



Measurement of RF Emissions from an ADX2FD Digitally Modulated Handheld Microphone Transmitter

For	Shure Incorporated 5800 West Touhy Avenue Niles, IL 60714
P.O. Number	4500380857
Date Tested	November 17, 2017 through December 1, 2017
Test Personnel	Mark Longinotti
Test Specification	FCC "Code of Federal Regulations" Title 47 Part 74 Subpart H, Section 74.861

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REVISION HISTORY

Revision	Date	Description
—	07 DEC 2017	Initial release

Measurement of RF Emissions from a Digitally Modulated Handheld Microphone Transmitter, Model No. ADX2FD

1. INTRODUCTION

1.1. Scope of Tests

This document represents the results of the series of radio interference measurements performed on a Shure Incorporated Digitally Modulated Handheld Microphone Transmitter, Model No. ADX2FD, (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was manufactured and submitted for testing by Shure Incorporated located in Niles, IL.

The EUT contained a transmitter that was designed to either transmit on a single frequency (non-diversity mode) or transmit simultaneously (diversity mode) on two independent channels in the following band using an integral, non-removable antenna:

Band	Frequency (MHz)	Serial No. Used for Antenna Port Tests	Serial No. Used for Radiated Emissions Tests	FCC Rule Part	Mode	Output Power (mW)
G57	470.125 – 607.875	292	307	74.861	Non-Diversity	2,10, 50
G57	470.125 – 607.875	292	307	74.861	Diversity	2,10, 20

The EUT also contained a digital modulation Zigbee transceiver. The transceiver was designed to transmit and receive in the 2400-2483.5 MHz band using an internal, non-removable antenna.

See Elite Electronic Engineering, Inc. Engineering Test Report No. 1703407-02 for compliance testing on the Zigbee transceiver.

1.2. Purpose

The test series was performed to determine if the EUT would meet selected requirements of FCC Part 74H for low power auxiliary station. Testing was performed in accordance with IEEE C63.26-2015.

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 23%.

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 74, Subpart H, Section 861, dated 1 October 2016
- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 2, dated 1

October 2016

- IEEE C63.26-2015 “American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services Accredited by the American National Standards Institute”

3. EUT SETUP AND OPERATION

3.1. General Description

The EUT is a Shure Incorporated, Digitally Modulated Handheld Microphone Transmitter, Model No. ADX2FD. A block diagram of the EUT setup is shown as Figure 1. A photograph of the EUT is shown as Figure 2.

3.1.1. Power Input

The EUT was powered by 3.6VDC from a removable, rechargeable Li-ion Battery Pack, Shure Model No.: SB920.

3.1.2. Peripheral Equipment

The following peripheral equipment was submitted with the EUT:

Item	Description
Shure SM58 Microphone	Connected to the microphone port of the EUT for all radiated emissions tests.

3.1.3. Signal Input/Output Leads

No interconnect cables were submitted with the EUT.

3.1.4. Grounding

The EUT was not grounded.

3.1.5. Frequency of EUT

Per CFR Title 47, Section 2, part 1057, for spurious emissions measurements, the frequency spectrum shall be investigated up to at least the tenth harmonic of the highest fundamental frequency.

3.2. Software

For all tests, the EUT had Firmware Version 1.0.14 loaded onto the device to provide correct load characteristics.

3.3. Operational Mode

All emissions tests were performed separately in the following modes:

G57:

Mode	UHF Transmitter				Diversity	Zigbee Transmitter
	Channel 1		Channel 2			
	Frequency	Output Power	Frequency	Output Power		
1	539.000 MHz	2mW	Off	Off	Off	Off
2	539.000 MHz	50mW	Off	Off	Off	Off
3	539.000 MHz	2mW	Off	Off	On	Off
4	539.000 MHz	20mW	Off	Off	On	Off
5	Off	Off	539.000 MHz	2mW	On	Off
6	Off	Off	539.000 MHz	20mW	On	Off
For intermodulation tests, the unit was programmed to operate in each of the following modes						
7	470.125 MHz	20mW	471.125	20mW	On	Off
8	470.125 MHz	20mW	607.875	20mW	On	Off
9	470.125 MHz	20mW	607.875	20mW	On	Transmit at 2445MHz

- Mode 7: Minimum signal separation in G57 Band
- Mode 8: Maximum signal separation in G57 Band
- Mode 9: Worst case G57 intermodulation mode and worst case Zigbee emissions
- Mode 9: Zigbee Transmit at 2445MHz, mid-power, txmod mode (modulated signal with 100% duty cycle)

Note – mid-power is the highest power setting for the Zigbee transmitter.

3.4. EUT Modifications

The following modifications were performed to the EUT:

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 and CISPR 16 for site attenuation.

4.2. Test Instrumentation

The test instrumentation and auxiliary equipment used during the tests are listed in Table 9-1.

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	1.06	-1.06
Expanded Uncertainty (95% confidence)	2.12	-2.12

Radiated Emissions Measurements		
Combined Standard Uncertainty	2.09	-2.09
Expanded Uncertainty (95% confidence)	4.19	-4.19

5. TEST PROCEDURES

5.1. RF Power Output Measurements

5.1.1. Requirements

Per 74.861(e)(1)(ii), for low power auxiliary stations operating in the 600MHz duplex gap and bands allocated for TV broadcasting, the power may not exceed the following values:

470MHz – 608MHz: 250mW conducted power

5.1.2. Procedures

The antenna port of the EUT was connected to an Agilent E9304A E-Series Average Power Sensor. The power sensor was connected to an Agilent E4419B EPM Series Power Meter. The output power of each EUT was then measured.

5.1.3. Results

The conducted output power data are shown on pages 20 through 22. All conducted output power readings from the EUT were below the limits of 74.861(e)(1)(ii).

5.2. Frequency Tolerance

5.2.1. Requirements

Per 76.861(e)(4), for low power auxiliary stations operating in the 600MHz duplex gap and the bands allocated for TV broadcasting, the frequency tolerance of the transmitter shall be 0.005 percent. In addition, per 2.1055(d)(2), for hand held battery powered equipment, reduce primary voltage to the battery operating end point which shall be declared by the manufacturer.

5.2.2. Procedures

The antenna port of the EUT was connected to a frequency counter. The EUT was then placed in a temperature chamber.

