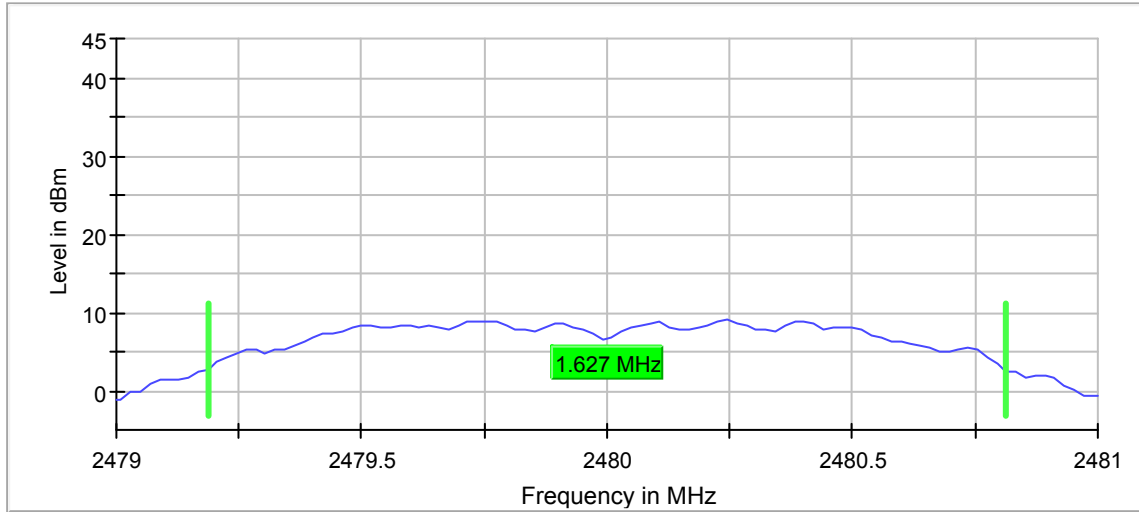
DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2405.000000	1.549020	0.500000	---	2404.225490	2405.774510	16.6	PASS
2445.000000	1.647058	0.500000	---	2444.166667	2445.813725	15.5	PASS
2480.000000	1.627450	0.500000	---	2479.186275	2480.813725	9.0	PASS

Low Frequency:



Mid Frequency:



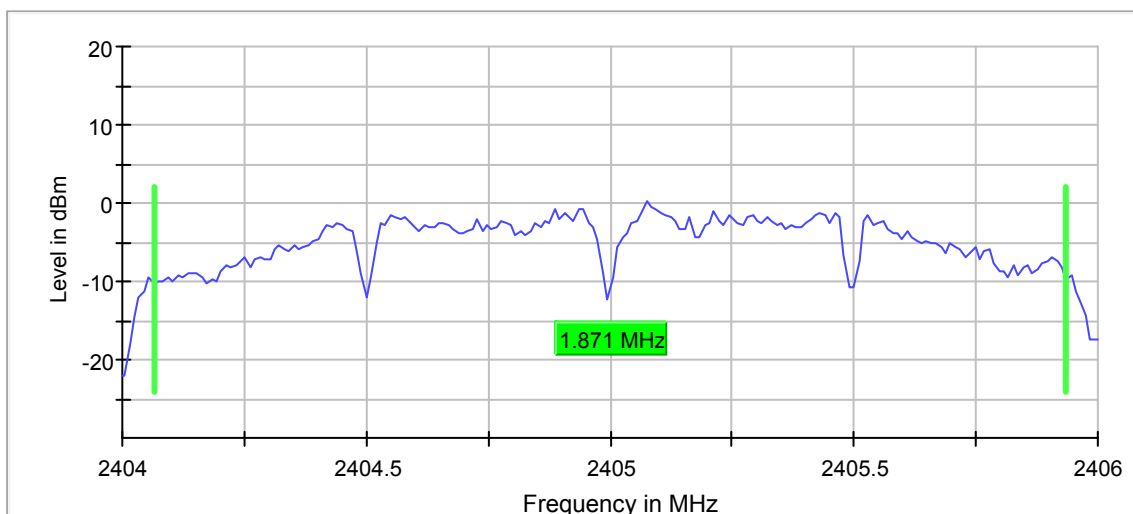
High Frequency:

Manufacturer : Shure Incorporated
 Test Item : Equipment Using Wide Band Modulations Other Than FHSS, Non-Adaptive
 : Transceiver
 Model No. : AD610
 Serial No. : AD2-4162933258
 Test Mode : Tx - Antenna 1
 Test Performed : 99% Bandwidth
 Test Date : February 2, 2017

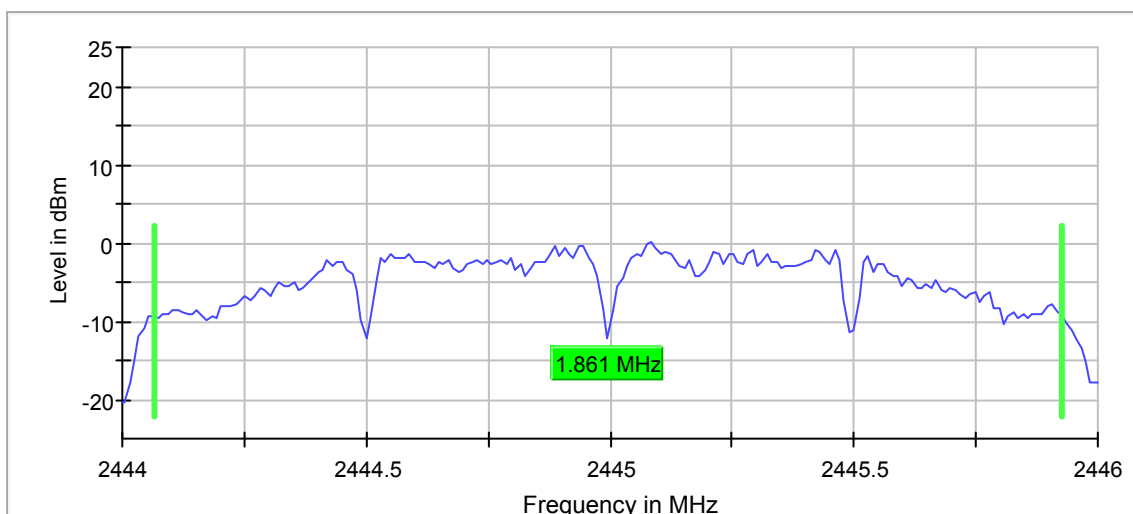
99% Bandwidth

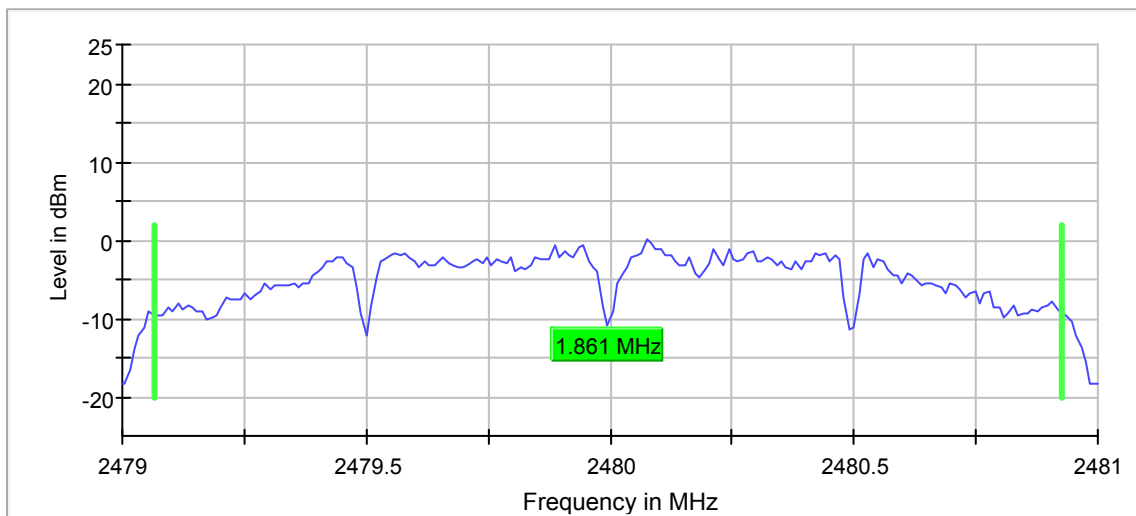
DUT Frequency (MHz)	Bandwidth (MHz)	Band Edge Left (MHz)	Limit Min BE L (MHz)	Band Edge Right (MHz)	Limit Max BE R	Result
2405.000000	1.871288	2404.064356	2400.000000	2405.935644	2483.500000	PASS
2445.000000	1.861387	2444.064356	2400.000000	2445.925743	2483.500000	PASS
2480.000000	1.861387	2479.064356	2400.000000	2480.925743	2483.500000	PASS

Low Frequency:



Mid Frequency:



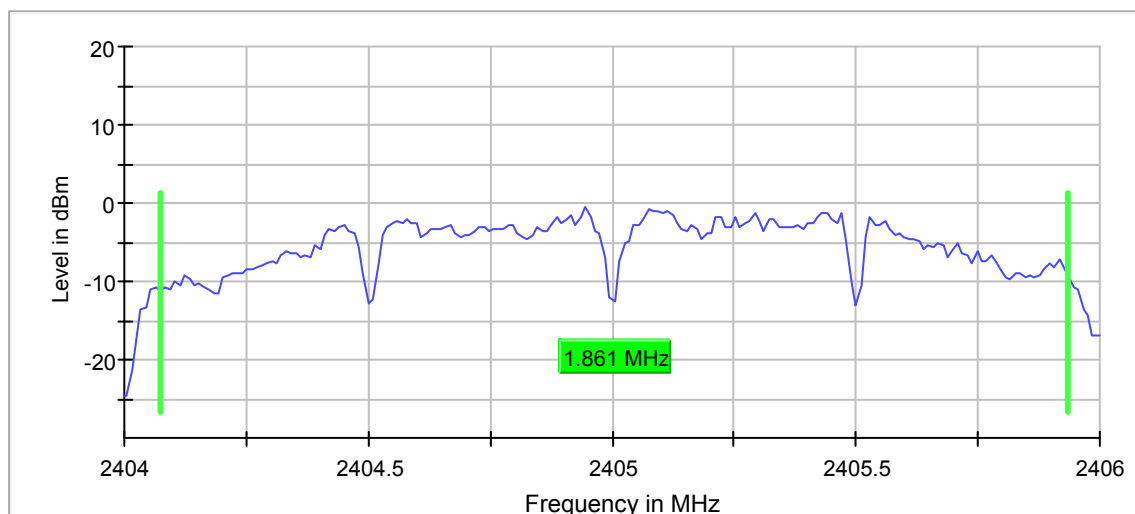
High Frequency:

Manufacturer : Shure Incorporated
 Test Item : Equipment Using Wide Band Modulations Other Than FHSS, Non-Adaptive
 : Transceiver
 Model No. : AD610
 Serial No. : AD2-4162933258
 Test Mode : Tx - Antenna 2
 Test Performed : 99% Bandwidth
 Test Date : February 2, 2017

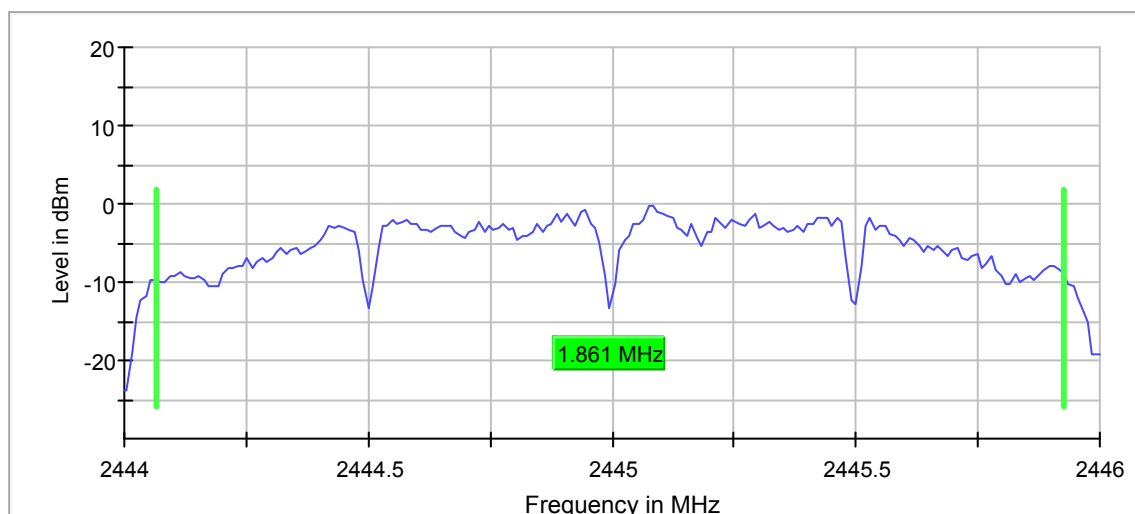
99% Bandwidth

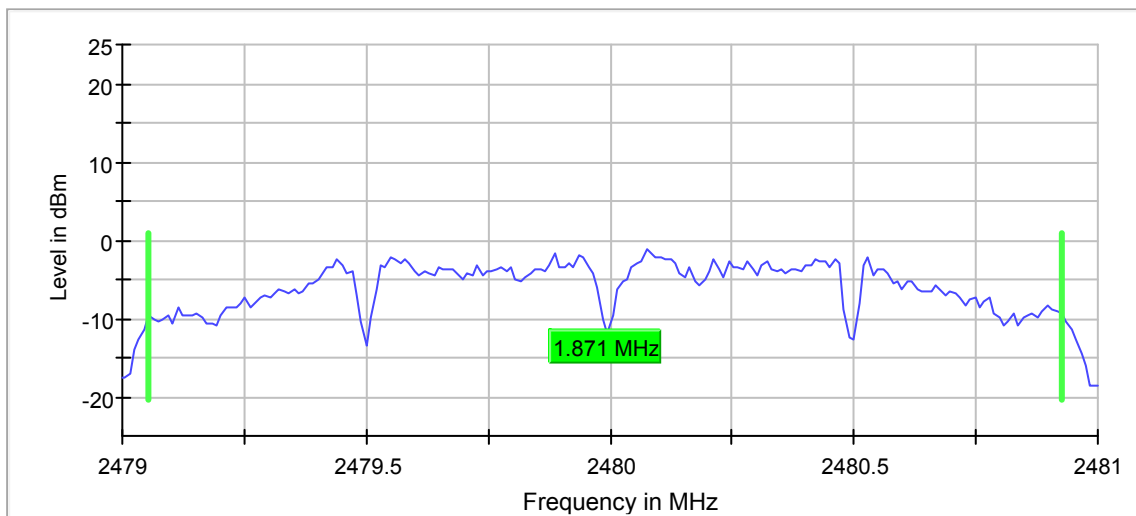
DUT Frequency (MHz)	Bandwidth (MHz)	Band Edge Left (MHz)	Limit Min BE L (MHz)	Band Edge Right (MHz)	Limit Max BE R	Result
2405.000000	1.861387	2404.074257	2400.000000	2405.935644	2483.500000	PASS
2445.000000	1.861387	2444.064356	2400.000000	2445.925743	2483.500000	PASS
2480.000000	1.871288	2479.054455	2400.000000	2480.925743	2483.500000	PASS

Low Frequency:



Mid Frequency:



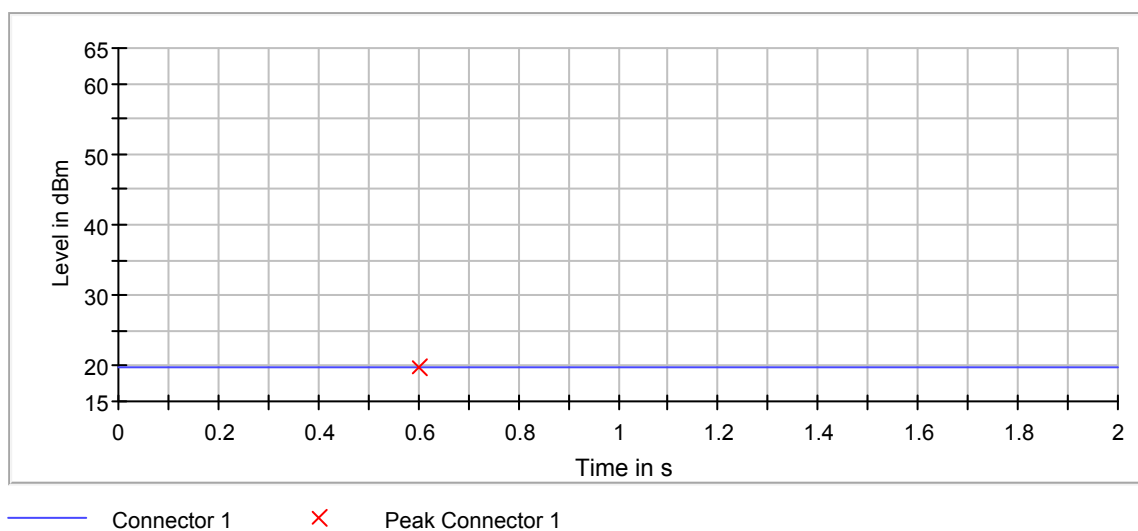
High Frequency:

Manufacturer : Shure Incorporated
 Test Item : Equipment Using Wide Band Modulations Other Than FHSS, Non-Adaptive
 : Transceiver
 Model No. : AD610
 Serial No. : AD2-4162933258
 Test Mode : Tx - Antenna 1
 Test Performed : Peak Output Power
 Test Date : February 2, 2017

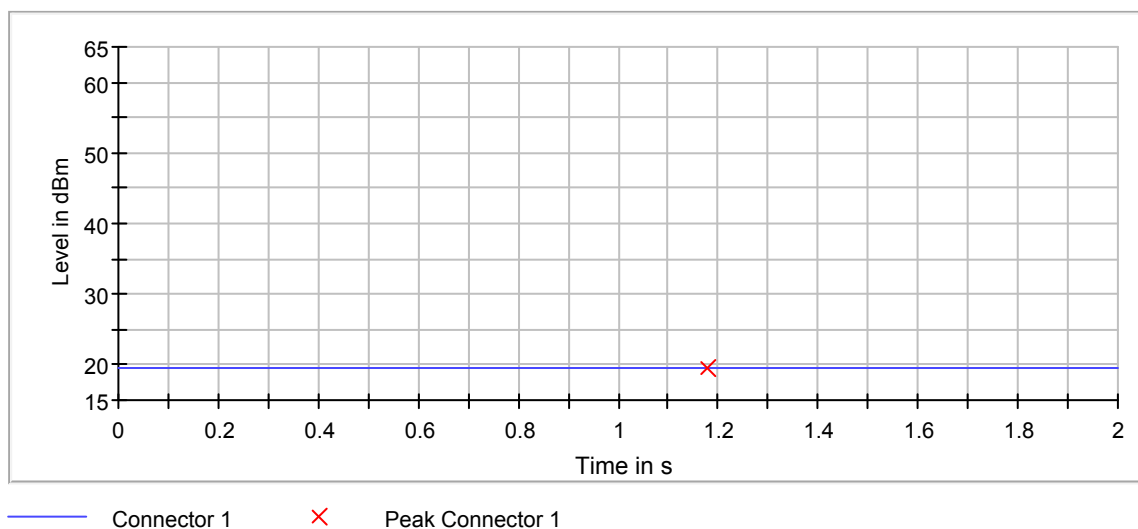
Peak Output Power

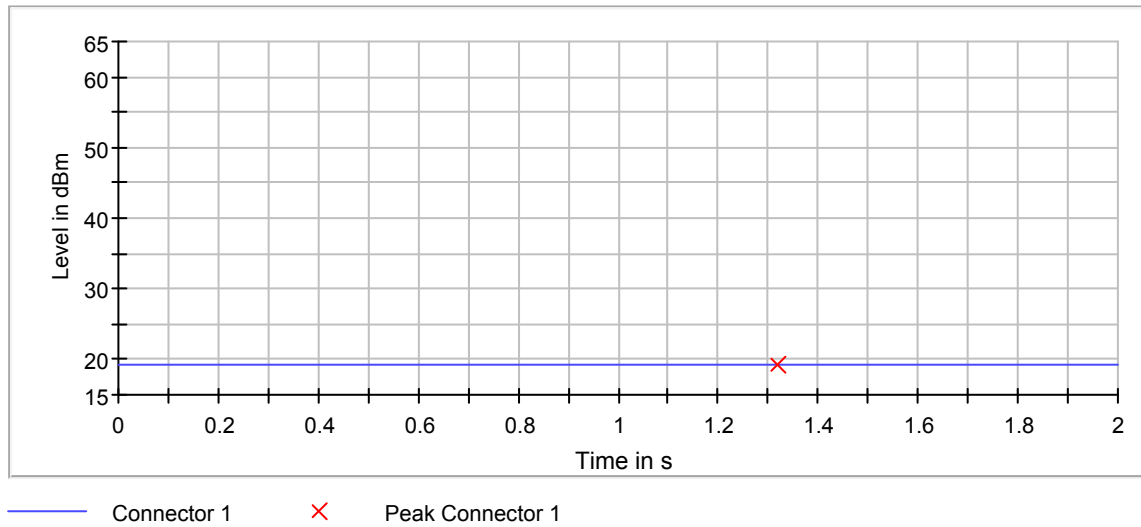
DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2405.000000	19.8	30.0	PASS
2445.000000	19.6	30.0	PASS
2480.000000	19.4	30.0	PASS