- a) The EUT was programmed to transmit with an unmodulated carrier.
- b) The nominal frequency of the transmitter was measured and recorded.
- c) The temperature chamber was then set to -30°C.
- d) Once the temperature had reached -30°C the EUT was allowed to soak for 45 minutes.
- e) After soaking at -30°C for 45 minutes, the EUT was turned on and the transmit frequency was measured and recorded.
- f) Steps (b) through (d) were repeated for each temperature in 10°C steps from -20°C to +50°C.
- g) The temperature chamber was set to +20°C and allowed to soak for 45 minutes. The battery was removed from the EUT. The battery leads of the EUT were connected to a DC power supply. The output voltage of the DC power supply was adjusted to the end point voltage and the frequency of the DUT was recorded.

5.2.3. Results

The frequency tolerance data are shown on pages 23 through 25. All frequency stability measurements from the EUT met the frequency tolerance requirements of +/- 0.005%. Photographs of the test configuration are shown as Figure 5.

5.3. Spurious Radiated Emissions

5.3.1. Requirements

Per 74.861(e)(6)(iii), for low power auxiliary stations operating in the 600MHz duplex band and the bands allocated for TV broadcasting, the mean power of emissions shall be attenuated below the mean output power of the transmitter by at least $43 + 10\log_{10}$ (mean output power in watts) dB for any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth.

5.3.2. 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 CISPR 16 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.

1. Preliminary radiated measurements were performed to determine the frequencies where the significant emissions might be found. With the EUT at one set position and the measurement antenna at a set height (i.e. without maximizing), the radiated emissions were measured using a peak detector and automatically plotted. The broadband measuring antenna was positioned at a 3 meter distance from the EUT. This data was then automatically plotted up through the 10th harmonic. All preliminary tests were performed separately with the EUT operating in the modes listed in Para. 3.2.
2. All significant broadband and narrowband signals found in the preliminary sweeps were then measured using a peak detector at a test distance of 3 meters. The measurements were made with a bilog antenna over the frequency range of 30MHz to 1GHz, and a double ridged waveguide antenna over the frequency range of 1GHz to 6GHz.
3. To ensure that maximum emission levels were 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 antennas are 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.

The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, another antenna was set in place of the EUT and connected to a calibrated signal generator. (A tuned dipole was used for all measurements below 1GHz and a double ridged waveguide antenna was used for all measurements above 1GHz.) 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 corrected to compensate for cable loss, as required, and for frequencies above 1GHz, increased by the gain of the waveguide.

5.3.3. Results

The plots of the peak preliminary spurious radiated emissions and the tabular final spurious radiated emissions results are presented on pages 26 through 55. All average spurious radiate emissions measured from the EUT were within the 74.861(e)(6)(iii) specification limits.

Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown as Figure 3 and Figure 4.

5.4. Intermodulation – Radiated Emissions

5.4.1. Requirements

Per a response to Inquiry to FCC (tracking number 294618), intermodulation testing must be performed on the EUT with simultaneous transmission of the worst case UHF transmitter and the worst case Part 15 (Zigbee) transmitter. Any intermodulation of the UHF transmitter and the Part 15.247 (Zigbee) transmitter must meet the appropriate requirements of 15.247 and the appropriate requirements of 74.861(e)(6)(iii) for spurious emissions. (See Elite Electronic Engineering, Inc. Engineering Test Report No. 1703407-02 for more information on the Zigbee transmitter.)

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.

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 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

Per 74.861(e)(6)(iii), for low power auxiliary stations operating in the 600MHz duplex band and the bands allocated for TV broadcasting, the mean power of emissions shall be attenuated below the mean output power of the transmitter by at least $43 + 10\log_{10}$ (mean output power in watts) dB for any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth.

5.4.2. 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.

1. 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.
2. All significant broadband and narrowband signals found in the preliminary sweeps were then measured using an average detector at a test distance of 3 meters. The measurements were made with a bilog antenna over the frequency range of 30MHz to 1GHz, and a double ridged waveguide antenna was used for frequencies above 1GHz.
3. To ensure that maximum emission levels were 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 antennas are 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.

The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, another antenna was set in place of the test item and connected to a calibrated signal generator. (A tuned dipole was used for all measurements below 1GHz and a double ridged waveguide antenna was used for all measurements above 1GHz.) 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 corrected to compensate for cable loss, as required, and for frequencies above 1GHz, increased by the gain of the waveguide.

5.4.3.Results

Channel 1: Transmit at 470.125MHz, 20mW; Channel 2: Transmit at 471.125MHz, 20mW, Diversity On, Zigbee Off

Preliminary radiated emissions plots with the EUT simultaneously transmitting at the minimum signal separation in the G57 band are shown on pages 56 through 59. As can be seen from the data, the intermodulation product of simultaneous transmissions from the EUT did not generate additional spurious radiated emissions.

Channel 1: Transmit at 470.125MHz, 20mW; Channel 2: Transmit at 607.875MHz, 20mW, Diversity On, Zigbee Off

Preliminary radiated emissions plots with the EUT simultaneously transmitting at the maximum signal separation in the G57 band are shown on pages 60 through 63. Final radiated emissions data with the EUT simultaneously transmitting at the maximum signal separation in the G57 band are shown on page 64. As can be seen from the data, the intermodulation product of simultaneous transmissions from the EUT was below the spurious radiated emissions limits of the 74.861(e)(6)(iii) specification limits.

Channel 1: Transmit at 470.125MHz, 20mW; Channel 2: Transmit at 607.875MHz, 20mW, Diversity On, Zigbee Transmit at 2445MHz (Channel 19), mid-power

Preliminary radiated emissions plots with the EUT simultaneously transmitting at the worst case UHF transmitter frequencies and the worst case Part 15 (Zigbee) transmitter frequency are shown on pages 65 through 72. As can be seen from the data, the intermodulation product of simultaneous transmissions from the EUT did not generate additional spurious radiated emissions.

5.5. Out-of-Band Unwanted Emissions / Spurious Unwanted Emissions

5.5.1.Requirements

In accordance with paragraph 74.861(e)(5) and (6), for low power auxiliary stations operating in the bands allocated for TV broadcasting, the following technical requirements apply:

- a) The operating bandwidth shall not exceed 200 kHz.
- b) The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:
 - i. On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;
 - ii. On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;
 - iii. On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\log_{10}$ (mean output power in watts) dB.

5.5.2.Procedures

The antenna port of the EUT was connected to a spectrum analyzer through 40dB of attenuation.

- a) The EUT was programmed to transmit on Channel 1 at 539MHz, 2mW (diversity off, Zigbee off), with a digitally modulated carrier.
- b) The mean output power was measured using the procedures in section 5.2.4.3 of ANSI C63.26-2015. The following settings were employed on the EMI Test Receiver:

Center Frequency	= Transmit frequency of the EUT
Frequency Span	= 500kHz (2 x to 3 x the OBW)
RBW	= 300kHz (\geq OBW)
VBW	= \geq 3 x RBW
Detector Mode	= Average
Number of measuring points	= 1001 (\geq 2 x span/RBW)
Sweep time	= auto-couple
Detector	= Average
Number of sweeps	= 100

- c) The peak marker function was used to determine the maximum amplitude level. The marker represents the average output power of the EUT.
- d) The reference level was set to the marker level.
- e) A screen dump of the trace was taken.
- f) Next the procedures in section 5.7.2 and 5.7.3 of ANSI C63.26-2015 were used to measure the out-of-band unwanted emissions. The following settings were employed on the EMI Test Receiver:

Center Frequency	= Transmit frequency of the EUT
Frequency Span	= 1MHz (wide enough to capture the fundamental emissions)
RBW	= 3kHz ($<$ OBW but not less than 1% of OBW)
VBW	= \geq 3 x RBW
Detector Mode	= Average
Number of measuring points	= 1001 (\geq 2 x span/RBW)
Sweep time	= auto-couple
Detector	= Average
Number of sweeps	= 100

- g) The emissions mask was added to the plot to show that the EUT met the out-of-band requirements.
- h) A screen dump of the trace was taken.
- i) Next the procedures in section 5.7.2 and 5.7.4 of ANSI C63.26-2015 were used to measure the spurious unwanted emissions near the out-of-band emissions. The following settings were employed on the EMI Test Receiver:

Center Frequency	= Transmit frequency of the EUT
Frequency Span	= 5MHz (wide enough to capture the spurious emissions near the out-of-band emissions)
RBW	= 100kHz (CISPR BW for emissions below 1GHz)
VBW	= \geq 3 x RBW
Detector Mode	= Average
Number of measuring points	= 1001 (\geq 2 x span/RBW)
Sweep time	= auto-couple
Detector	= Average
Number of sweeps	= 100

- j) The emissions mask was added to the plot to show that the EUT met the spurious emissions requirements near the out-of-band emissions.
- k) A screen dump of the trace was taken.

- l) Steps (b) through (k) were repeated for all non-interharmonics modes listed in paragraph 3.3.

5.5.3. Results

The plots of the out-of-band unwanted emissions and spurious unwanted emissions near the out-of-band emissions are presented on pages 73 through 90. The limits, shown on the plots are referenced to the power measured from the EUT. As can be seen from the data, the EUT met all the out-of-band emissions requirements and all of the near out-of-band emissions requirements.

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

The Shure Incorporated Digitally Modulated Handheld Microphone Transmitter, Model No. ADX2FD, did fully meet the output power, frequency tolerance, out-of-band emissions, intermodulation and spurious radiated emissions requirements of the FCC "Code of Federal Regulations" Title 47, Part 74, Subpart H, Section 74.861 when tested per IEEE C63.26-2015.

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 A2LA, 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	3/22/2017	3/22/2018
APW11	PREAMPLIFIER	PMI	PE2-35-120-5R0-10-12-SFF	PL11685/1241	1GHZ-20GHZ	3/22/2017	3/22/2018
CDU2	LAPTOP COMPUTER	DELL	PRECISION	---	---	N/A	
CDX8	COMPUTER	ELITE	WORKSTATION			N/A	
EMCE02	TEMPERATURE CHAMBER	THERMOTRON	S-8	15461	-70C TO 150C	7/3/2017	7/3/2018
GRE2	SIGNAL GENERATOR	AGILENT	E4438C	MY42081749	250KHZ-6GHZ	3/21/2017	3/21/2018
MDB8	MULTIMETER (M. LONGINOTTI)	FLUKE CORPORATION	177	81240019	I,VAC,VDC,R	8/17/2017	8/17/2018
MFC0	MICROWAVE FREQ. COUNTER	HEWLETT PACKARD	5343A	2133A00591	10HZ-26GHZ	8/15/2017	8/15/2018
MPE3	DUAL POWER METER	AGILENT	E4419B	GB39511117	0.1MHZ-50GHZ	2/22/2017	2/22/2018
MPI1	POWER SENSOR	AGILIENT	E9304A	MY41496041	9KHZ-6GHZ	6/21/2016	6/21/2018
NDN0	TUNED DIPOLE ANTENNA	EMCO	3121C-DB2	311	60-140MHZ	4/19/2016	4/19/2018
NDP0	TUNED DIPOLE ANTENNA	EMCO	3121C-DB3	311	140-400MHZ	4/19/2016	4/19/2018
NDQ0	TUNED DIPOLE ANTENNA	EMCO	3121C-DB4	311	400-1000MHZ	4/19/2016	4/19/2018
NHG0	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ	NOTE 1	
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	9/11/2017	9/11/2018
NWQ0	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66657	1GHZ-18GHZ	5/18/2016	5/18/2018
NWQ2	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66659	1GHZ-18GHZ	3/2/2016	3/2/2018
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	11/22/2016	12/22/2017
SHA0	DC POWER SUPPLY	HEWLETT PACKARD	6642A	MY40000116	0-20V/0-10A	NOTE 1	
SHC2	Power Supplies	HENGFU	HF60W-SL-24	A11372702	24V	NOTE 1	
T2D8	20DB, 25W ATTENUATOR	WEINSCHTEL	46-20-43	AY9247	DC-18GHZ	7/7/2016	7/7/2018
T2DG	20DB, 25W ATTENUATOR	WEINSCHTEL	46-20-34	BN1038	DC-18GHZ	1/5/2016	1/5/2018
T2DN	20DB, 25W ATTENUATOR	WEINSCHTEL	46-20-34	BS2147	DC-18GHZ	6/13/2016	6/13/2018
XOB2	ADAPTER	HEWLETT PACKARD	K281C,012	09407	18-26.5GHZ	NOTE 1	
XPR0	HIGH PASS FILTER	K&L MICROWAVE	11SH10-4800/X20000	001	4.8-20GHZ	9/12/2017	9/12/2019

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.