Low Frequency:



Mid Frequency:



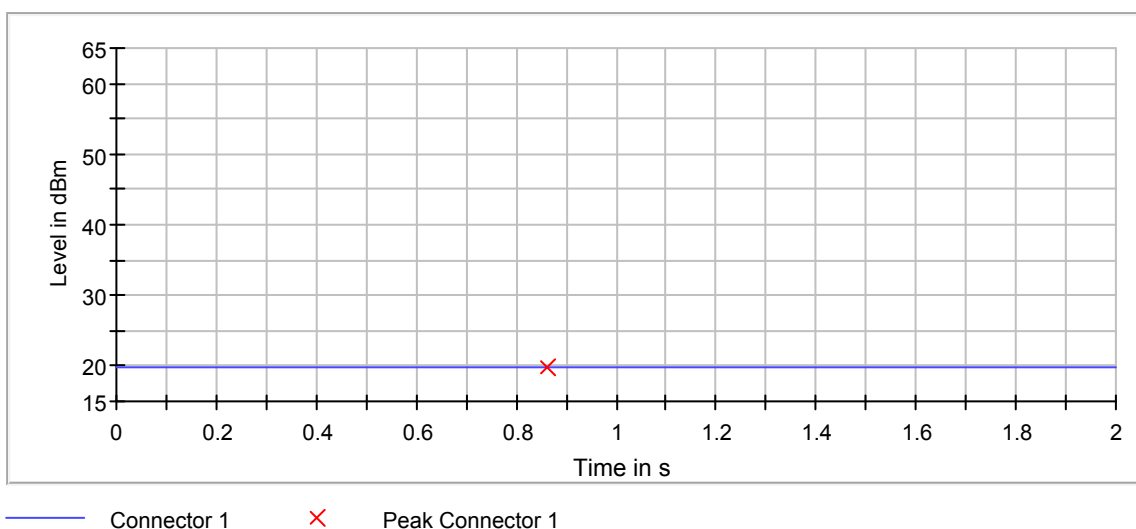
High Frequency:

Manufacturer : Shure Incorporated
 Test Item : Equipment Using Wide Band Modulations Other Than FHSS, Non-Adaptive
 : Transceiver
 Model No. : AD610
 Serial No. : AD2-4162933258
 Test Mode : Tx - Antenna 2
 Test Performed : Peak Output Power
 Test Date : February 2, 2017

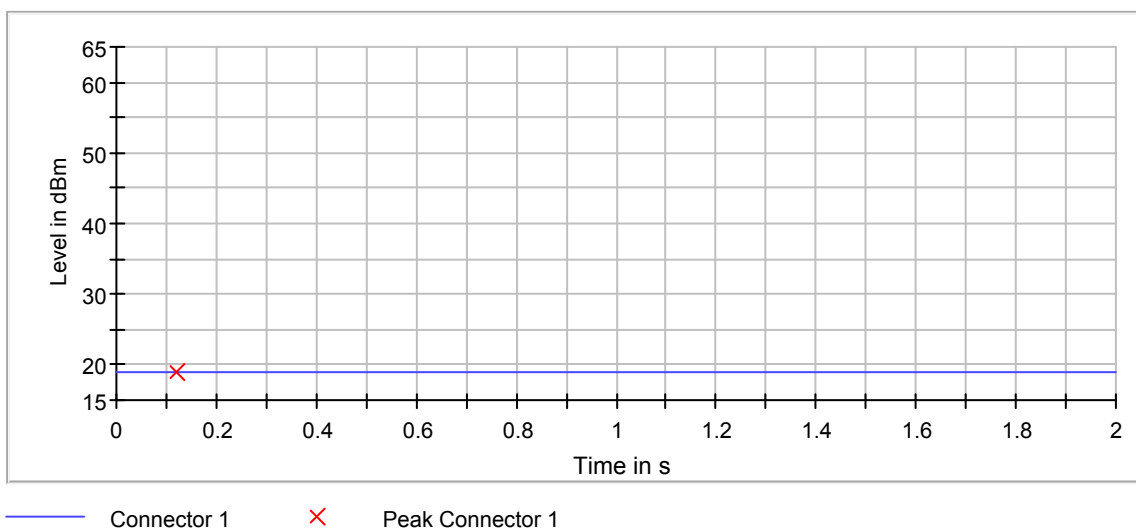
Peak Output Power

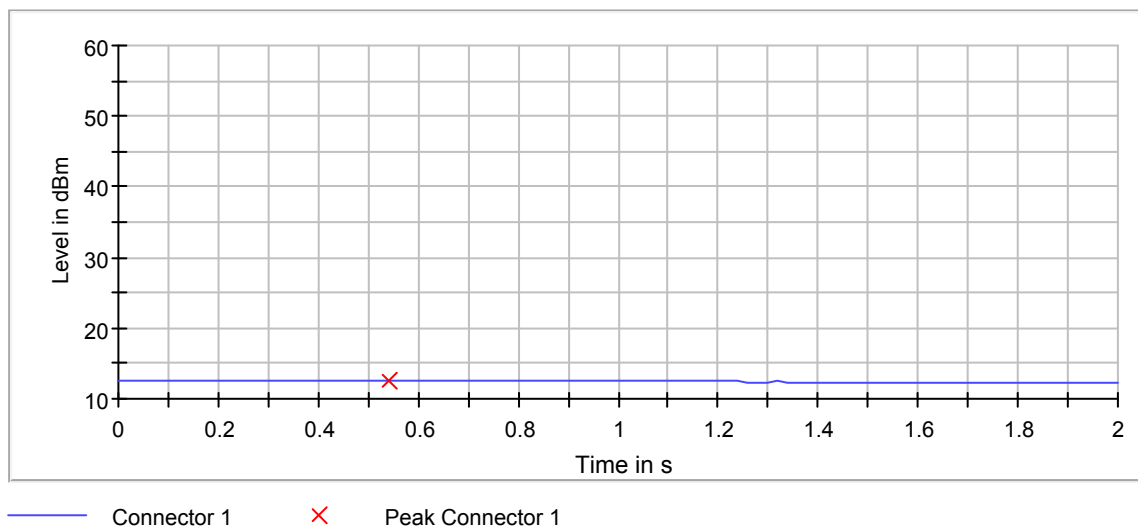
DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2405.000000	19.8	30.0	PASS
2445.000000	19.1	30.0	PASS
2480.000000	12.6	30.0	PASS

Low Frequency:



Mid Frequency:



High Frequency:



DATA PAGE

Manufacturer : Shure Incorporated
Test Item : ShowLink Access Point
Model No. : AD610
Mode : Tx
Test Specification : FCC-15.247, RSS-247 Peak Output Power
Date : February 9-10, 2017

Freq. (MHz)	Ant Pol	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)
2405.00	H	8.7	5.9	2.8	11.8
2405.00	V	17.2	5.9	2.8	20.3
2445.00	H	5.9	5.9	2.8	9.1
2445.00	V	16.7	5.9	2.8	19.8
2480.00	H	2.5	5.9	2.8	5.6
2480.00	V	11.5	5.9	2.8	14.7



DUTY CYCLE

MANUFACTURER : Shure Incorporated
 TEST ITEM : ShowLink Access Point
 MODEL NUMBER : AD610

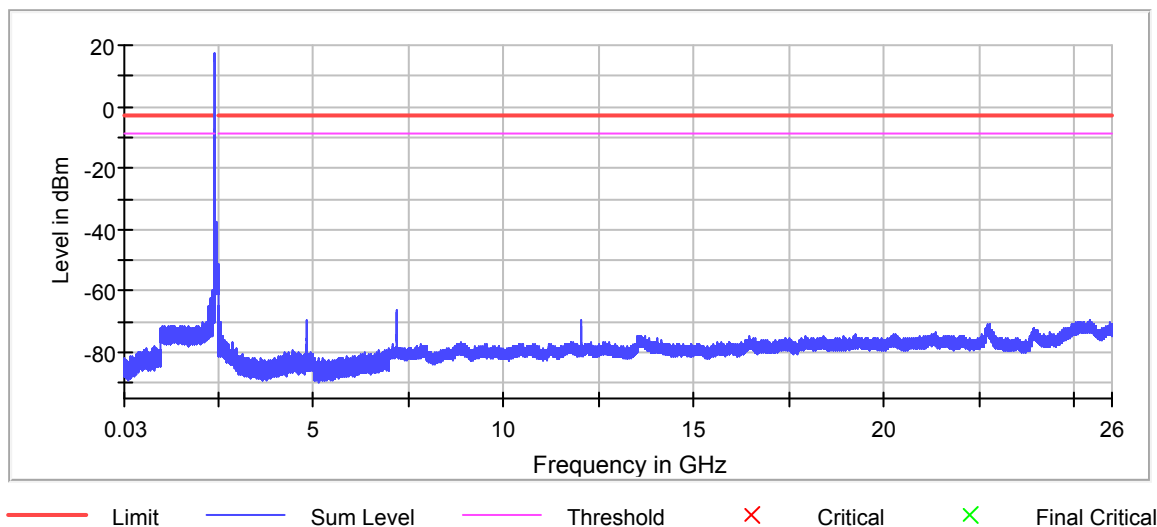
NOTES

Manufacturer : Shure Incorporated
 Test Item : Equipment Using Wide Band Modulations Other Than FHSS, Non-Adaptive
 : Transceiver
 Model No. : AD610
 Serial No. : AD2-4162933258
 Test Mode : Tx - Antenna 1
 Test Performed : Antenna Conducted Spurious Emissions
 Test Date : February 2, 2017

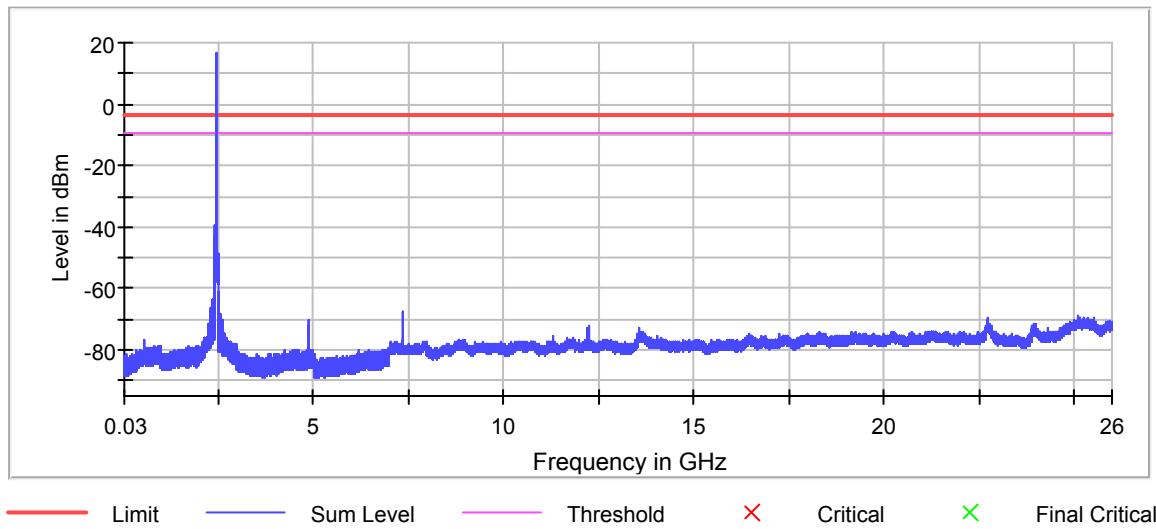
Antenna Conducted Spurious Emissions

DUT Frequency (MHz)	Result
2405.000000	PASS
2445.000000	PASS
2480.000000	PASS

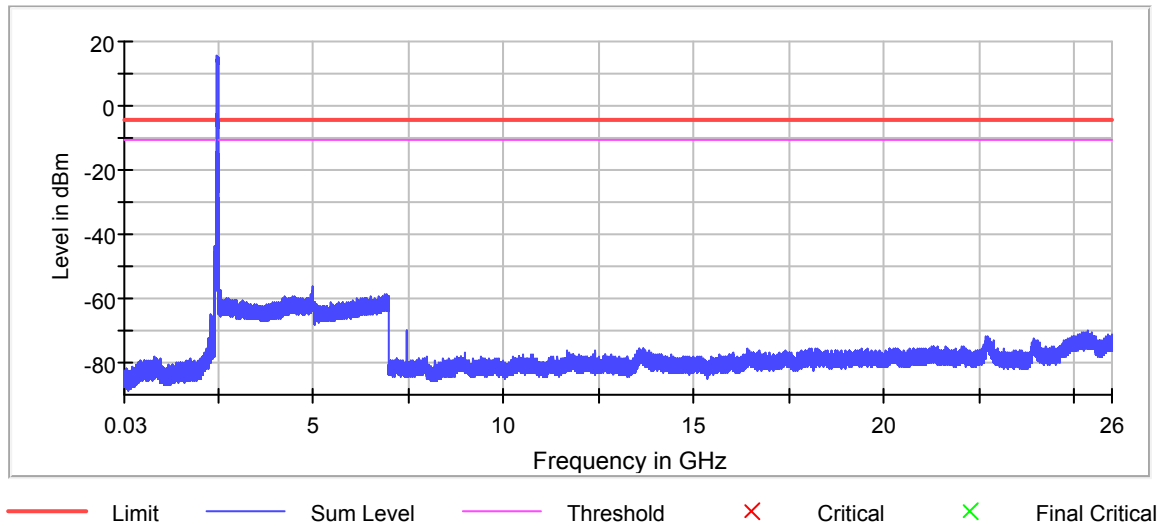
Low Frequency:



Mid Frequency:



High Frequency:

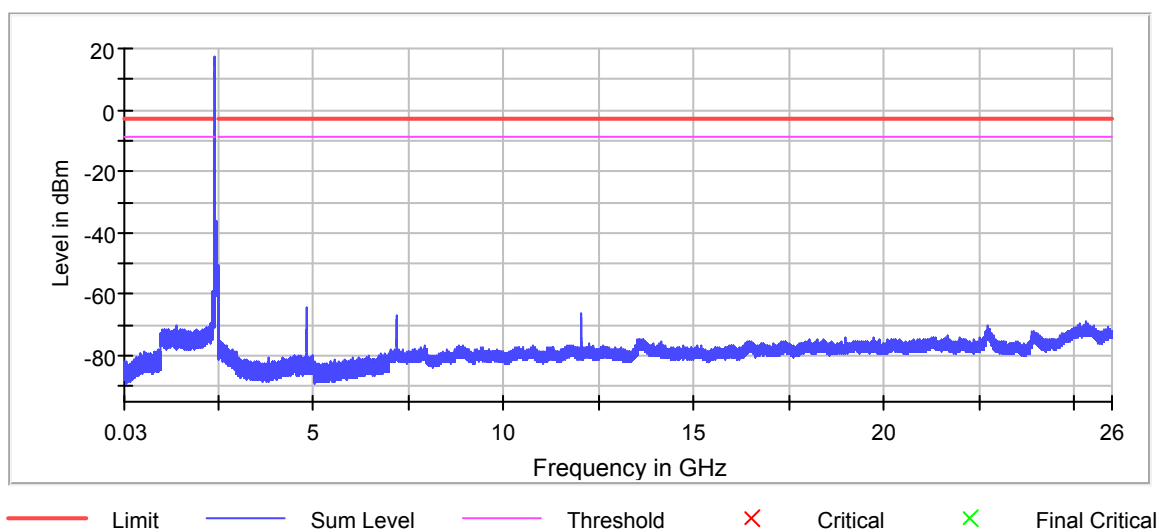


Manufacturer : Shure Incorporated
 Test Item : Equipment Using Wide Band Modulations Other Than FHSS, Non-Adaptive
 : Transceiver
 Model No. : AD610
 Serial No. : AD2-4162933258
 Test Mode : Tx - Antenna 2
 Test Performed : Antenna Conducted Spurious Emissions
 Test Date : February 2, 2017

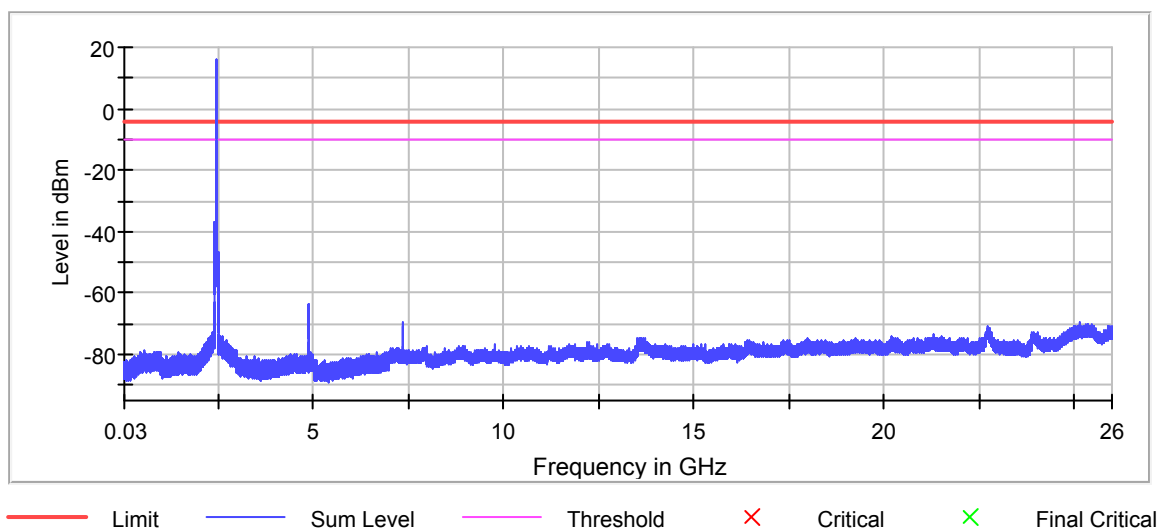
Antenna Conducted Spurious Emissions

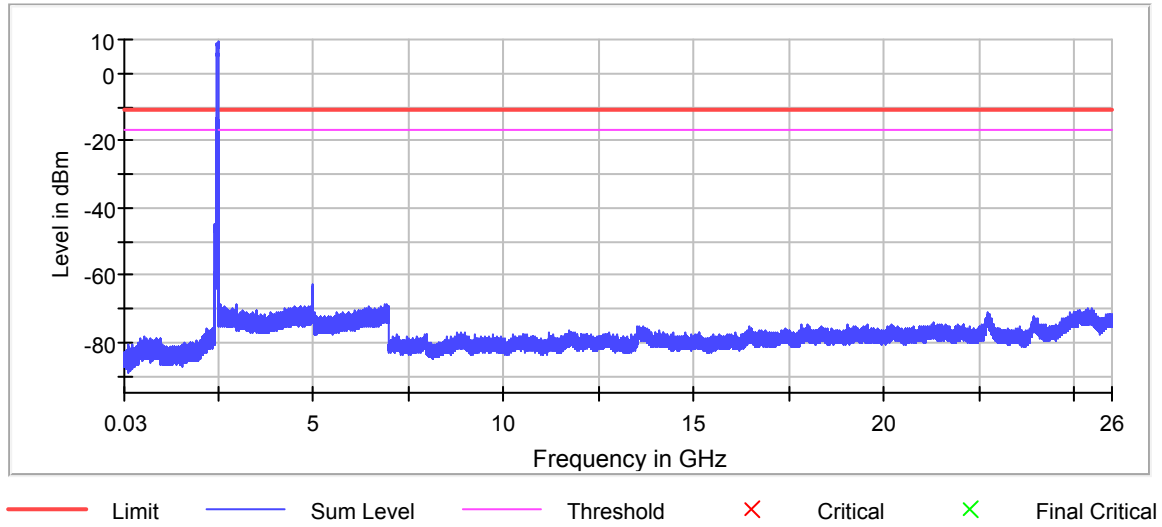
DUT Frequency (MHz)	Result
2405.000000	PASS
2445.000000	PASS
2480.000000	PASS