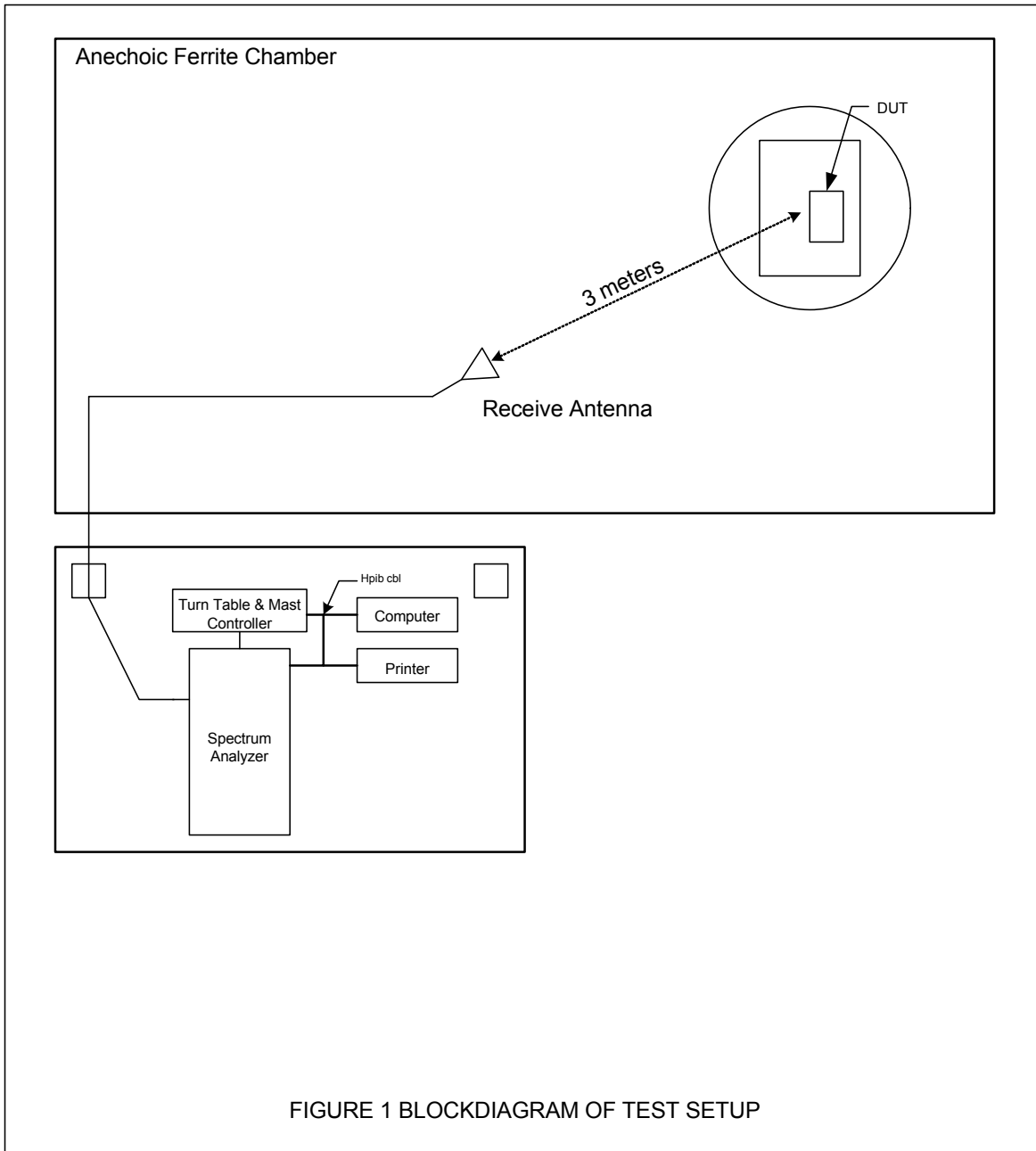
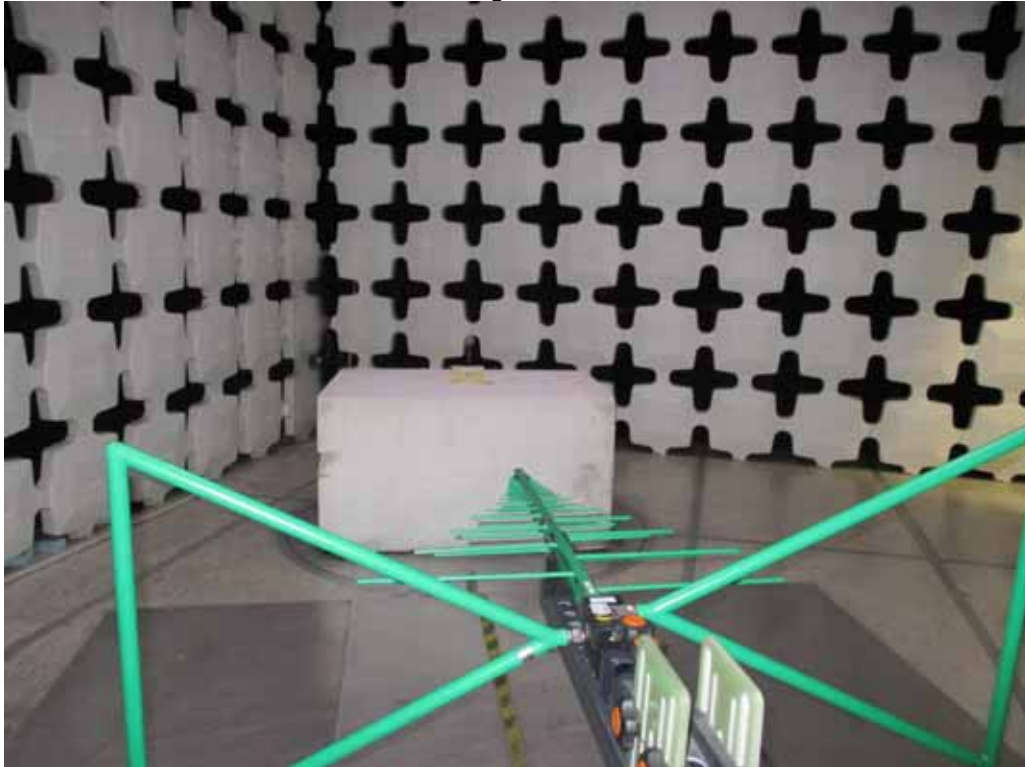


Figure 2

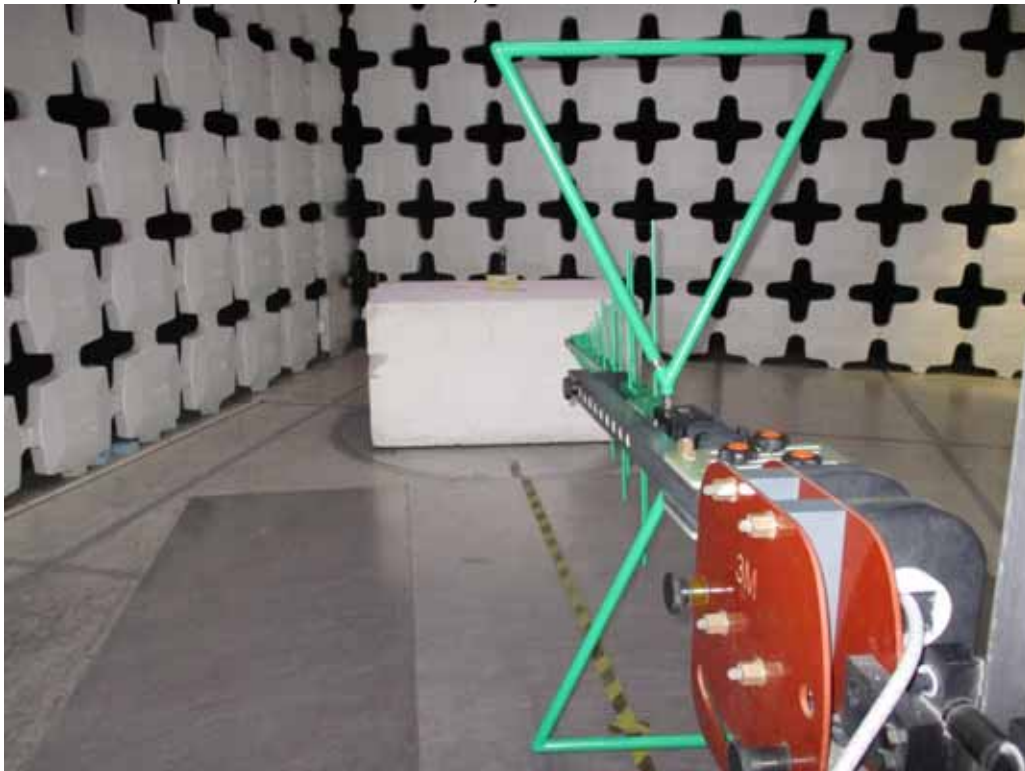


Photograph of the EUT

Figure 3

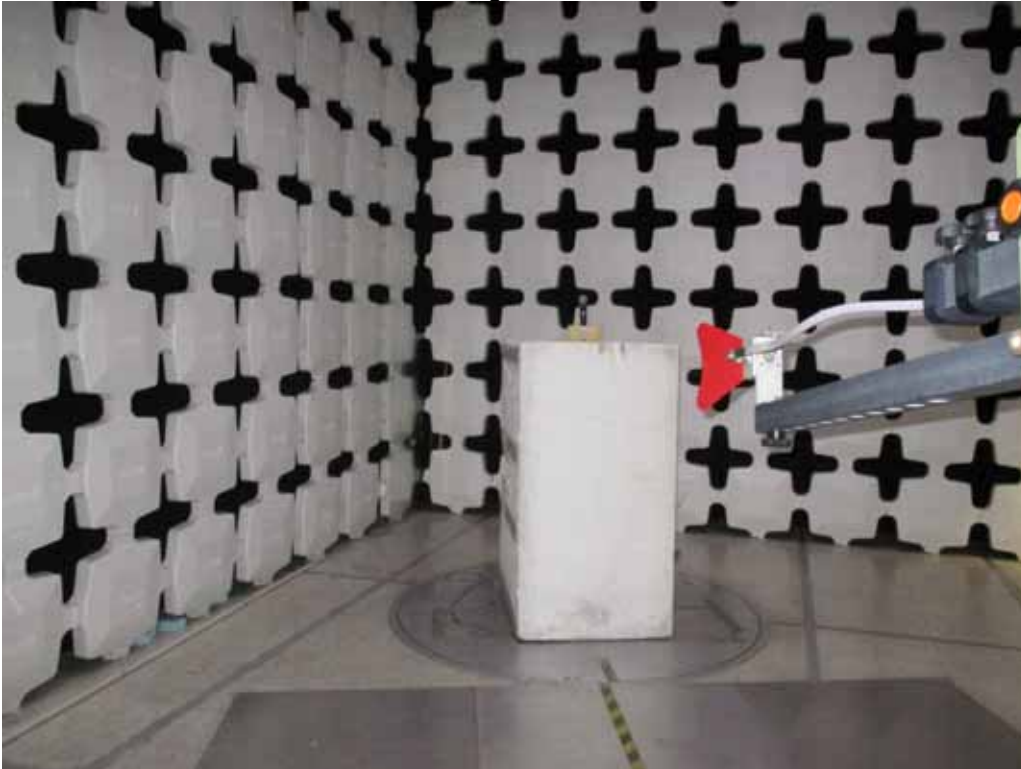


Test Setup for Radiated Emissions, 30MHz to 1GHz – Horizontal Polarization

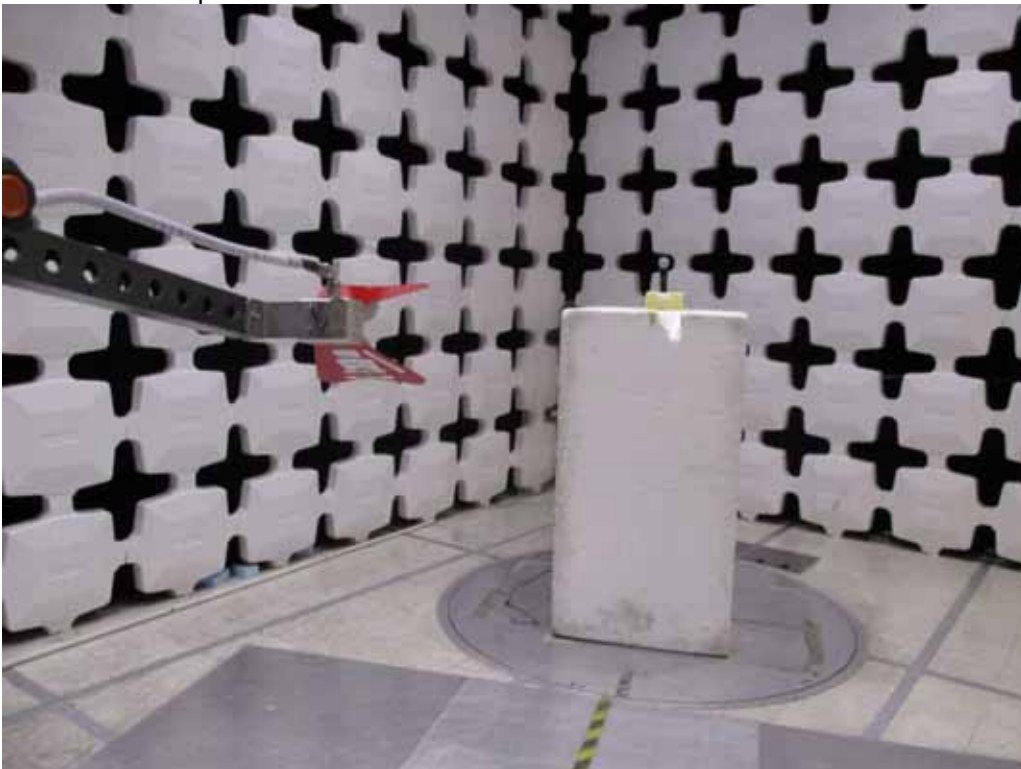


Test Setup for Radiated Emissions, 30MHz to 1GHz – Vertical Polarization

Figure 4



Test Setup for Radiated Emissions above 1GHz – Horizontal Polarization



Test Setup for Radiated Emissions above 1GHz – Vertical Polarization

Figure 5



Test Setup for Frequency Tolerance Tests



Test Setup for Frequency Tolerance Tests



MANUFACTURER : Shure Incorporated
MODEL NO. : ADX2FD
SERIAL NO. : 292
SPECIFICATION : FCC 74.861(e)(1)(ii) Conducted Output Power
DATE : November 17, 2017
MODE : See Below
UNIT : G57
EQUIPMENT USED : MPE3, MPI1
NOTES : Channel 1 On, Channel 2 Off, Diversity Off, Zigbee Off

Frequency MHz	Nominal Power mW	Measured Average Power mW	FCC Part 74H Limit mW
539.000	2.0	1.57	250
539.000	50.0	33.5	250

Checked By: MARK E. LONGINOTTI
Mark E. Longinotti



MANUFACTURER : Shure Incorporated
MODEL NO. : ADX2FD
SERIAL NO. : 292
SPECIFICATION : FCC 74.861(e)(1)(ii) Conducted Output Power
DATE : November 17, 2017
MODE : See Below
UNIT : G57
EQUIPMENT USED : MPE3, MPI1
NOTES : Channel 1 On, Channel 2 Off, Diversity On, Zigbee Off

Frequency MHz	Nominal Power mW	Measured Average Power mW	FCC Part 74H Limit mW
539.000	2.0	1.67	250
539.000	20.0	14.9	250

Checked By: MARK E. LONGINOTTI
Mark E. Longinotti



MANUFACTURER : Shure Incorporated
MODEL NO. : ADX2FD
SERIAL NO. : 292
SPECIFICATION : FCC 74.861(e)(1)(ii) Conducted Output Power
DATE : November 17, 2017
MODE : See Below
UNIT : G57
EQUIPMENT USED : MPE3, MPI1
NOTES : Channel 2 On, Channel 1 Off, Diversity On, Zigbee Off