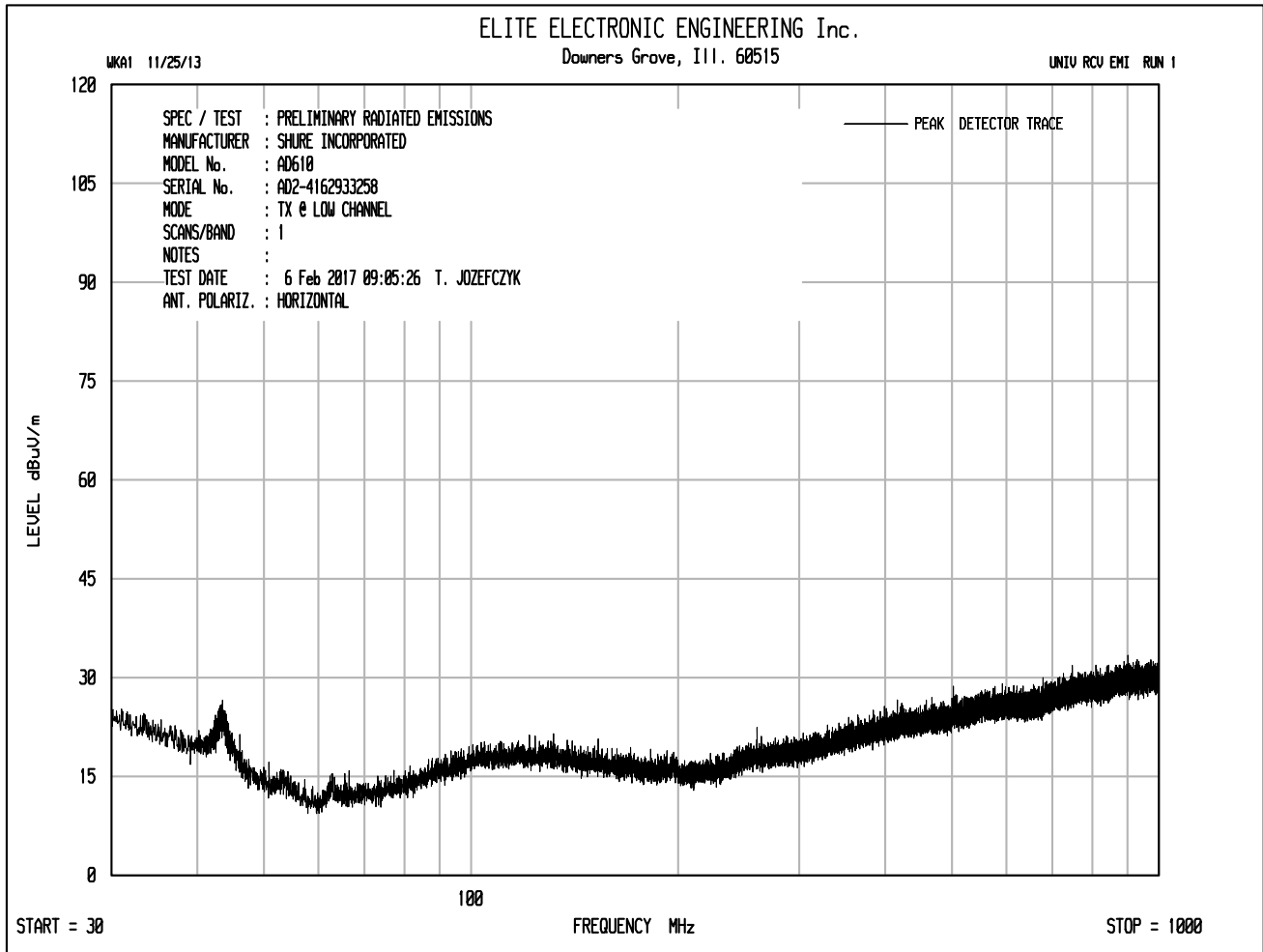
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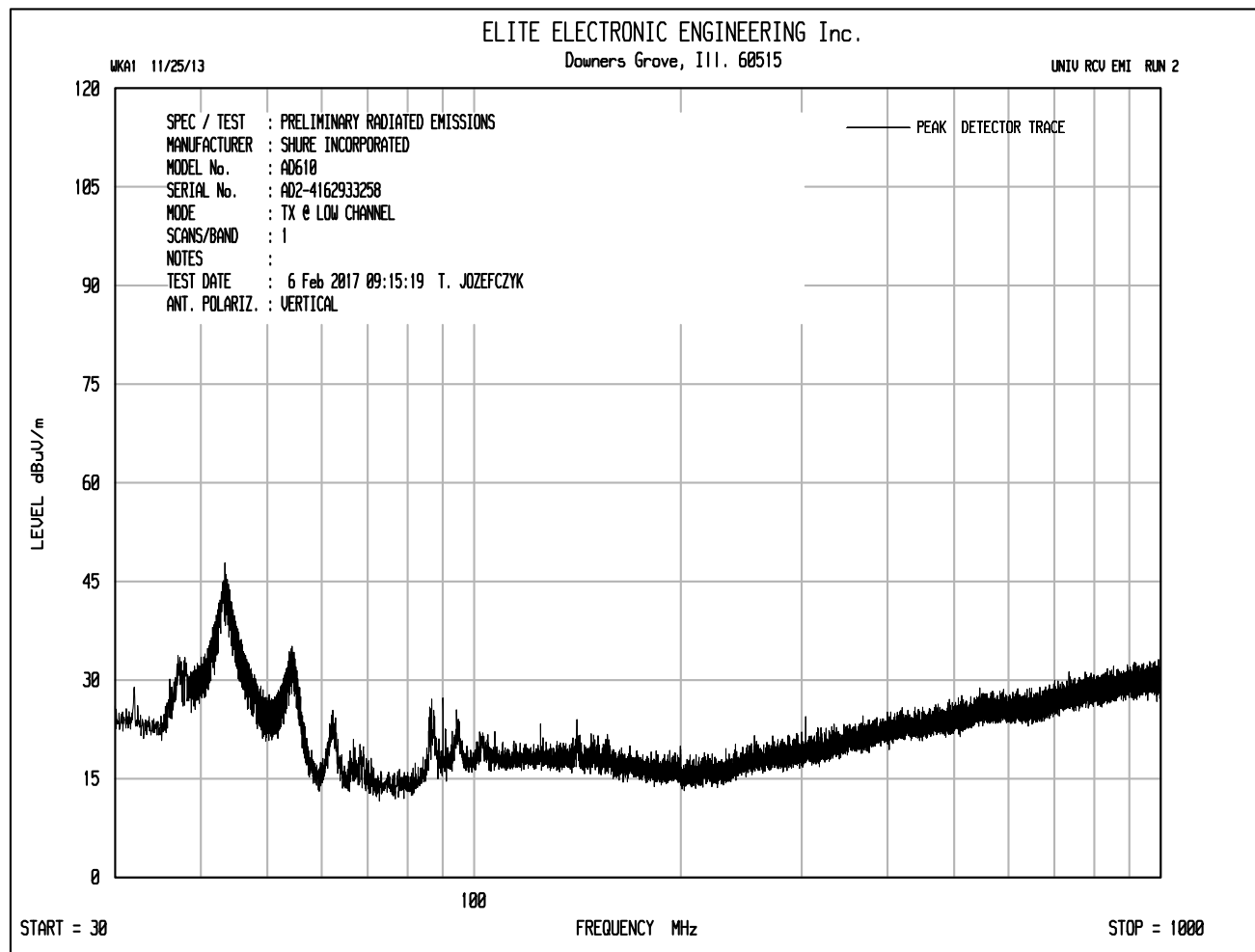


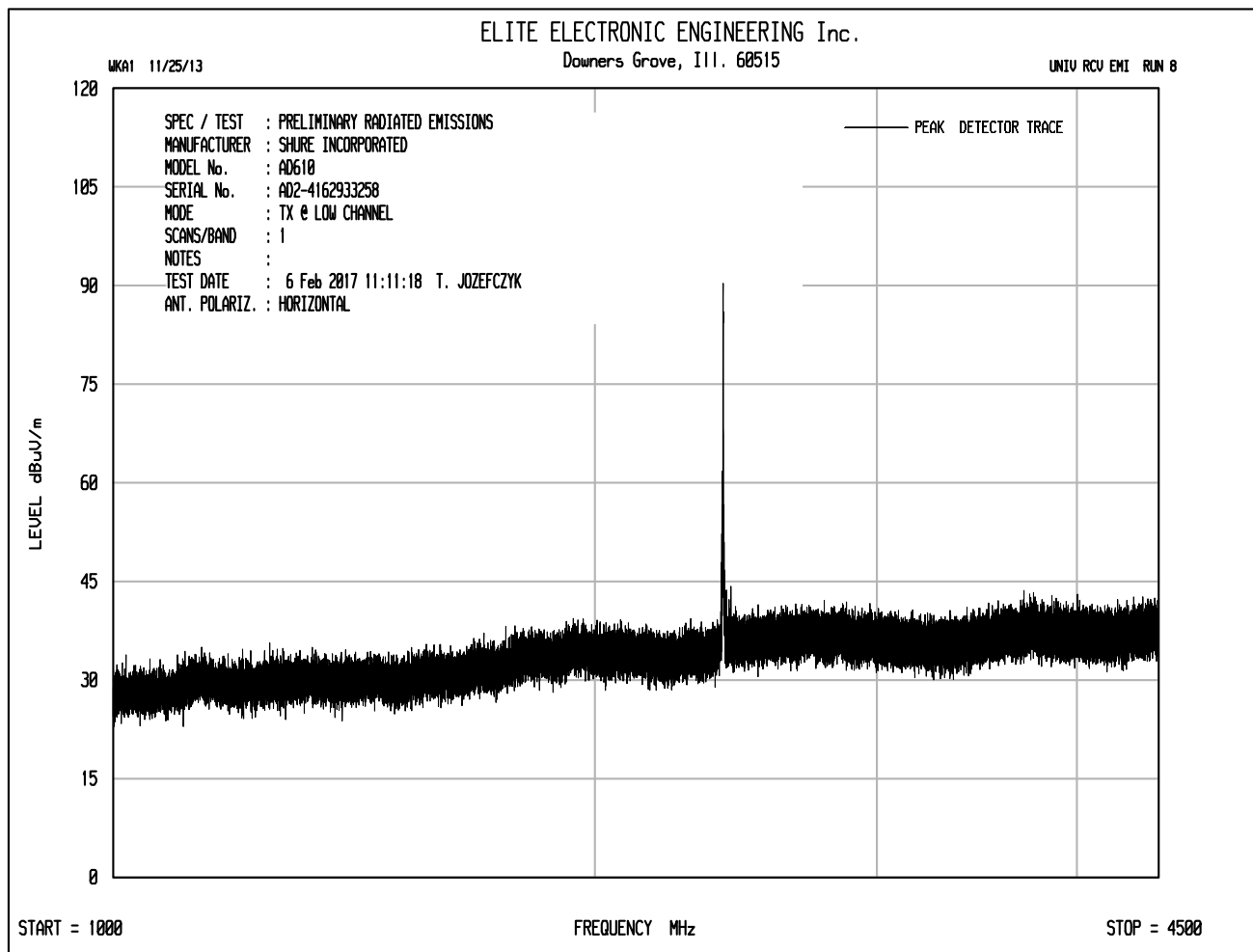
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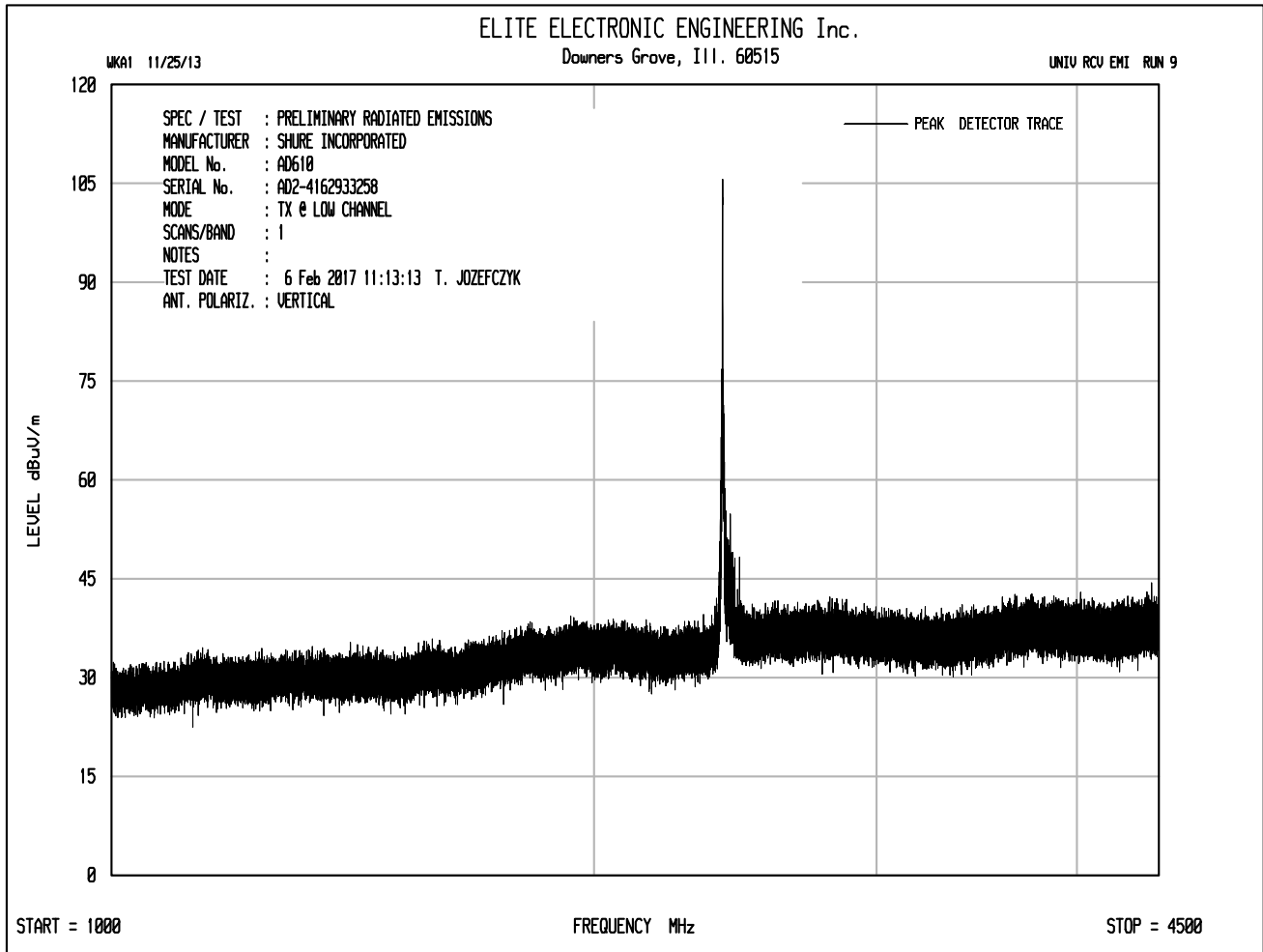


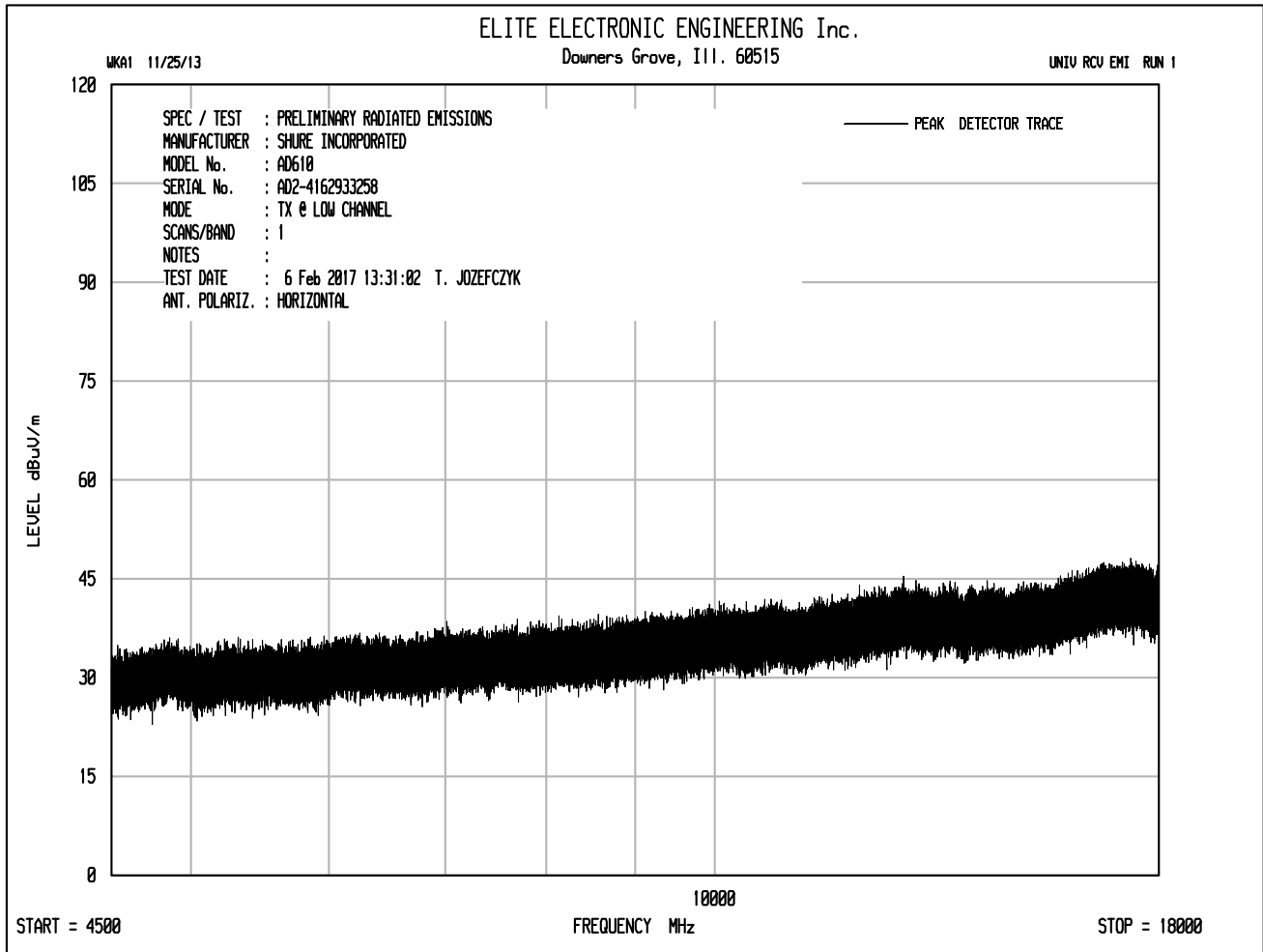
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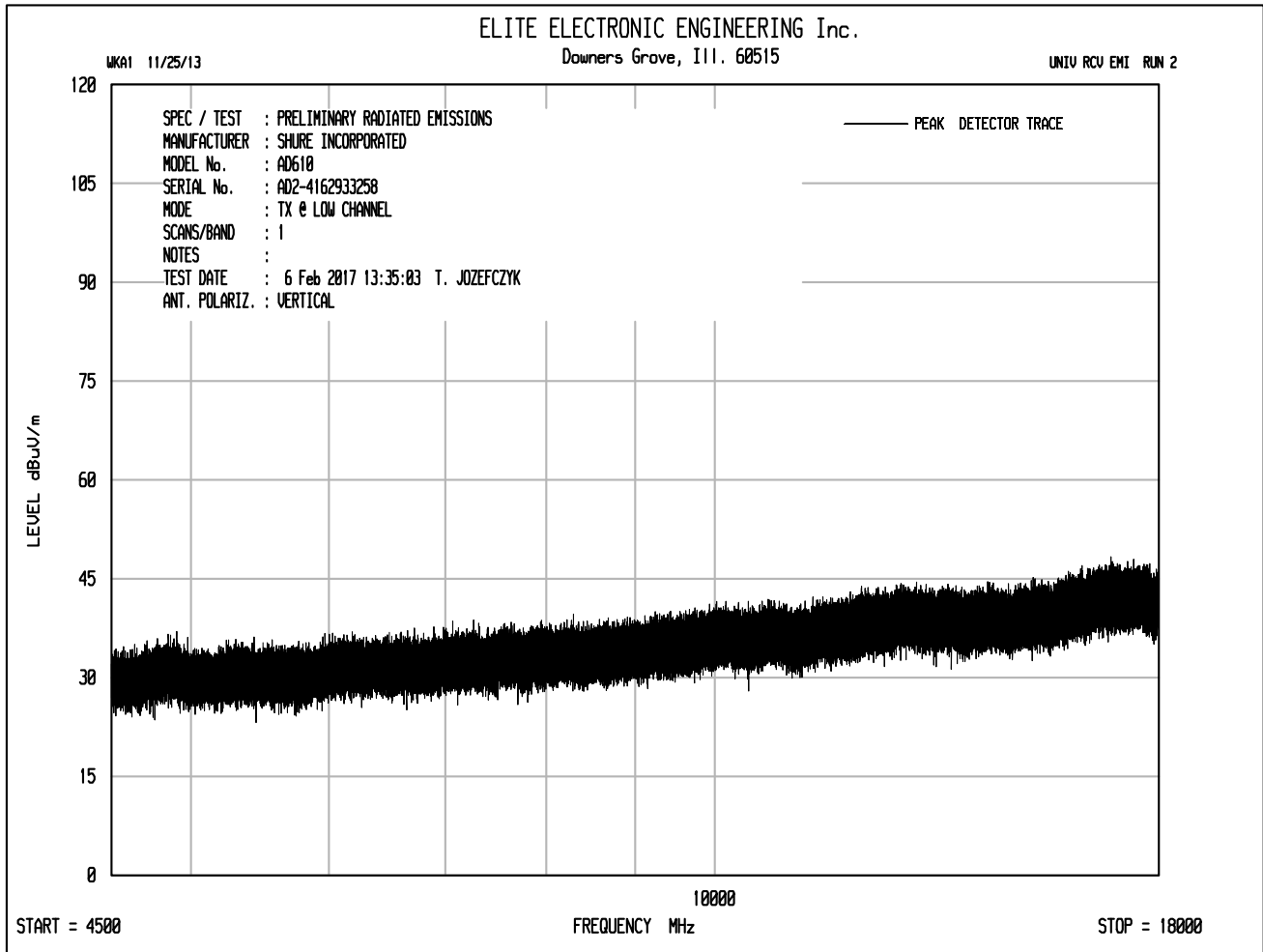