Frequency MHz	Nominal Power mW	Measured Average Power mW	FCC Part 74H Limit mW
539.000	2.0	1.43	250
539.000	20.0	14.2	250

Checked By: MARK E. LONGINOTTI
Mark E. Longinotti



MANUFACTURER : Shure Incorporated
 MODEL NO. : ADX2FD
 SERIAL NO. : 292
 SPECIFICATION : FCC 76.861(e)(4) Frequency Tolerance
 DATE : November 29, 2017 and November 30, 2017
 MODE : Transmit at 539.000MHz
 UNIT : G57
 EQUIPMENT USED : EMCE02, MFC0, SHA0, MDB8, T2DG
 NOTES : Channel 1 On, Channel 2 Off, Diversity Off, Zigbee Off

Temperature °C	Input Voltage	Nominal Frequency Hz	Measured Frequency Hz	Frequency Variation in %			Pass/Fail
				Lower Limit %	Measured Variation %	Upper Limit %	
-30	3.6	539,000,000	538,999,450	-0.005000000	-0.000102041	0.005000000	Pass
-20	3.6	539,000,000	538,999,721	-0.005000000	-0.000051763	0.005000000	Pass
-10	3.6	539,000,000	538,999,851	-0.005000000	-0.000027644	0.005000000	Pass
0	3.6	539,000,000	538,999,885	-0.005000000	-0.000021336	0.005000000	Pass
+10	3.6	539,000,000	538,999,876	-0.005000000	-0.000023006	0.005000000	Pass
+20	3.6	539,000,000	538,999,886	-0.005000000	-0.000021150	0.005000000	Pass
+30	3.6	539,000,000	538,999,920	-0.005000000	-0.000014842	0.005000000	Pass
+40	3.6	539,000,000	538,999,940	-0.005000000	-0.000011132	0.005000000	Pass
+50	3.6	539,000,000	538,999,962	-0.005000000	-0.000007050	0.005000000	Pass
+21	3.2	539,000,000	538,999,889	-0.005000000	-0.000020594	0.005000000	Pass

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 Mark E. Longinotti



MANUFACTURER : Shure Incorporated
 MODEL NO. : ADX2FD
 SERIAL NO. : 292
 SPECIFICATION : FCC 76.861(e)(4) Frequency Tolerance
 DATE : November 29, 2017 and November 30, 2017
 MODE : Transmit at 539.000MHz
 UNIT : G57
 EQUIPMENT USED : EMCE02, MFC0, SHA0, MDB8, T2DG
 NOTES : Channel 1 On, Channel 2 Off, Diversity On, Zigbee Off