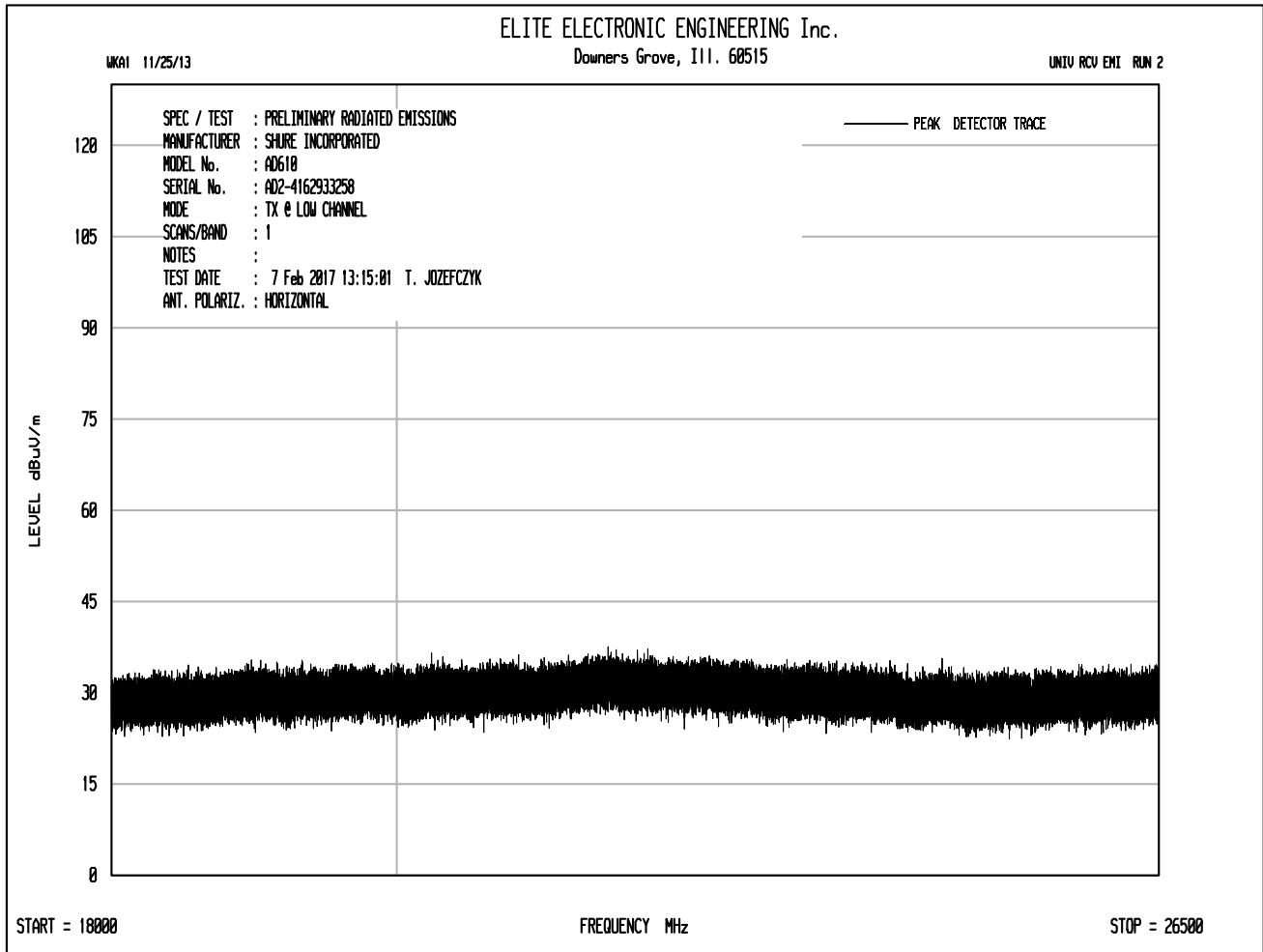


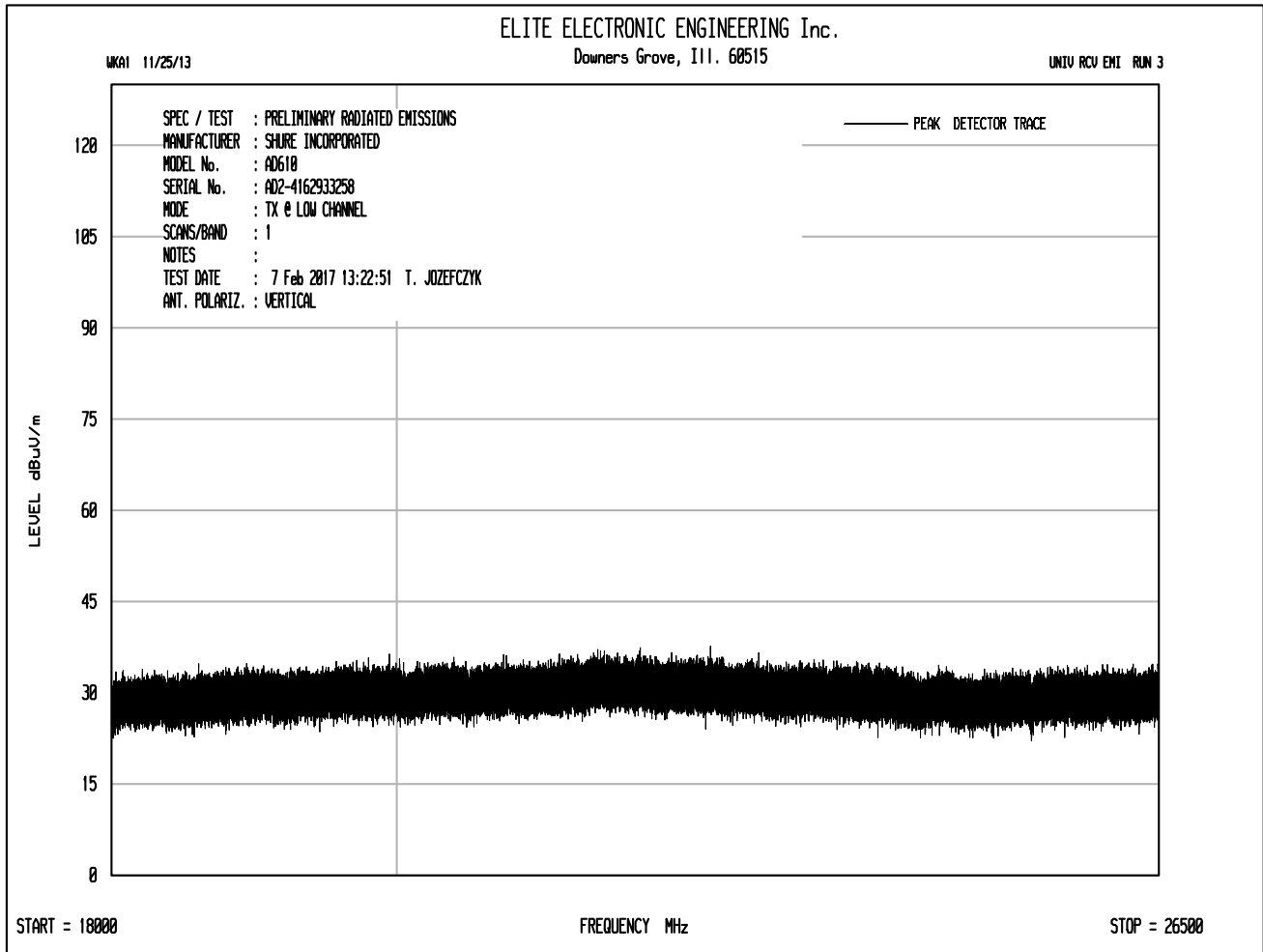


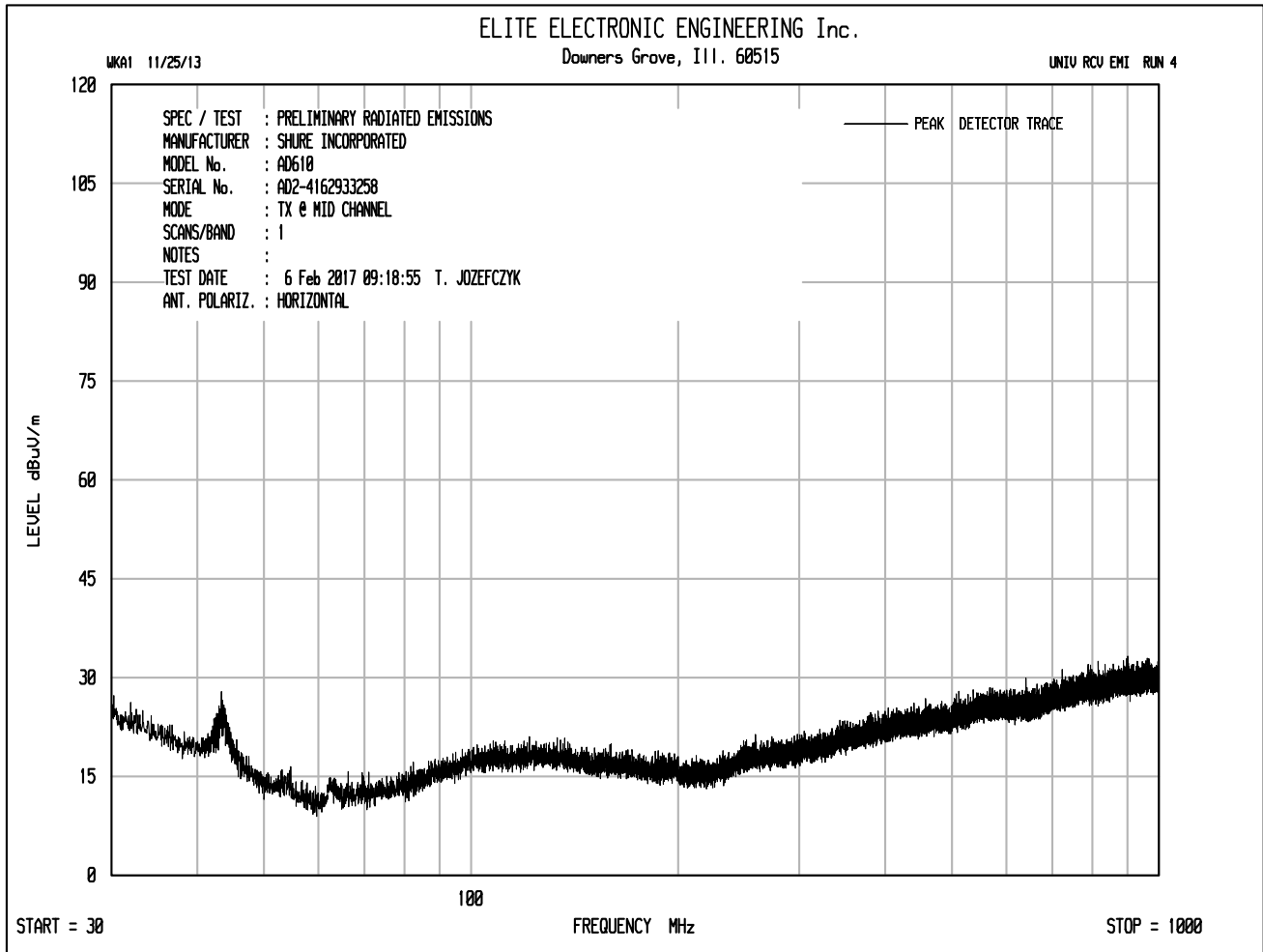


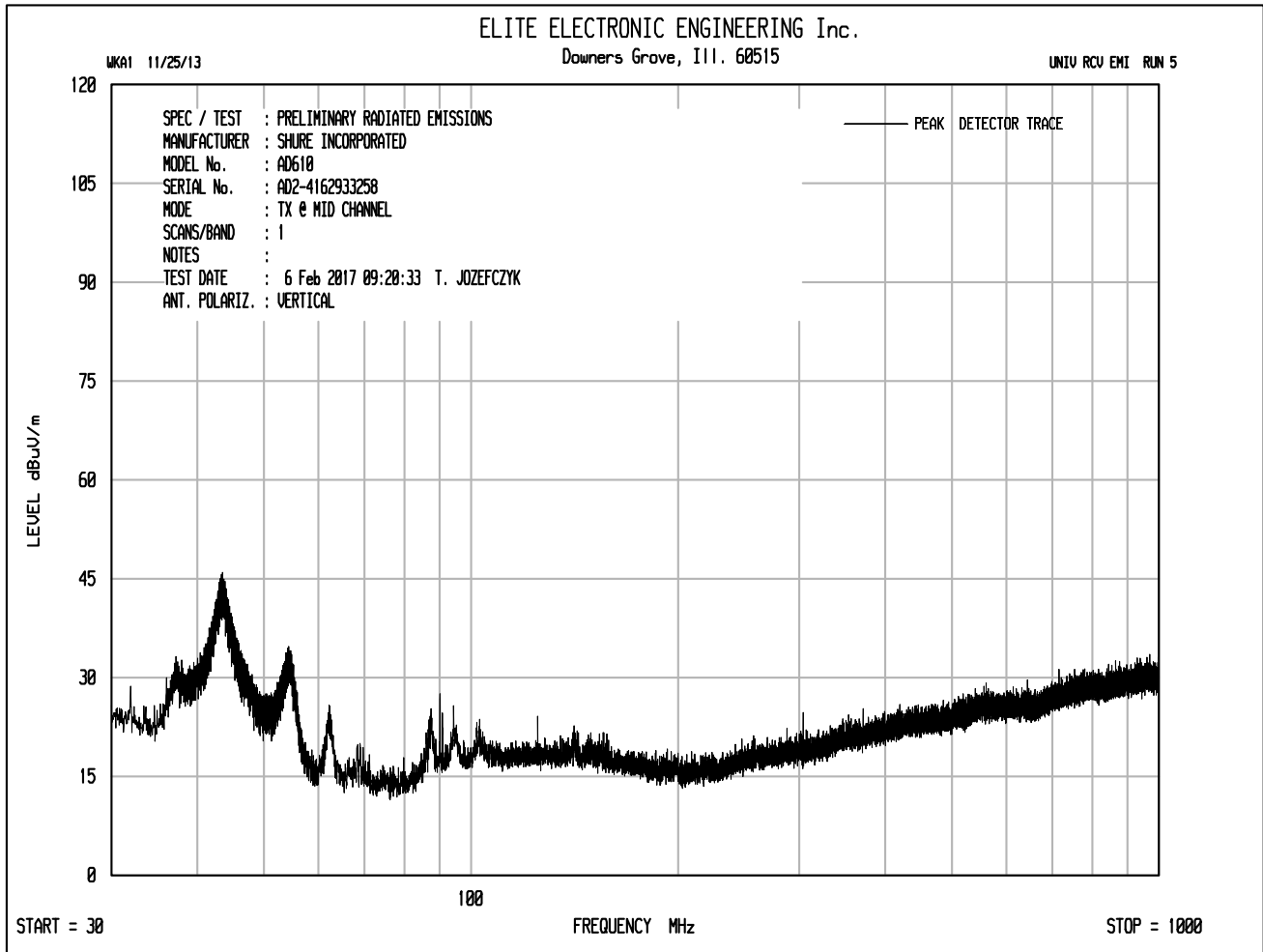


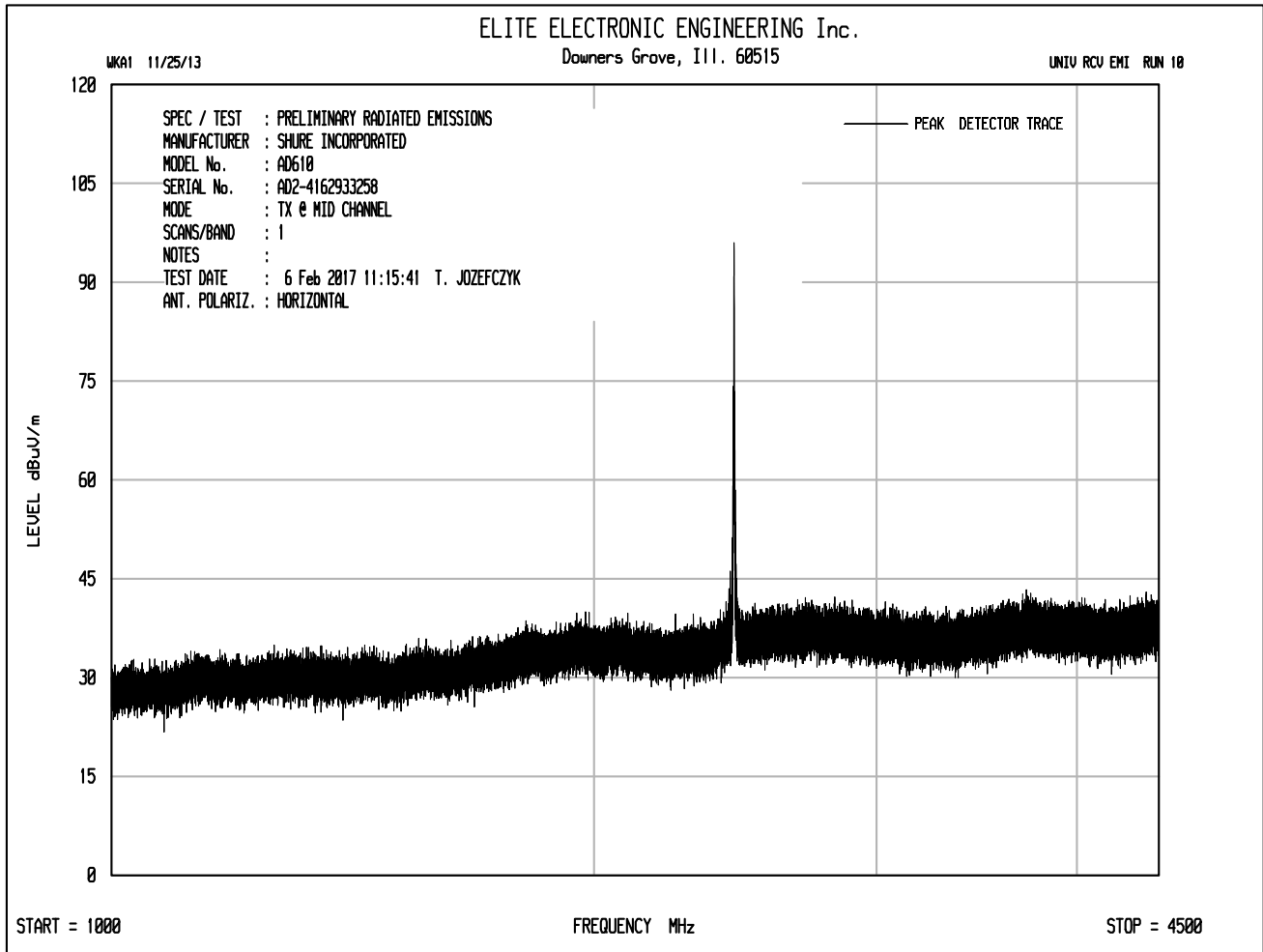


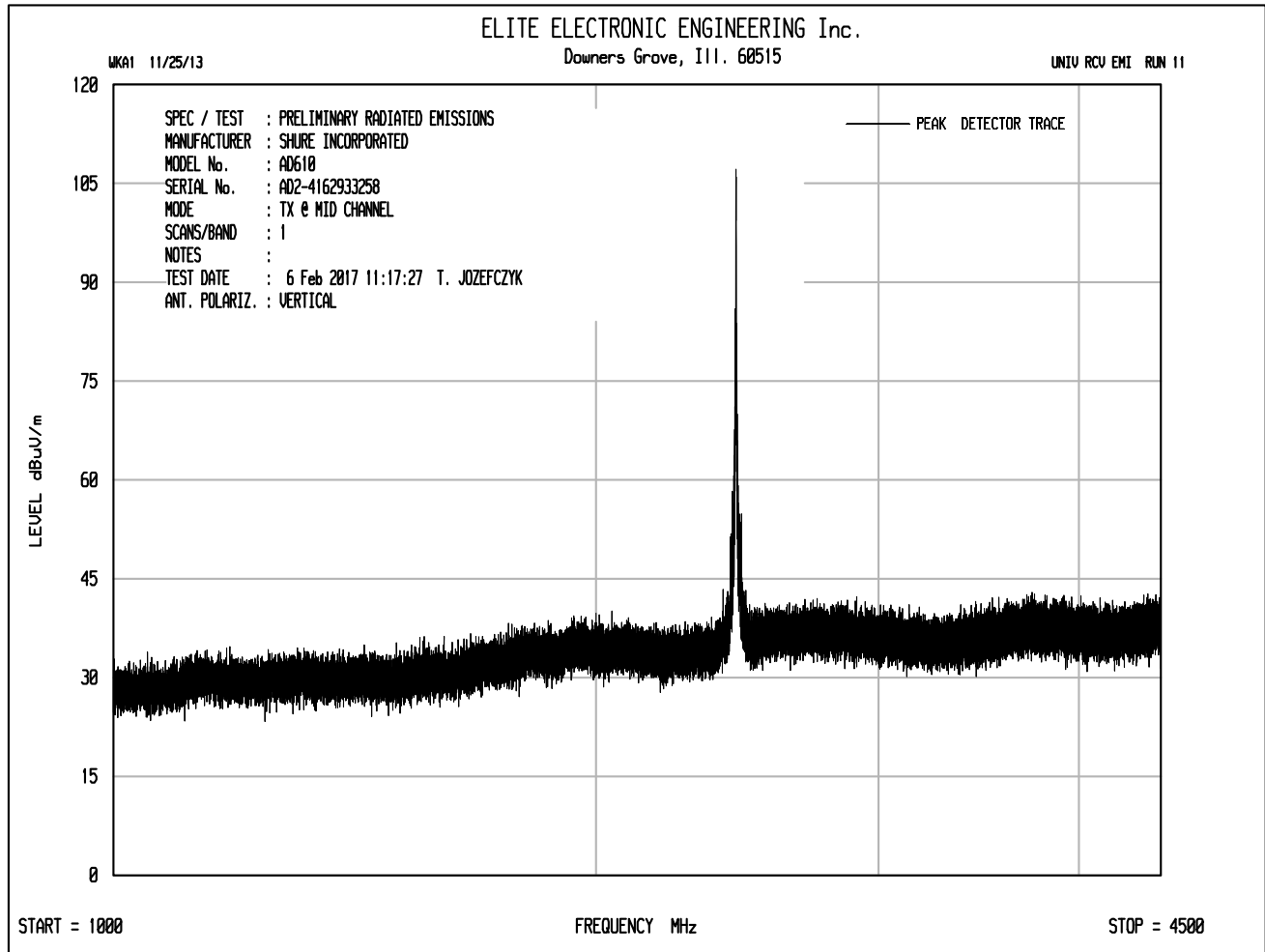


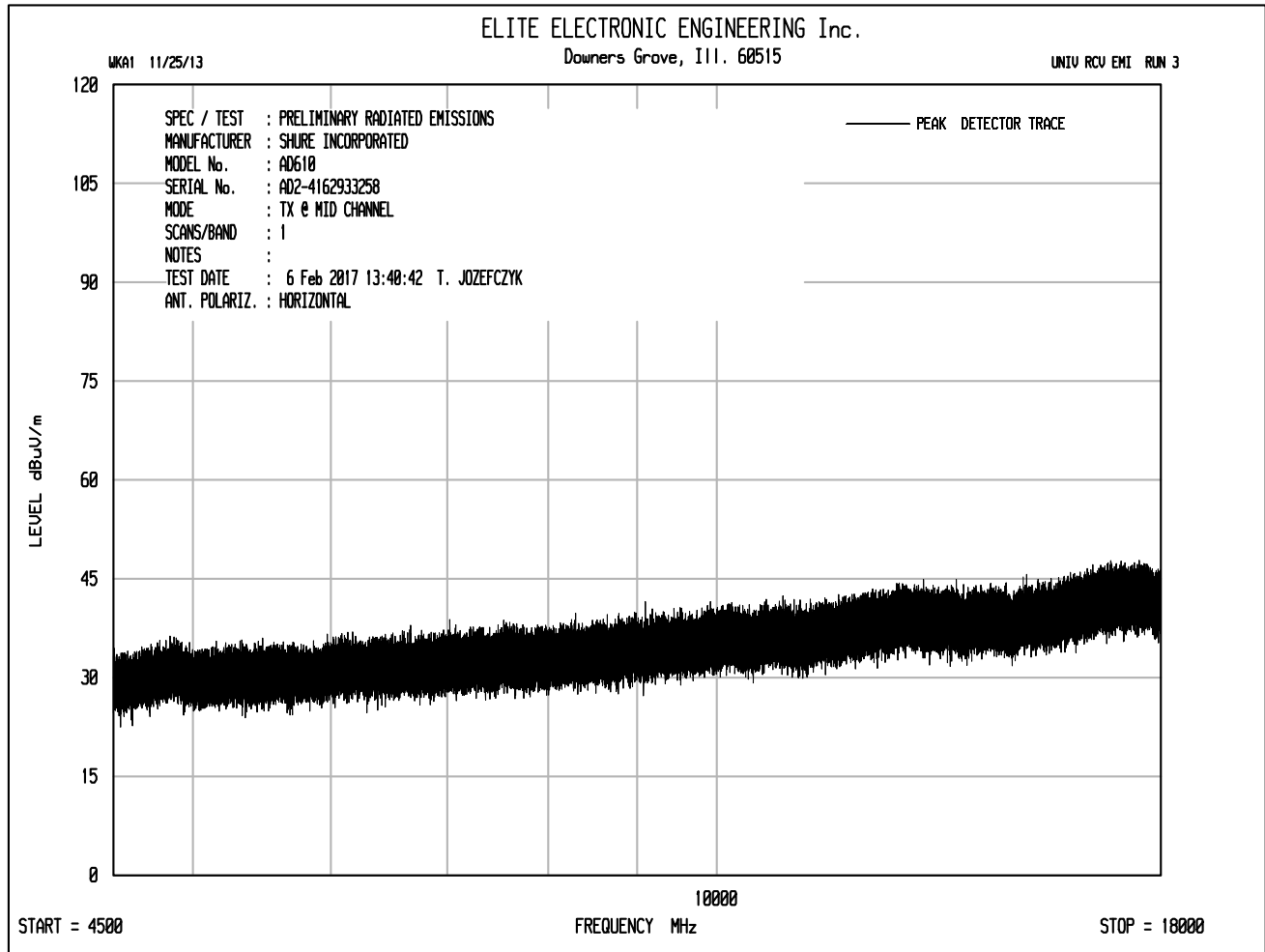


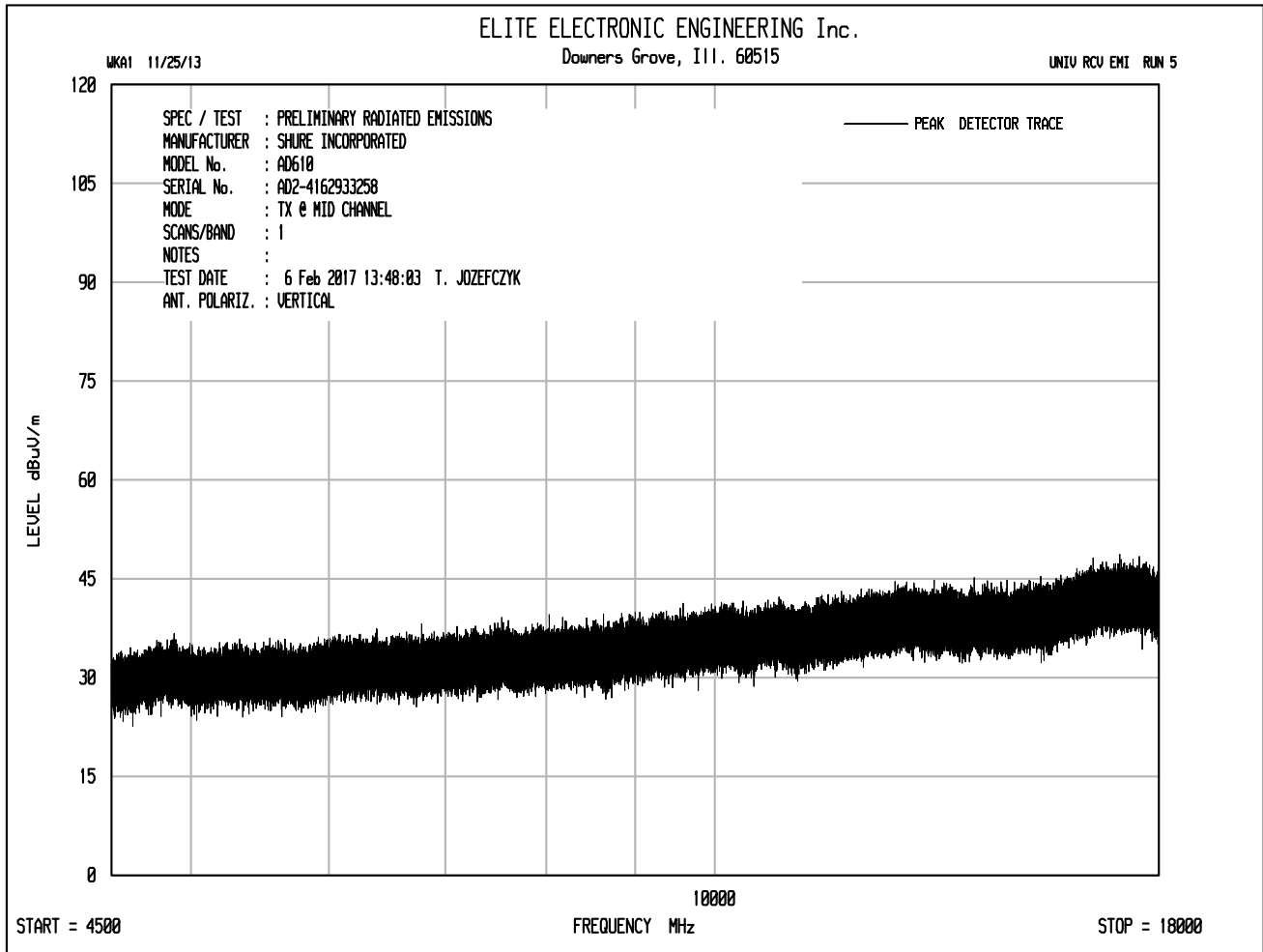


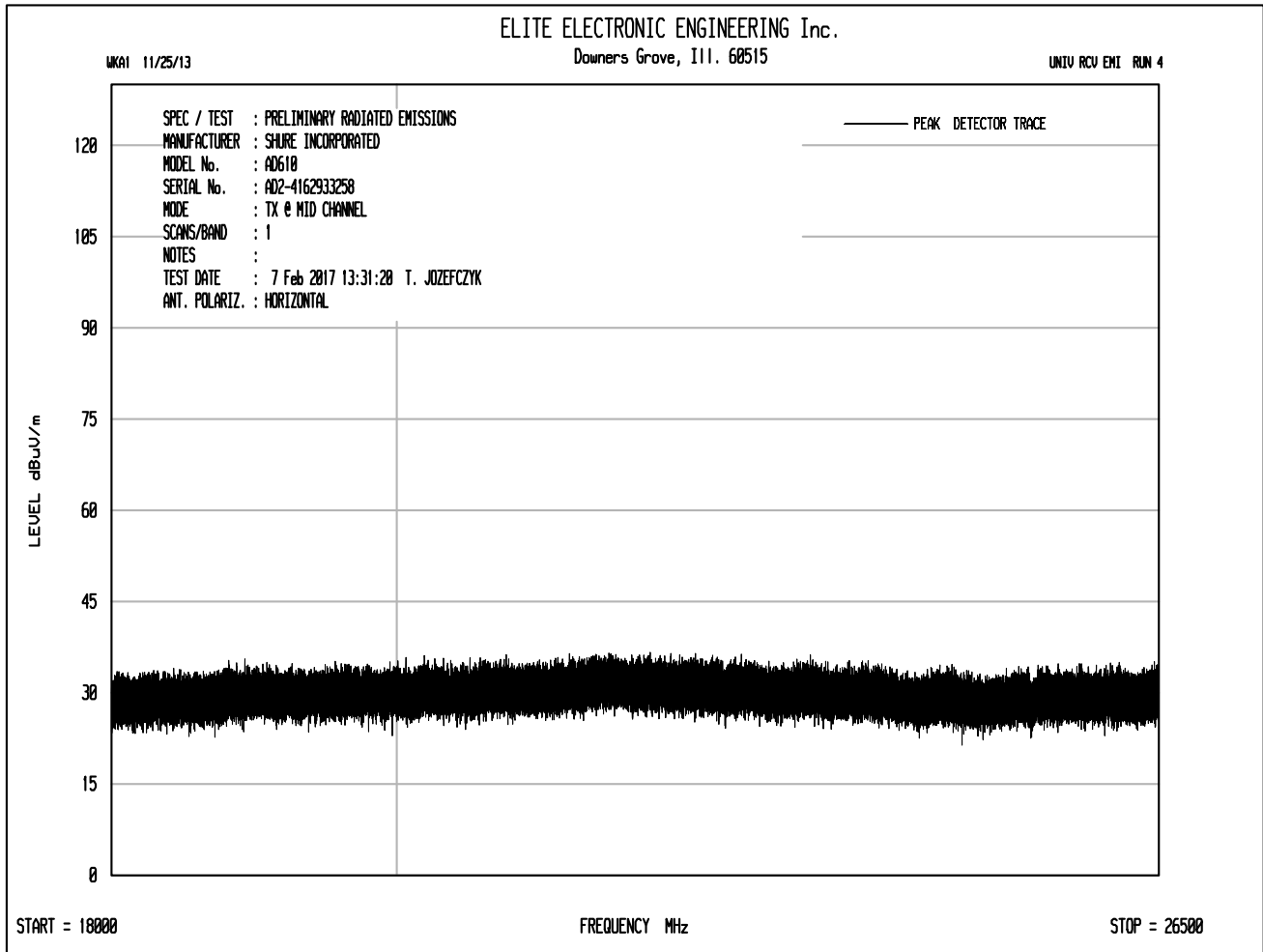


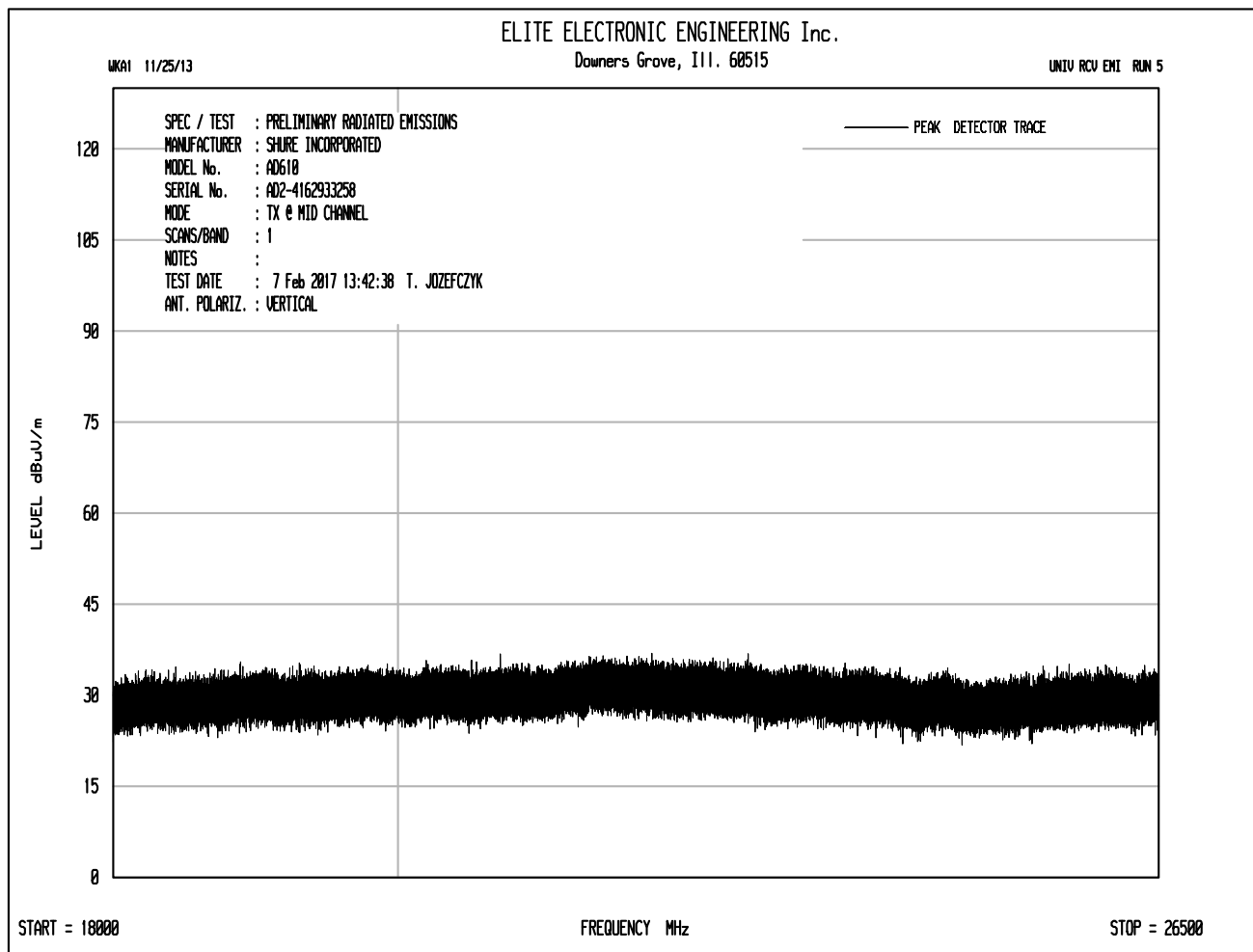


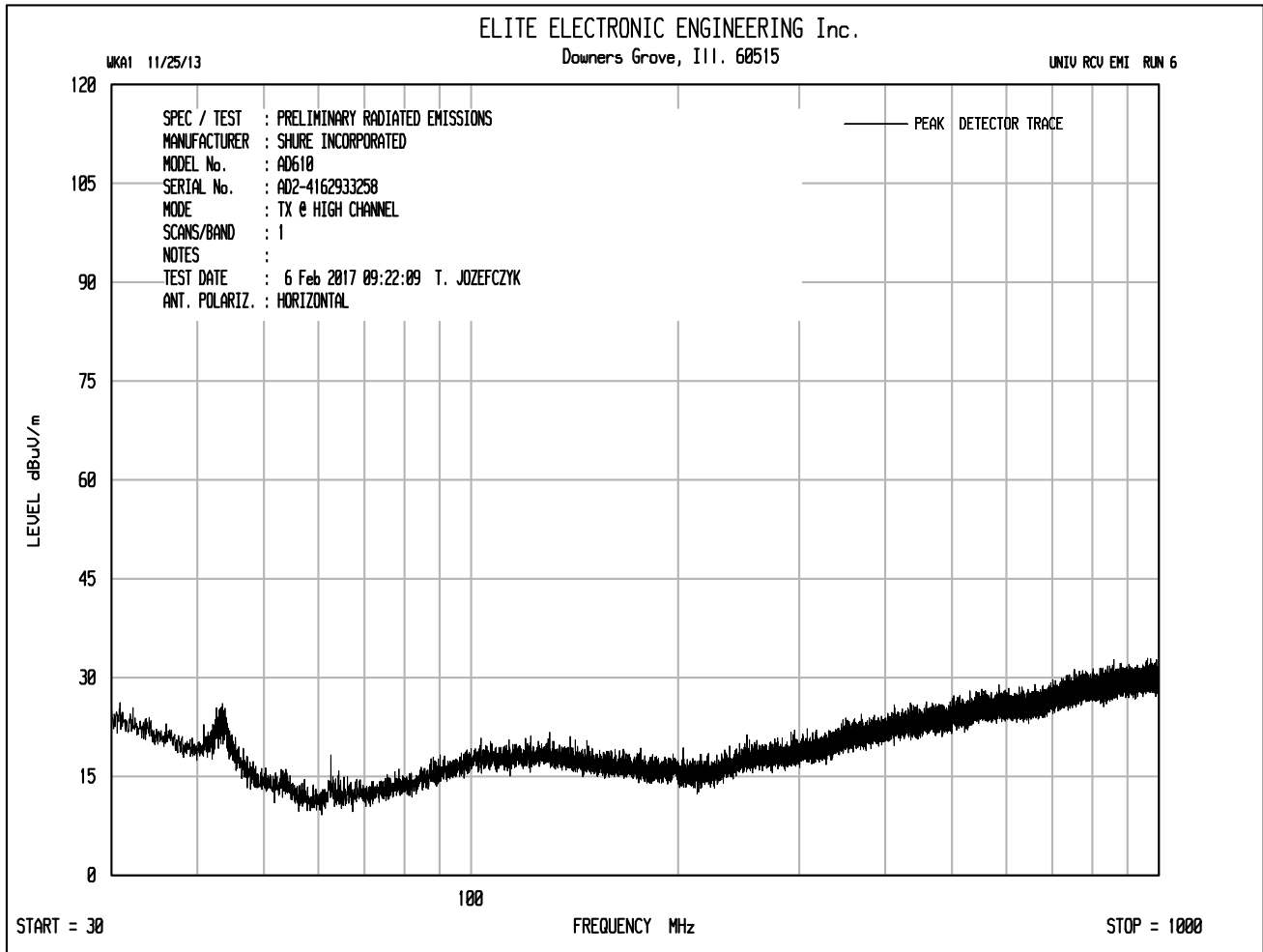


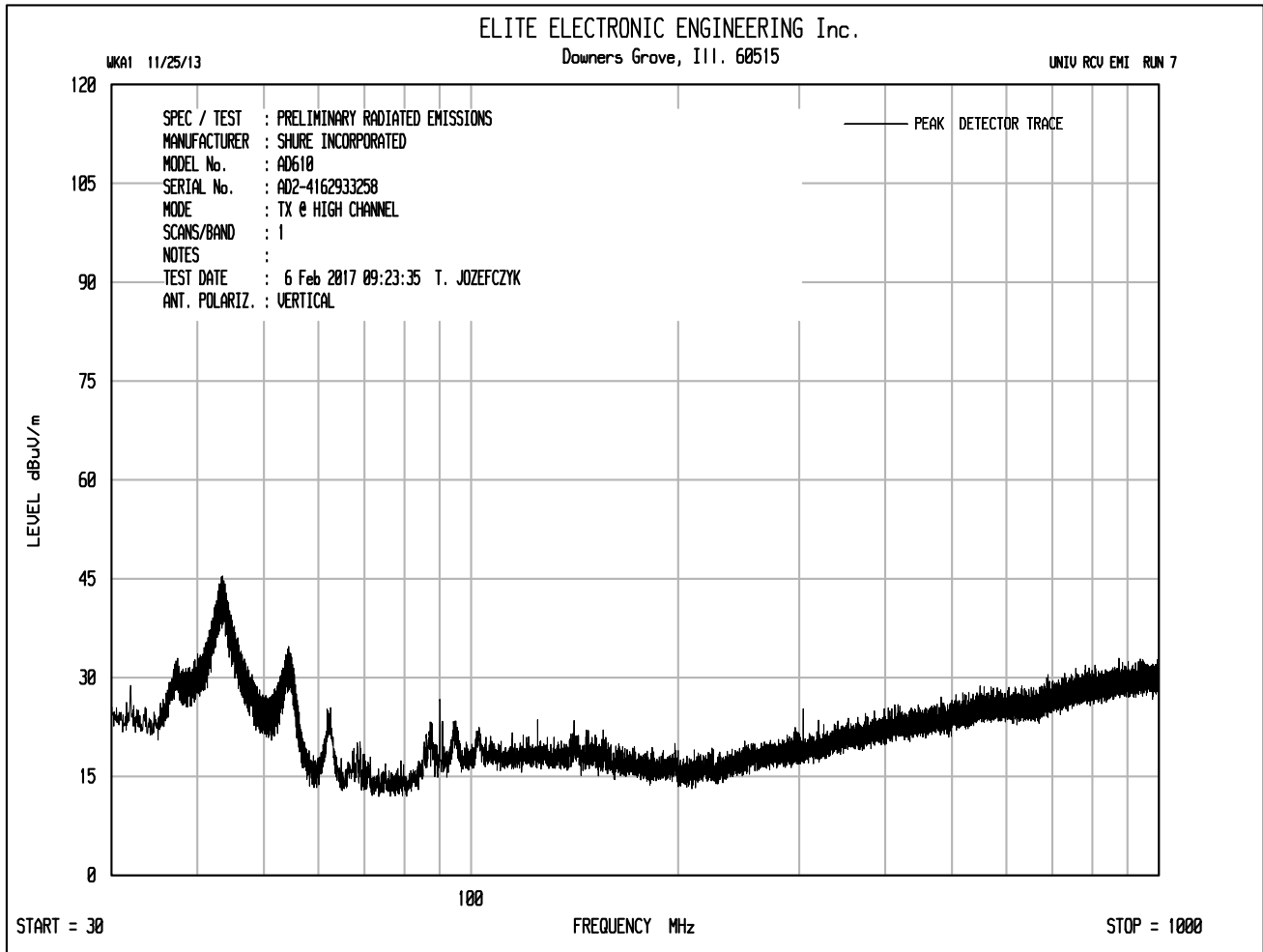


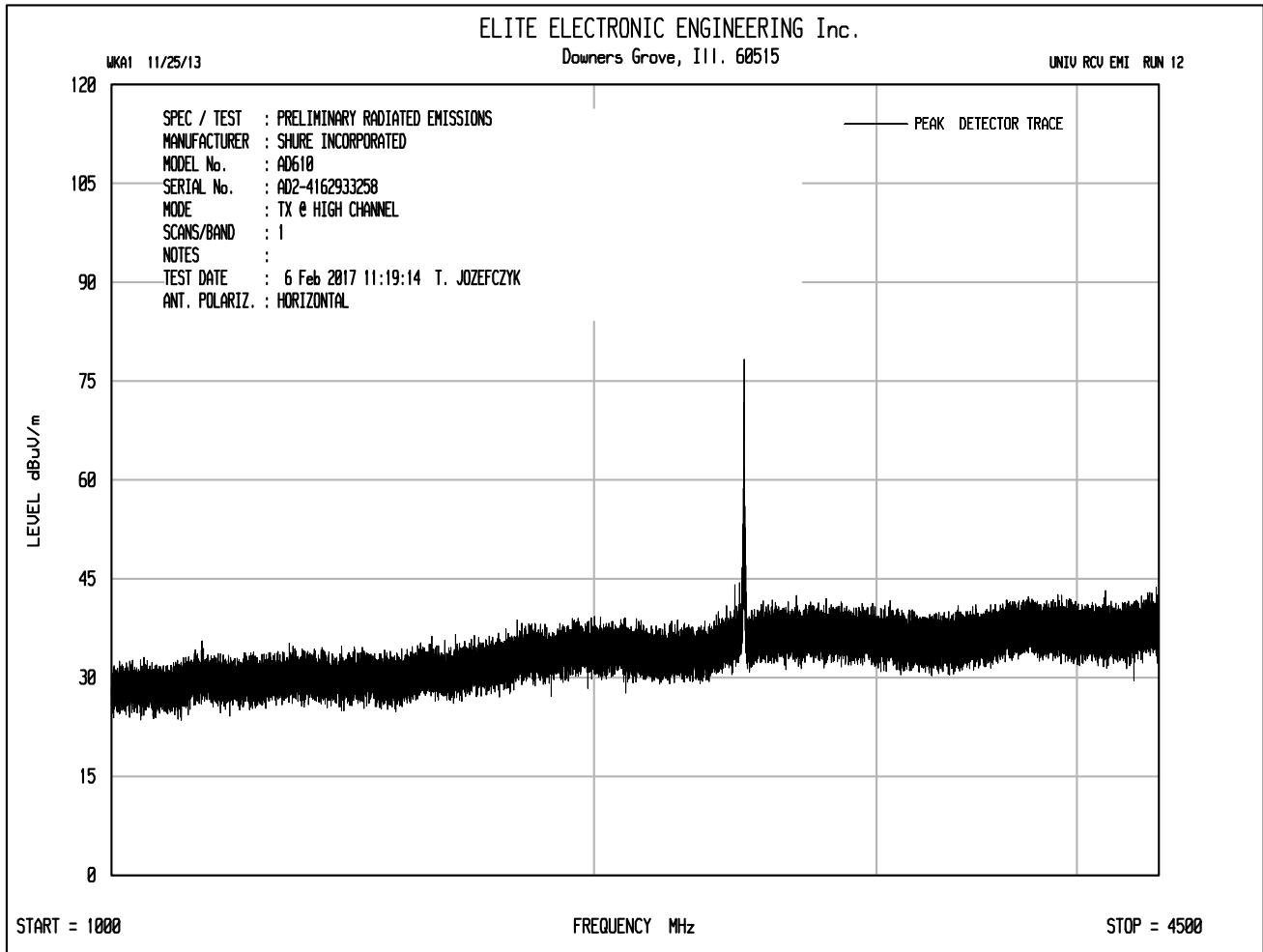


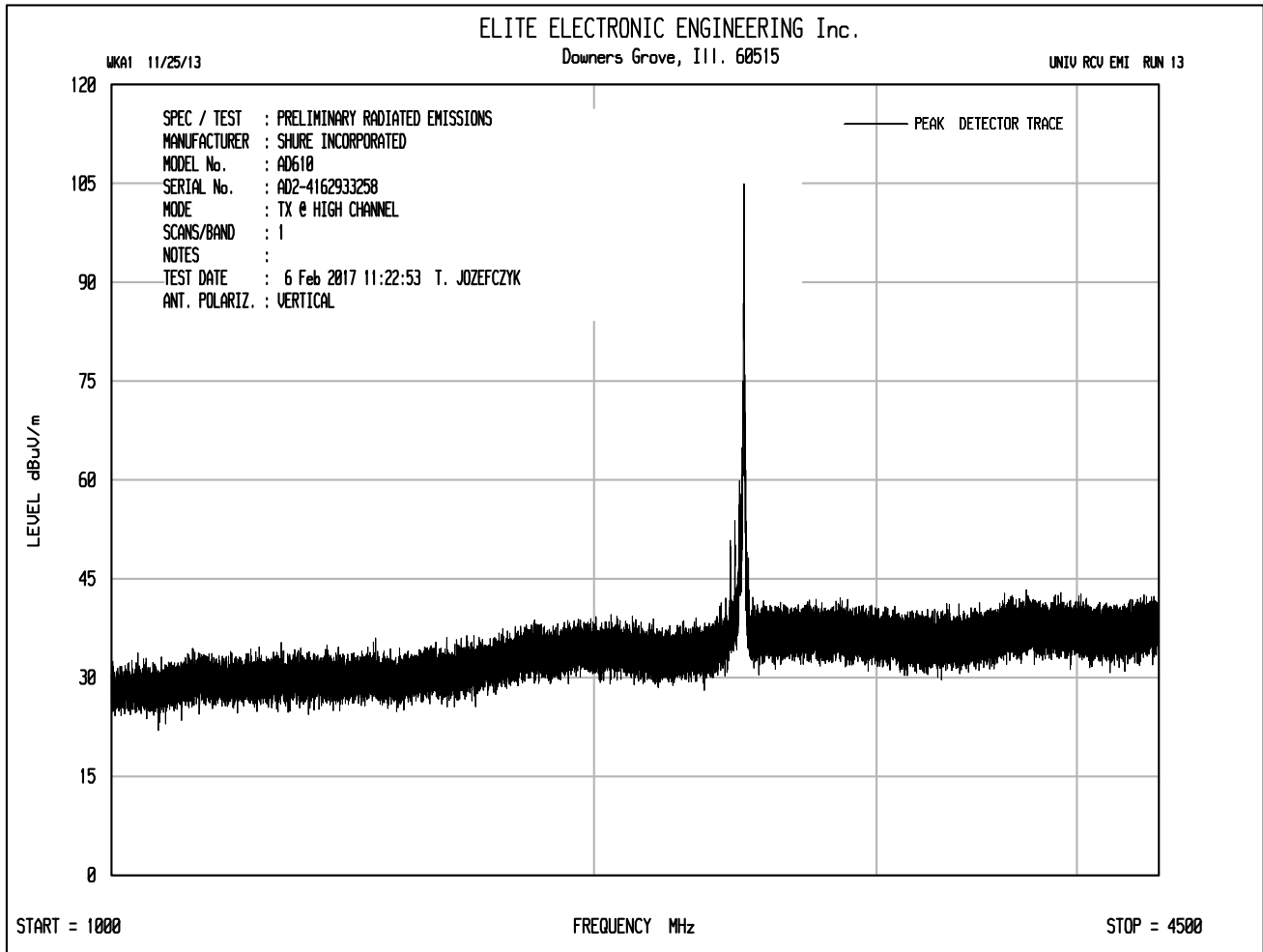


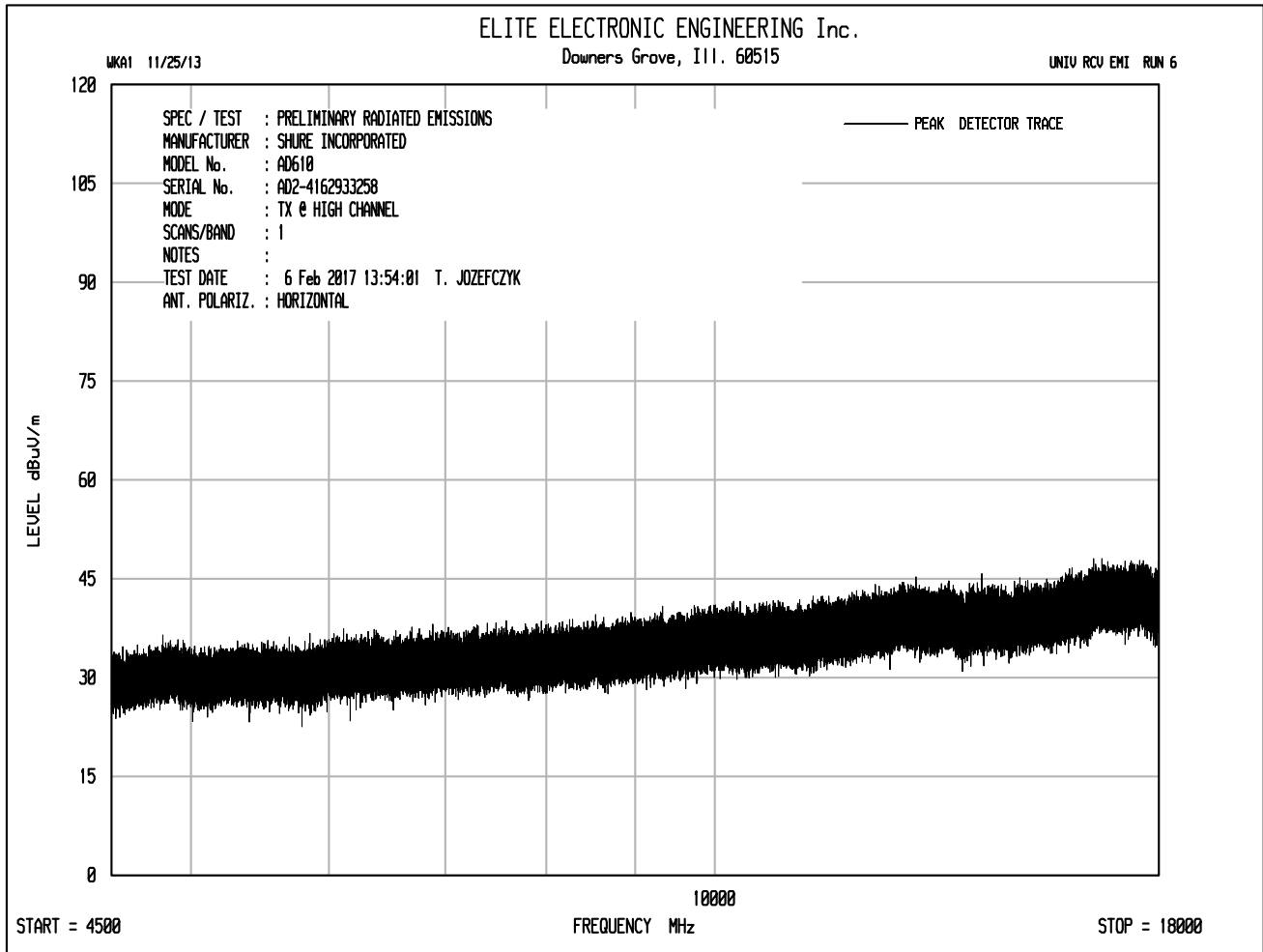


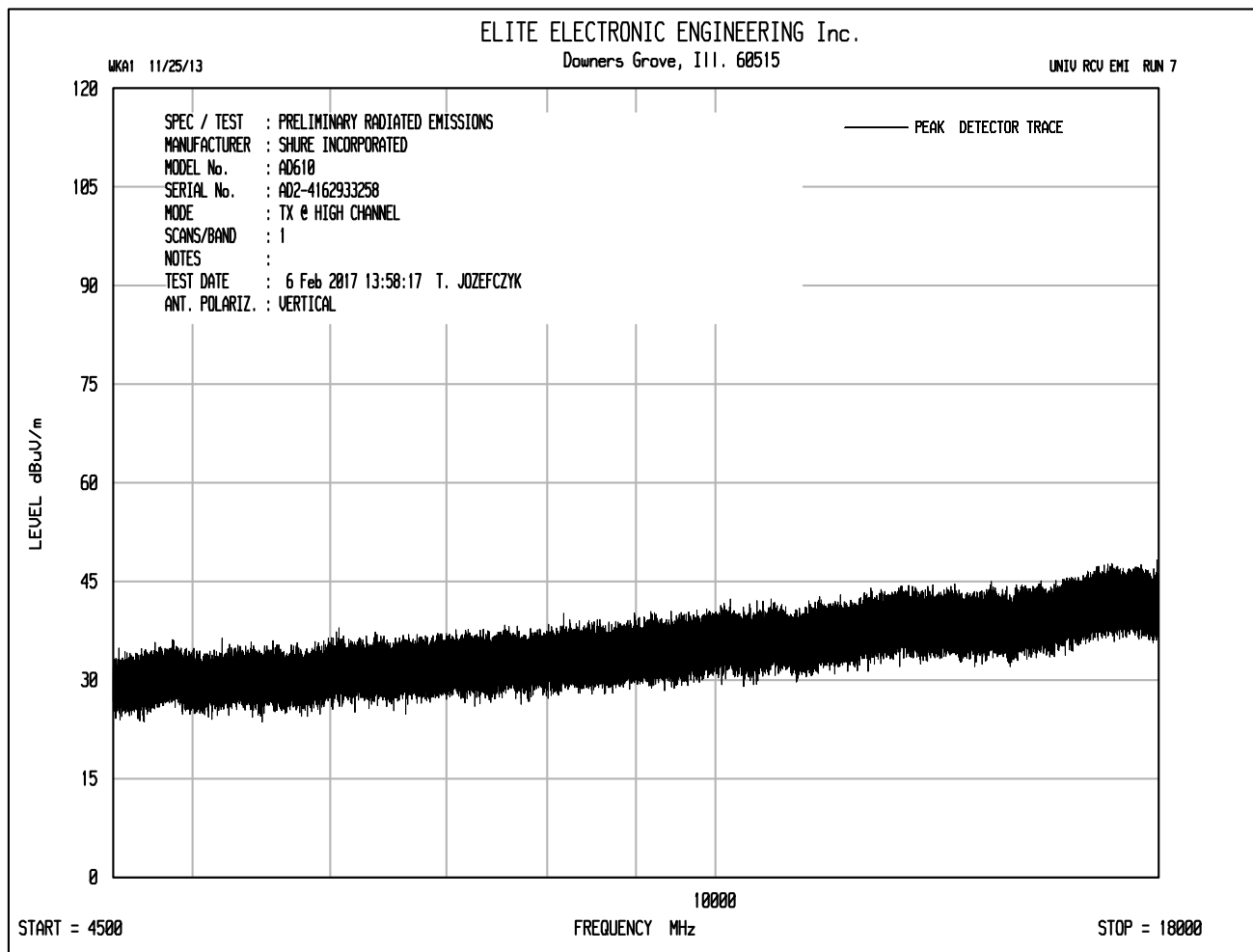


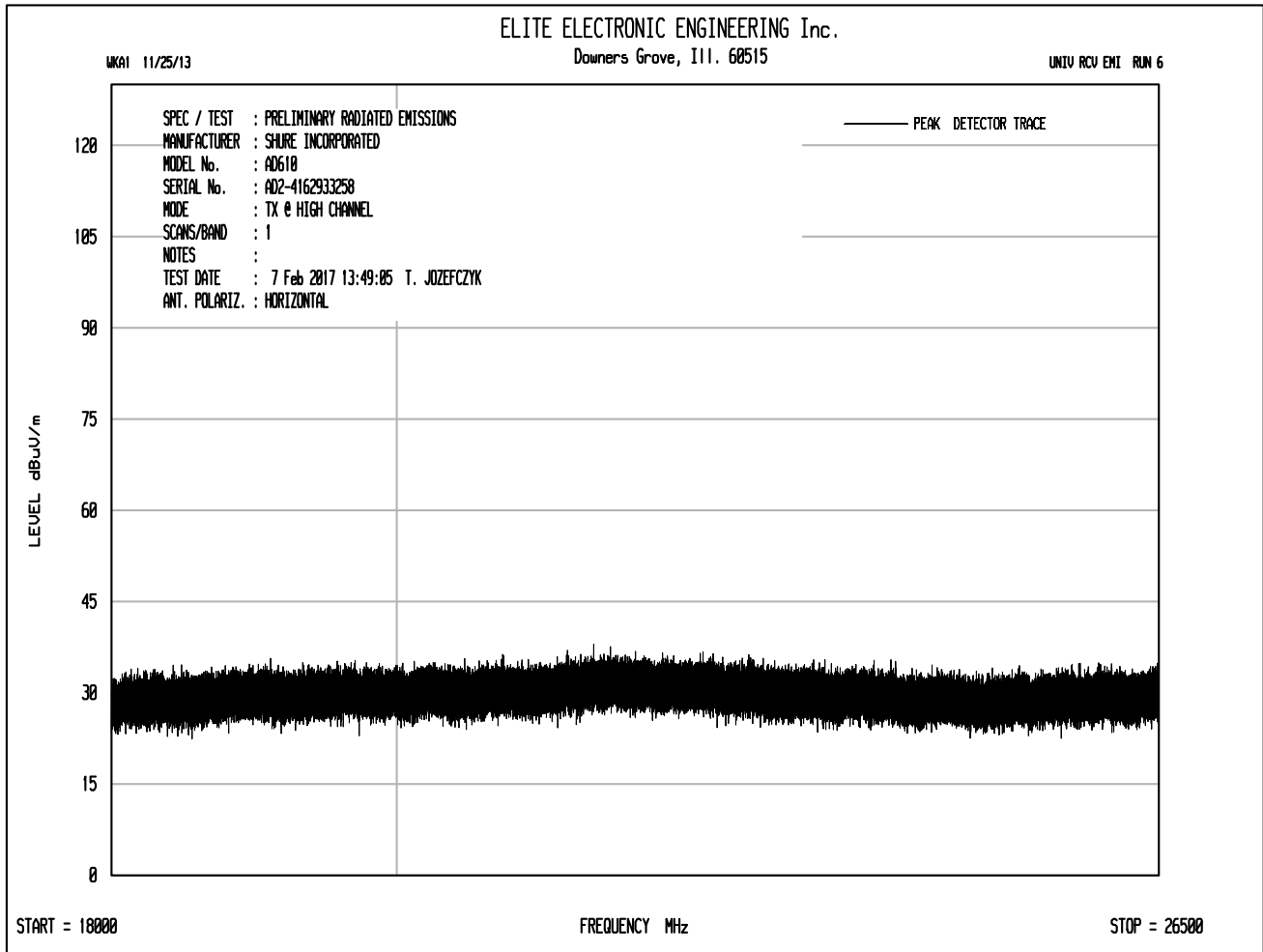


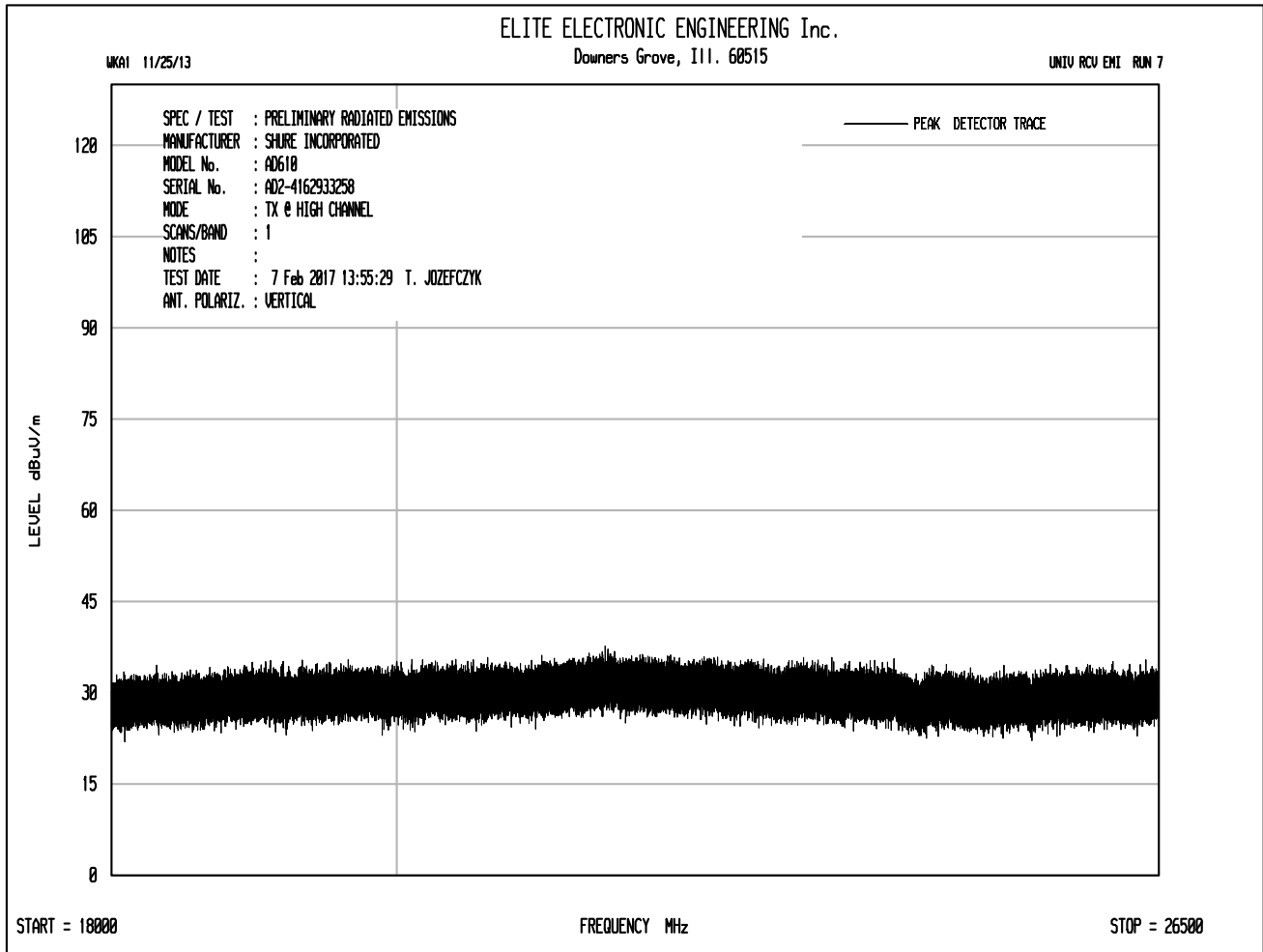














Manufacturer : Shure Incorporated
Test Item : Tx
Model No. : AD610
Serial No. : AD2-4162933258
Mode : Transmit at 2405MHz
Test Specification : FCC-15.247, RSS-247 Radiated Spurious Emissions - Harmonics

Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2405.00	H	67.5	3.4	32.0	0.0	102.9	139730.5		
2405.00	V	75.8	3.4	32.0	0.0	111.2	364159.2		
7215.00	H	48.4	6.1	36.0	-40.1	50.4	332.7	36415.9	-40.8
7215.00	V	48.2	6.1	36.0	-40.1	50.2	325.1	36415.9	-41.0
9620.00	H	48.4	6.8	36.9	-39.6	52.5	421.7	36415.9	-38.7
9620.00	V	47.7	6.8	36.9	-39.6	51.8	389.5	36415.9	-39.4
14430.00	H	50.2	8.7	39.4	-40.0	58.3	820.7	36415.9	-32.9
14430.00	V	49.4	8.7	39.4	-40.0	57.5	753.6	36415.9	-33.7
16835.00	H	48.8	9.4	41.6	-38.9	60.9	1108.6	36415.9	-30.3
16835.00	V	48.5	9.4	41.6	-38.9	60.6	1077.1	36415.9	-30.6
21645.00	H	32.7	2.2	40.6	-28.6	46.8	219.7	36415.9	-44.4