Temperature °C	Input Voltage	Nominal Frequency Hz	Measured Frequency Hz	Frequency Variation in %			Pass/Fail
				Lower Limit %	Measured Variation %	Upper Limit %	
-30	3.6	539,000,000	538,999,612	-0.005000000	-0.000071985	0.005000000	Pass
-20	3.6	539,000,000	538,999,798	-0.005000000	-0.000037477	0.005000000	Pass
-10	3.6	539,000,000	538,999,889	-0.005000000	-0.000020594	0.005000000	Pass
0	3.6	539,000,000	538,999,895	-0.005000000	-0.000019481	0.005000000	Pass
+10	3.6	539,000,000	538,999,862	-0.005000000	-0.000025603	0.005000000	Pass
+20	3.6	539,000,000	538,999,867	-0.005000000	-0.000024675	0.005000000	Pass
+30	3.6	539,000,000	538,999,925	-0.005000000	-0.000013915	0.005000000	Pass
+40	3.6	539,000,000	538,999,948	-0.005000000	-0.000009647	0.005000000	Pass
+50	3.6	539,000,000	538,999,950	-0.005000000	-0.000009276	0.005000000	Pass
+21	3.2	539,000,000	538,999,878	-0.005000000	-0.000022635	0.005000000	Pass

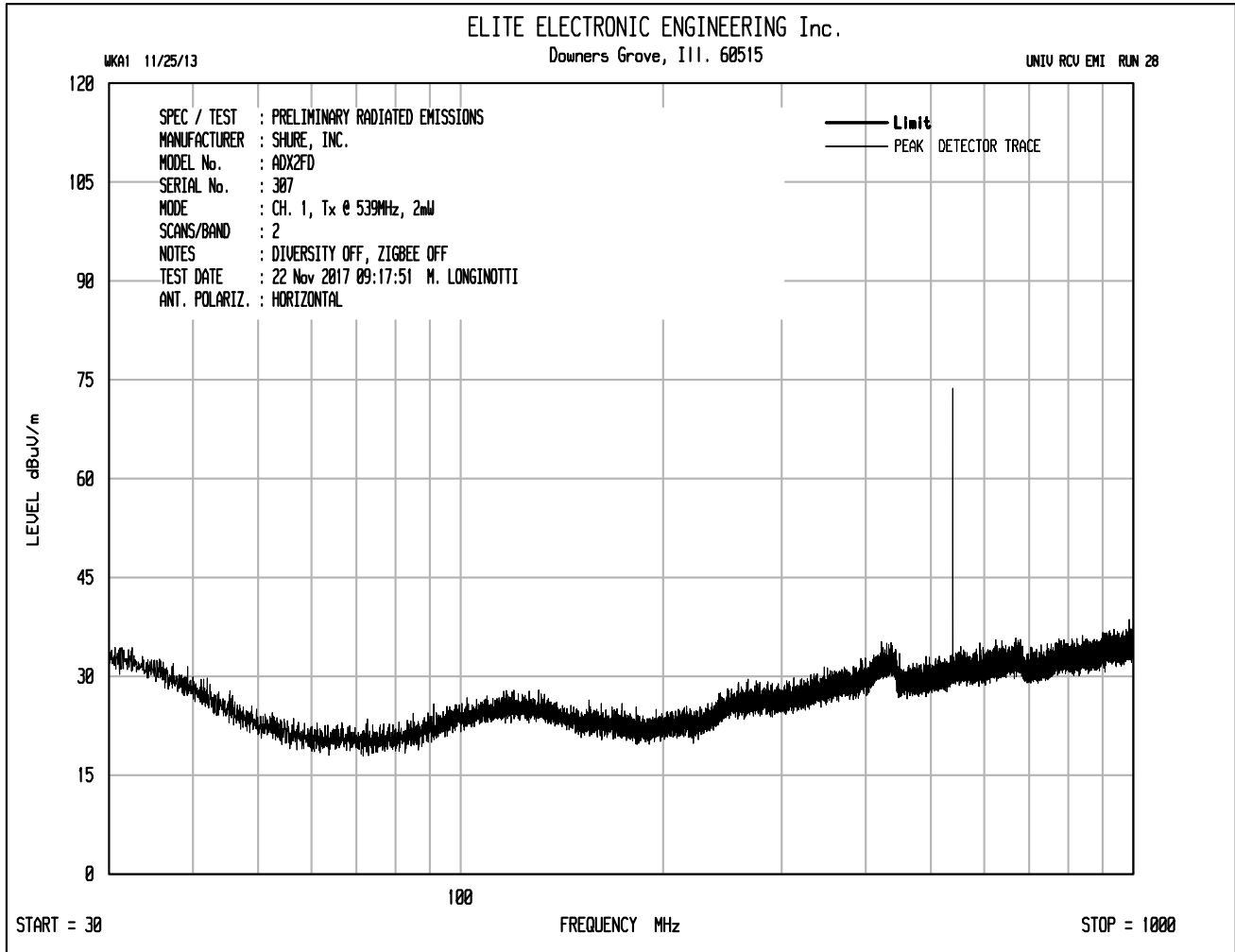
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 Mark E. Longinotti

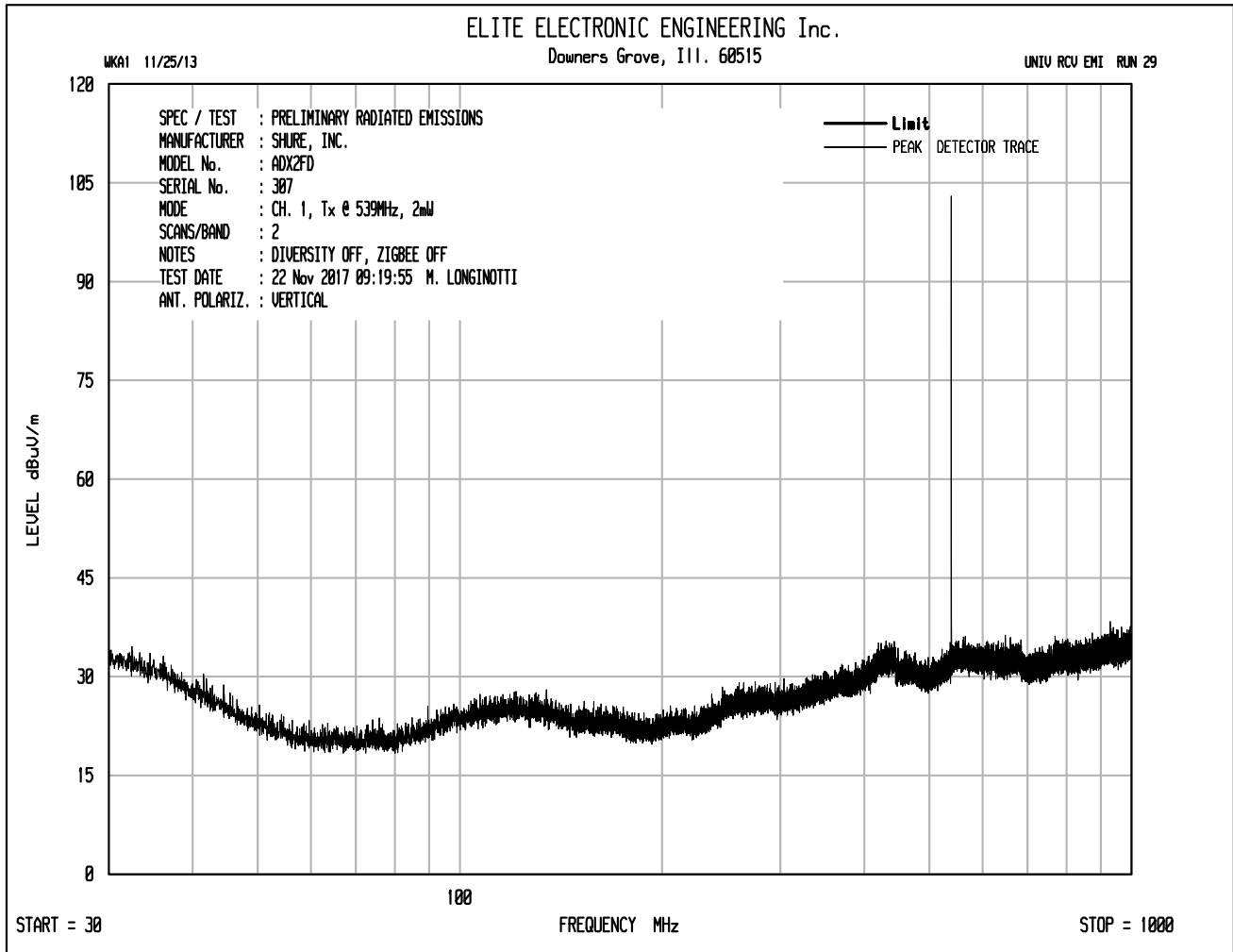


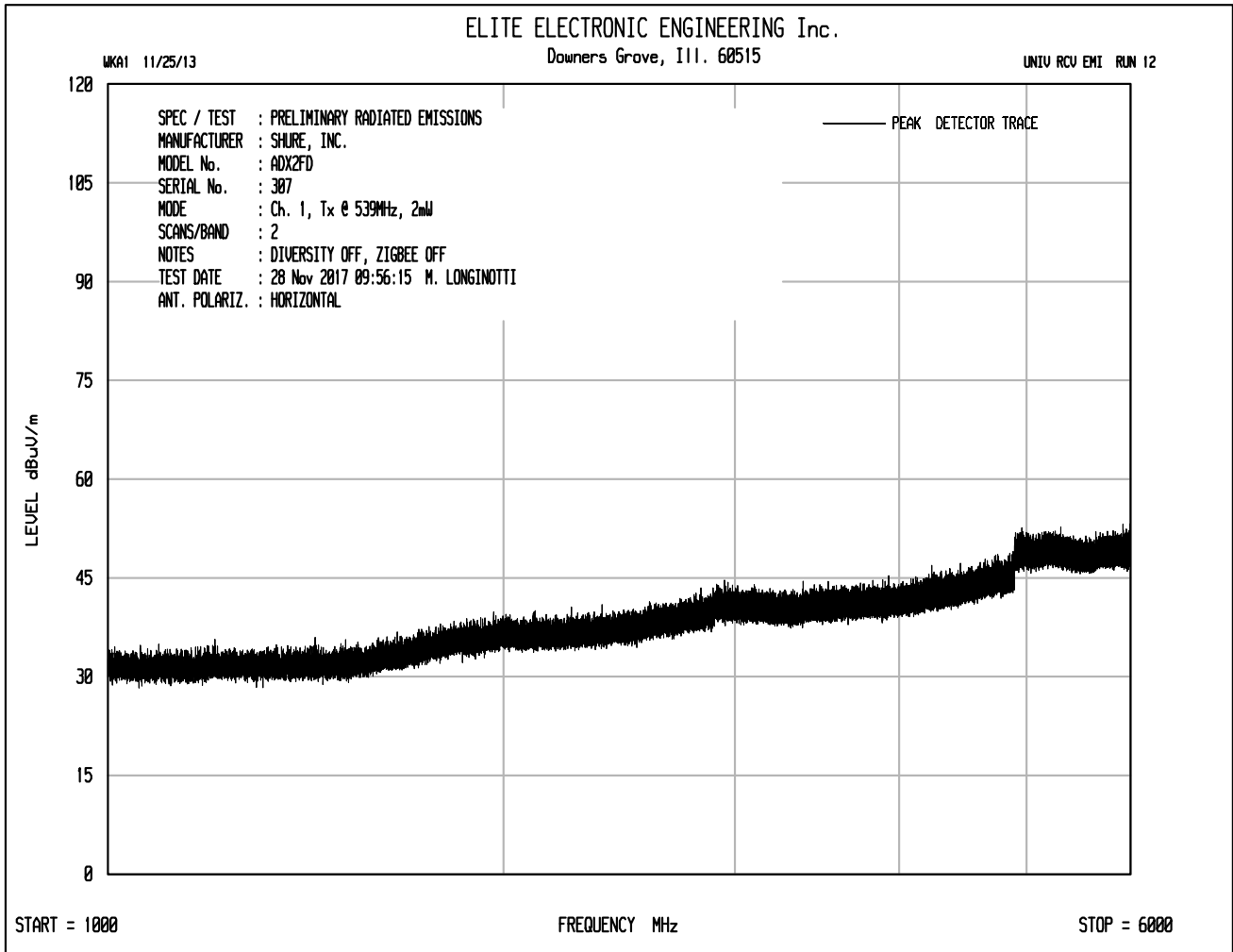
MANUFACTURER : Shure Incorporated
 MODEL NO. : ADX2FD
 SERIAL NO. : 292
 SPECIFICATION : FCC 76.861(e)(4) Frequency Tolerance
 DATE : November 29, 2017 and November 30, 2017
 MODE : Transmit at 539.000MHz
 UNIT : G57
 EQUIPMENT USED : EMCE02, MFC0, SHA0, MDB8, T2DG
 NOTES : Channel 1 Off, Channel 2 On, Diversity On, Zigbee Off