21645.00	V	32.6	2.2	40.6	-28.6	46.7	217.4	36415.9	-44.5
24050.00	H	32.1	2.2	40.6	-30.1	44.9	175.4	36415.9	-46.3
24050.00	V	32.3	2.2	40.6	-30.1	45.1	179.5	36415.9	-46.1



Manufacturer : Shure Incorporated
Test Item : ShowLink Access Point
Model No. : AD610
Serial No. : AD2-4162933258
Mode : Transmit at 2405MHz
Test Specification : FCC-15.247, RSS-247 Radiated Spurious Emissions - Harmonics

Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4810.00	H	38.2	4.8	34.1	-40.2	36.9	70.1	5000.0	-37.1
4810.00	V	48.3	4.8	34.1	-40.2	47.0	222.6	5000.0	-27.0
12025.00	H	47.7	8.0	38.5	-39.7	54.5	531.6	5000.0	-19.5
12025.00	V	47.8	8.0	38.5	-39.7	54.6	536.5	5000.0	-19.4
19240.00	H	31.3	2.2	40.4	-28.5	45.4	186.0	5000.0	-28.6
19240.00	V	31.4	2.2	40.4	-28.5	45.5	189.2	5000.0	-28.4



Manufacturer : Shure Incorporated
Test Item : ShowLink Access Point
Model No. : AD610
Serial No. : AD2-4162933258
Mode : Transmit at 2405MHz
Test Specification : FCC-15.247, RSS-247 Radiated Spurious Emissions – Restricted Band Averages

Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4810.00	H	26.0	4.8	34.1	-40.2	0.0	24.7	17.1	500.0	-29.3
4810.00	V	35.9	4.8	34.1	-40.2	0.0	34.6	53.9	500.0	-19.3
12025.00	H	35.2	8.0	38.5	-39.7	0.0	42.0	125.6	500.0	-12.0
12025.00	V	35.2	8.0	38.5	-39.7	0.0	42.0	125.5	500.0	-12.0
19240.00	H	19.0	2.2	40.4	-28.5	0.0	33.2	45.4	500.0	-20.8
19240.00	V	19.0	2.2	40.4	-28.5	0.0	33.1	45.3	500.0	-20.9



Manufacturer : Shure Incorporated
Test Item : ShowLink Access Point
Model No. : AD610
Serial No. : AD2-4162933258
Mode : Transmit at 2445MHz
Test Specification : FCC-15.247, RSS-247 Radiated Spurious Emissions - Harmonics

Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2445.00	H	62.5	3.5	32.1	0.0	98.1	80557.5		
2445.00	V	70.7	3.5	32.1	0.0	106.3	206588.5		
9780.00	H	50.0	6.9	37.0	-39.5	54.3	521.4	20658.8	-32.0
9780.00	V	49.8	6.9	37.0	-39.5	54.1	506.6	20658.8	-32.2
14670.00	H	48.9	8.8	39.5	-40.2	57.1	713.0	20658.8	-29.2
14670.00	V	48.6	8.8	39.5	-40.2	56.8	688.8	20658.8	-29.5
17115.00	H	49.5	9.6	41.5	-38.8	61.7	1210.4	20658.8	-24.6
17115.00	V	48.8	9.6	41.5	-38.8	61.0	1120.5	20658.8	-25.3
22005.00	H	32.1	2.2	40.6	-29.2	45.7	192.6	20658.8	-40.6
22005.00	V	32.3	2.2	40.6	-29.2	45.9	197.5	20658.8	-40.4
24450.00	H	32.6	2.2	40.6	-30.2	45.3	183.9	20658.8	-41.0
24450.00	V	32.7	2.2	40.6	-30.2	45.3	184.8	20658.8	-41.0



Manufacturer : Shure Incorporated
Test Item : ShowLink Access Point
Model No. : AD610
Serial No. : AD2-4162933258
Mode : Transmit at 2445MHz
Test Specification : FCC-15.247, RSS-247 Radiated Spurious Emissions - Harmonics

Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4890.00	H	49.4	4.9	34.1	-40.3	48.1	254.9	5000.0	-25.9
4890.00	V	49.5	4.9	34.1	-40.3	48.3	258.8	5000.0	-25.7
7335.00	H	48.5	6.2	35.9	-40.1	50.6	338.8	5000.0	-23.4
7335.00	V	48.3	6.2	35.9	-40.1	50.4	329.6	5000.0	-23.6
12225.00	H	49.2	8.0	38.5	-39.6	56.1	638.4	5000.0	-17.9
12225.00	V	49.2	8.0	38.5	-39.6	56.1	639.9	5000.0	-17.9
19560.00	H	31.2	2.2	40.4	-28.4	45.5	187.5	5000.0	-28.5
19560.00	V	31.3	2.2	40.4	-28.4	45.6	190.3	5000.0	-28.4



Manufacturer : Shure Incorporated
Test Item : ShowLink Access Point
Model No. : AD610
Serial No. : AD2-4162933258
Mode : Transmit at 2445MHz
Test Specification : FCC-15.247, RSS-247 Radiated Spurious Emissions – Restricted Band

Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4890.00	H	36.9	4.9	34.1	-40.3	0.0	35.6	60.4	500.0	-18.4
4890.00	V	36.9	4.9	34.1	-40.3	0.0	35.7	60.9	500.0	-18.3
7335.00	H	36.27	6.2	35.9	-40.1	0.0	38.3	82.6	500.0	-15.6
7335.00	V	36.3	6.2	35.9	-40.1	0.0	38.3	82.4	500.0	-15.7
12225.00	H	36.6	8.0	38.5	-39.6	0.0	43.5	150.3	500.0	-10.4
12225.00	V	36.6	8.0	38.5	-39.6	0.0	43.5	150.2	500.0	-10.4
19560.00	H	19.3	2.2	40.4	-28.4	0.0	33.5	47.4	500.0	-20.5
19560.00	V	19.2	2.2	40.4	-28.4	0.0	33.4	46.8	500.0	-20.6



Manufacturer : Shure Incorporated
Test Item : ShowLink Access Point
Model No. : AD610
Serial No. : AD2-4162933258
Mode : Transmit at 2480MHz
Test Specification : FCC-15.247, RSS-247 Radiated Spurious Emissions - Harmonics

Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2480.00	H	59.8	3.5	32.2	0.0	95.5	59367.3		
2480.00	V	68.3	3.5	32.2	0.0	104.0	159055.0		
9920.00	H	48.9	7.0	37.1	-39.5	53.5	471.4	15905.5	-30.6
9920.00	V	49.6	7.0	37.1	-39.5	54.1	508.6	15905.5	-29.9
14880.00	H	48.9	8.9	39.6	-40.4	57.1	714.2	15905.5	-27.0
14880.00	V	49.1	8.9	39.6	-40.4	57.3	734.2	15905.5	-26.7
17360.00	H	48.6	9.7	41.5	-39.1	60.6	1077.6	15905.5	-23.4
17360.00	V	49.1	9.7	41.5	-39.1	61.2	1148.0	15905.5	-22.8
24800.00	H	31.8	2.2	40.6	-30.9	43.7	153.9	15905.5	-40.3
24800.00	V	32.2	2.2	40.6	-30.9	44.1	160.4	15905.5	-39.9



Manufacturer : Shure Incorporated
Test Item : ShowLink Access Point
Model No. : AD610
Serial No. : AD2-4162933258
Mode : Transmit at 2480MHz
Test Specification : FCC-15.247, RSS-247 Radiated Spurious Emissions - Harmonics

Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2483.50	H	26.0	3.5	32.2	0.0	61.7	1217.8	5000.0	-12.3
2483.50	V	25.6	3.5	32.2	0.0	61.3	1157.7	5000.0	-12.7
4960.00	H	48.5	4.9	34.2	-40.3	47.3	232.7	5000.0	-26.6
4960.00	V	48.9	4.9	34.2	-40.3	47.7	242.6	5000.0	-26.3
7440.00	H	48.5	6.2	35.9	-40.0	50.6	337.1	5000.0	-23.4
7440.00	V	48.8	6.2	35.9	-40.0	50.9	348.9	5000.0	-23.1
12400.00	H	48.8	8.0	38.5	-39.5	55.8	617.1	5000.0	-18.2
12400.00	V	48.8	8.0	38.5	-39.5	55.8	616.4	5000.0	-18.2
19840.00	H	31.4	2.2	40.4	-28.2	45.8	196.0	5000.0	-28.1
19840.00	V	31.6	2.2	40.4	-28.2	46.1	201.9	5000.0	-27.9
22320.00	H	32.8	2.2	40.6	-29.1	46.5	211.3	5000.0	-27.5
22320.00	V	32.9	2.2	40.6	-29.1	46.7	215.2	5000.0	-27.3



Manufacturer : Shure Incorporated
Test Item : ShowLink Access Point
Model No. : AD610
Serial No. : AD2-4162933258
Mode : Transmit at 2480MHz
Test Specification : FCC-15.247, RSS-247 Radiated Spurious Emissions – Restricted Band

Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2483.50	H	17.9	3.5	32.2	0.0	0.0	53.6	476.0	500.0	-0.4
2483.50	V	17.4	3.5	32.2	0.0	0.0	53.1	450.4	500.0	-0.9
4960.00	H	35.7	4.9	34.2	-40.3	0.0	34.5	53.3	500.0	-19.4
4960.00	V	35.8	4.9	34.2	-40.3	0.0	34.6	53.7	500.0	-19.4
7440.00	H	36.19	6.2	35.9	-40.0	0.0	38.3	82.1	500.0	-15.7
7440.00	V	36.2	6.2	35.9	-40.0	0.0	38.3	81.9	500.0	-15.7
12400.00	H	36.4	8.0	38.5	-39.5	0.0	43.4	148.4	500.0	-10.6
12400.00	V	36.4	8.0	38.5	-39.5	0.0	43.4	148.0	500.0	-10.6
19840.00	H	19.2	2.2	40.4	-28.2	0.0	33.7	48.2	500.0	-20.3
19840.00	V	19.2	2.2	40.4	-28.2	0.0	33.7	48.2	500.0	-20.3
22320.00	H	20.2	2.2	40.6	-29.1	0.0	34.0	50.0	500.0	-20.0
22320.00	V	20.4	2.2	40.6	-29.1	0.0	34.1	50.7	500.0	-19.9

Manufacturer : Shure Incorporated
 Test Item : Equipment Using Wide Band Modulations Other Than FHSS, Non-Adaptive
 : Transceiver
 Model No. : AD610
 Serial No. : AD2-4162933258
 Test Mode : Tx at 2405MHz - Antenna 1
 Test Performed : Band Edge
 Test Date : February 2, 2017

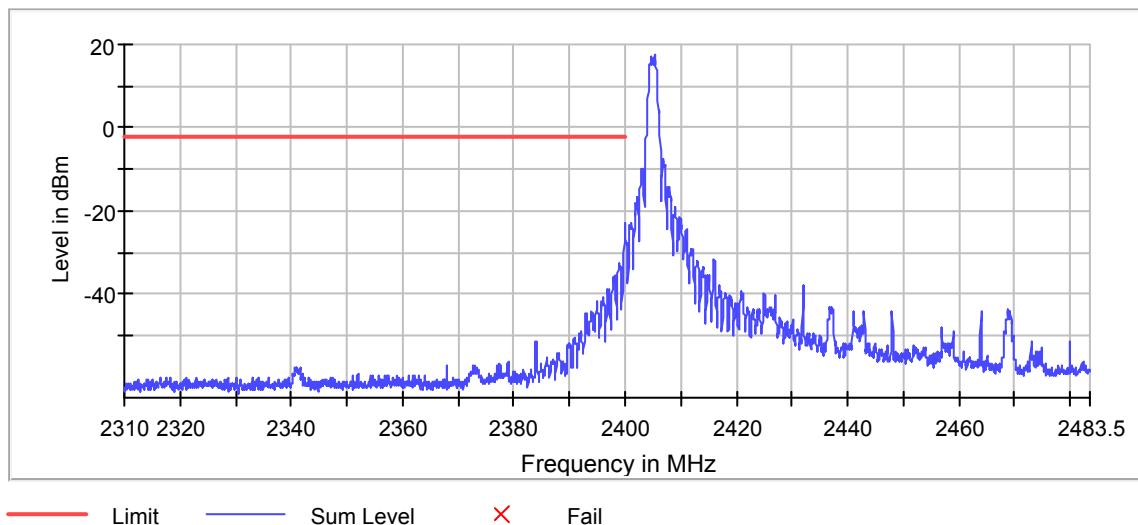
Band Edge

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.925042	-24.8	22.4	-2.4	PASS
2399.875069	-25.9	23.5	-2.4	PASS
2399.825097	-27.3	24.9	-2.4	PASS
2399.775125	-30.2	27.8	-2.4	PASS
2399.675180	-31.2	28.8	-2.4	PASS
2399.725153	-31.4	29.0	-2.4	PASS
2399.625208	-32.1	29.7	-2.4	PASS
2399.025541	-32.6	30.2	-2.4	PASS
2398.825652	-33.0	30.6	-2.4	PASS
2399.075514	-33.2	30.8	-2.4	PASS
2398.975569	-33.3	30.9	-2.4	PASS
2399.175458	-33.7	31.3	-2.4	PASS
2398.875625	-33.8	31.3	-2.4	PASS
2398.925597	-33.8	31.4	-2.4	PASS
2398.775680	-34.0	31.6	-2.4	PASS

In-band Peak

Frequency (MHz)	Level (dBm)
2405.221873	17.6

Low Frequency:



Manufacturer : Shure Incorporated
 Test Item : Equipment Using Wide Band Modulations Other Than FHSS, Non-Adaptive
 : Transceiver
 Model No. : AD610
 Serial No. : AD2-4162933258
 Test Mode : Tx at 2405MHz - Antenna 2
 Test Performed : Band Edge
 Test Date : February 2, 2017

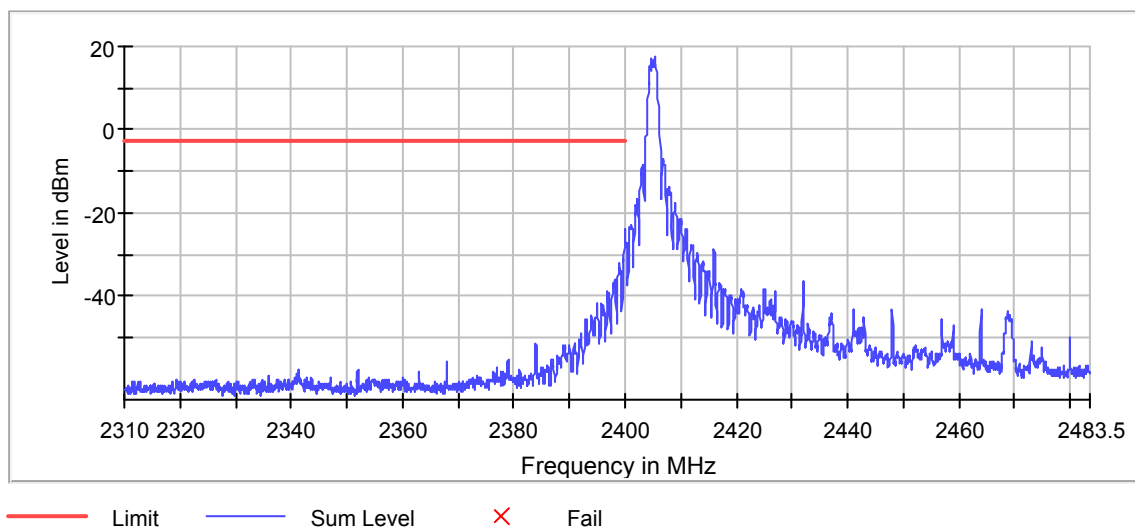
Band Edge

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.925042	-26.3	23.6	-2.6	PASS
2399.875069	-26.9	24.3	-2.6	PASS
2399.825097	-28.4	25.8	-2.6	PASS
2399.775125	-30.5	27.8	-2.6	PASS
2399.675180	-31.0	28.4	-2.6	PASS
2399.725153	-31.7	29.0	-2.6	PASS
2399.025541	-32.3	29.7	-2.6	PASS
2399.625208	-32.4	29.8	-2.6	PASS
2399.075514	-33.0	30.3	-2.6	PASS
2398.825652	-33.4	30.7	-2.6	PASS
2398.875625	-33.9	31.3	-2.6	PASS
2399.175458	-34.1	31.5	-2.6	PASS
2398.975569	-34.1	31.5	-2.6	PASS
2398.925597	-34.4	31.8	-2.6	PASS
2399.125486	-34.4	31.8	-2.6	PASS

In-band Peak

Frequency (MHz)	Level (dBm)
2405.221873	17.4

Low Frequency:





Manufacturer : Shure Incorporated
Test Item : Equipment Using Wide Band Modulations Other Than FHSS, Non-Adaptive
: Transceiver
Model No. : AD610
Serial No. : AD2-4162933258
Test Mode : Tx at 2480MHz
Test Performed : Band Edge – High Band Peak and Average
Test Date : February 2, 2017

Peak

Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2483.50	H	26.0	3.5	32.2	0.0	61.7	1217.8	5000.0	-12.3
2483.50	V	25.6	3.5	32.2	0.0	61.3	1157.7	5000.0	-12.7

Average

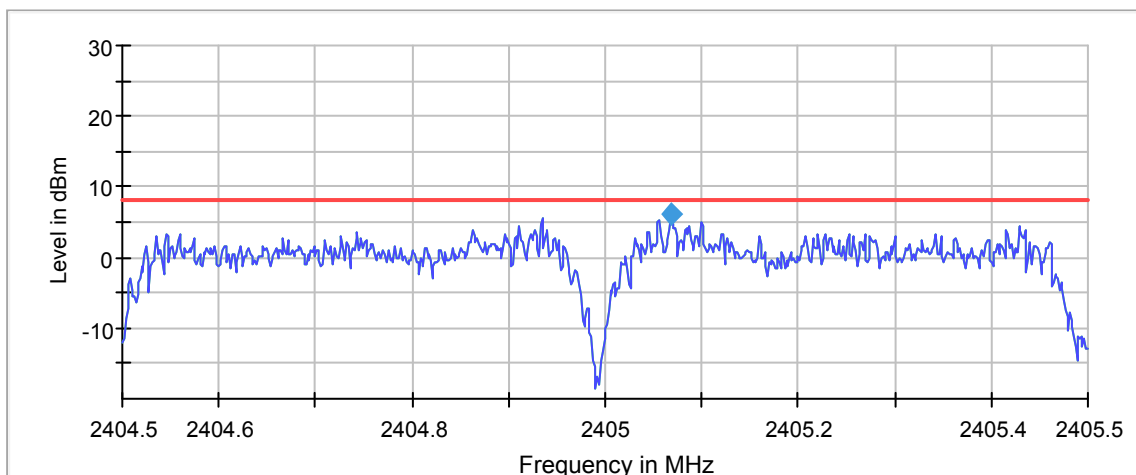
Freq. MHz	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2483.50	H	17.9	3.5	32.2	0.0	0.0	53.6	476.0	500.0	-0.4
2483.50	V	17.4	3.5	32.2	0.0	0.0	53.1	450.4	500.0	-0.9

Manufacturer : Shure Incorporated
 Test Item : Equipment Using Wide Band Modulations Other Than FHSS, Non-Adaptive
 : Transceiver
 Model No. : AD610
 Serial No. : AD2-4162933258
 Test Mode : Tx - Antenna 1
 Test Performed : Power Spectral Density
 Test Date : February 2, 2017

Power Spectral Density

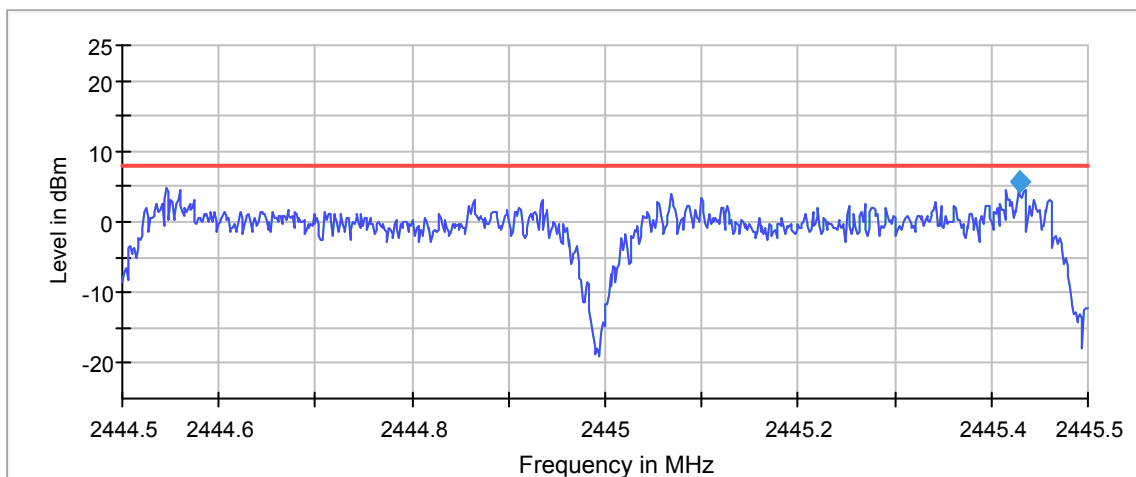
DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2405.000000	2405.068114	6.097	8.0	PASS
2445.000000	2445.428892	5.761	8.0	PASS
2480.000000	2480.428892	5.321	8.0	PASS

Low Frequency:

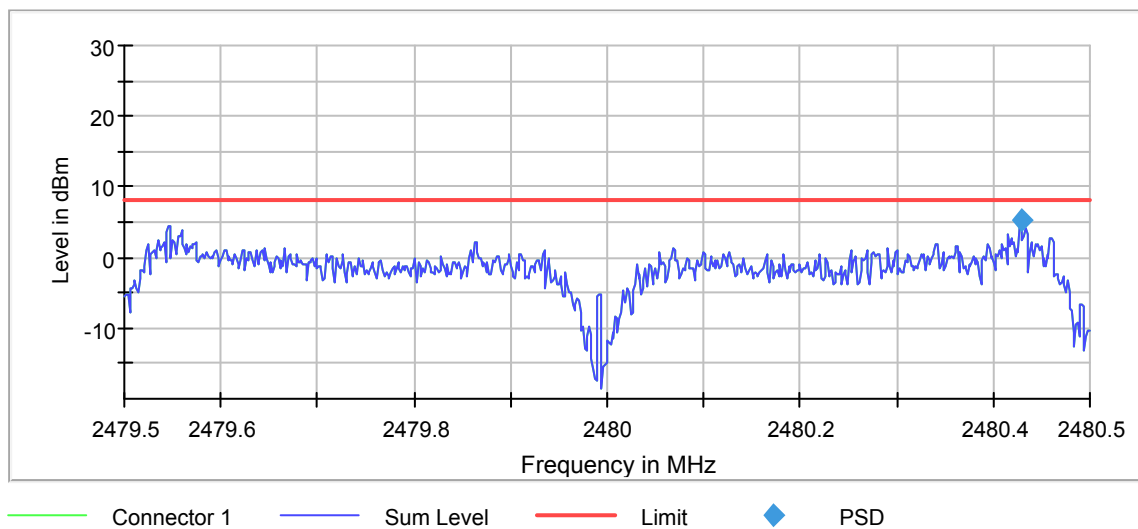


Connector 1 Sum Level Limit PSD

Mid Frequency:



Connector 1 Sum Level Limit PSD

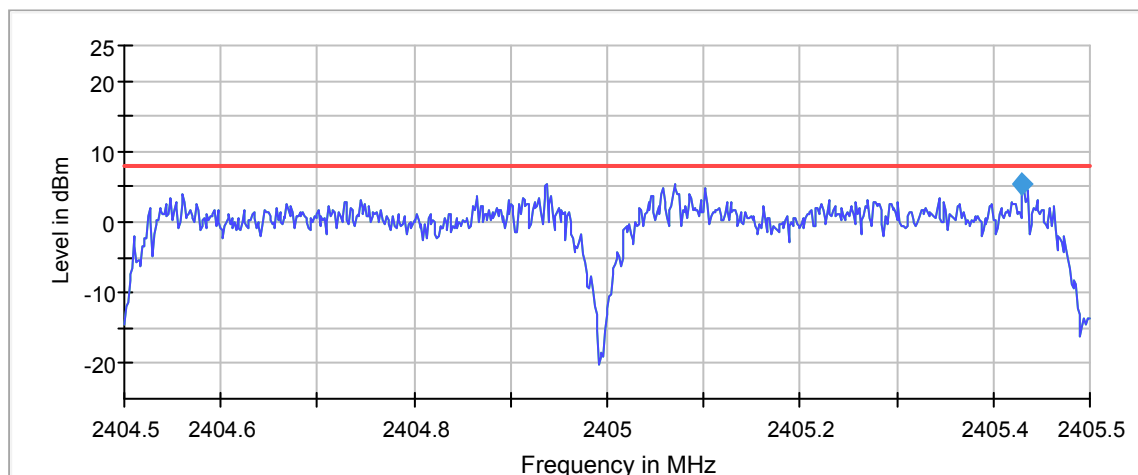
High Frequency:

Manufacturer : Shure Incorporated
 Test Item : Equipment Using Wide Band Modulations Other Than FHSS, Non-Adaptive
 : Transceiver
 Model No. : AD610
 Serial No. : AD2-4162933258
 Test Mode : Tx - Antenna 2
 Test Performed : Power Spectral Density
 Test Date : February 2, 2017

Power Spectral Density

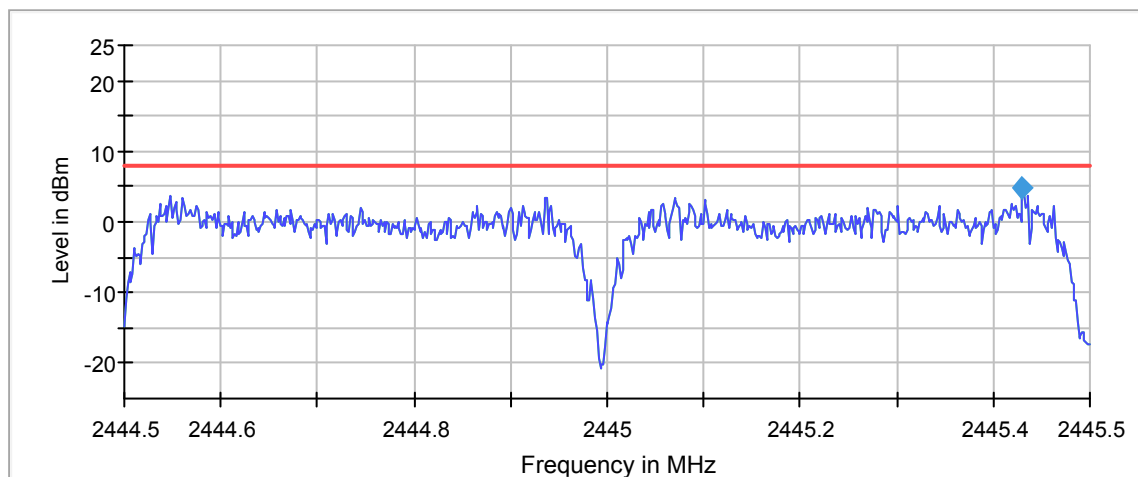
DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2405.000000	2405.430389	5.374	8.0	PASS
2445.000000	2445.430389	4.839	8.0	PASS
2480.000000	2480.430389	-1.286	8.0	PASS

Low Frequency:



Connector 1 Sum Level Limit PSD

Mid Frequency:



Connector 1 Sum Level Limit PSD

High Frequency: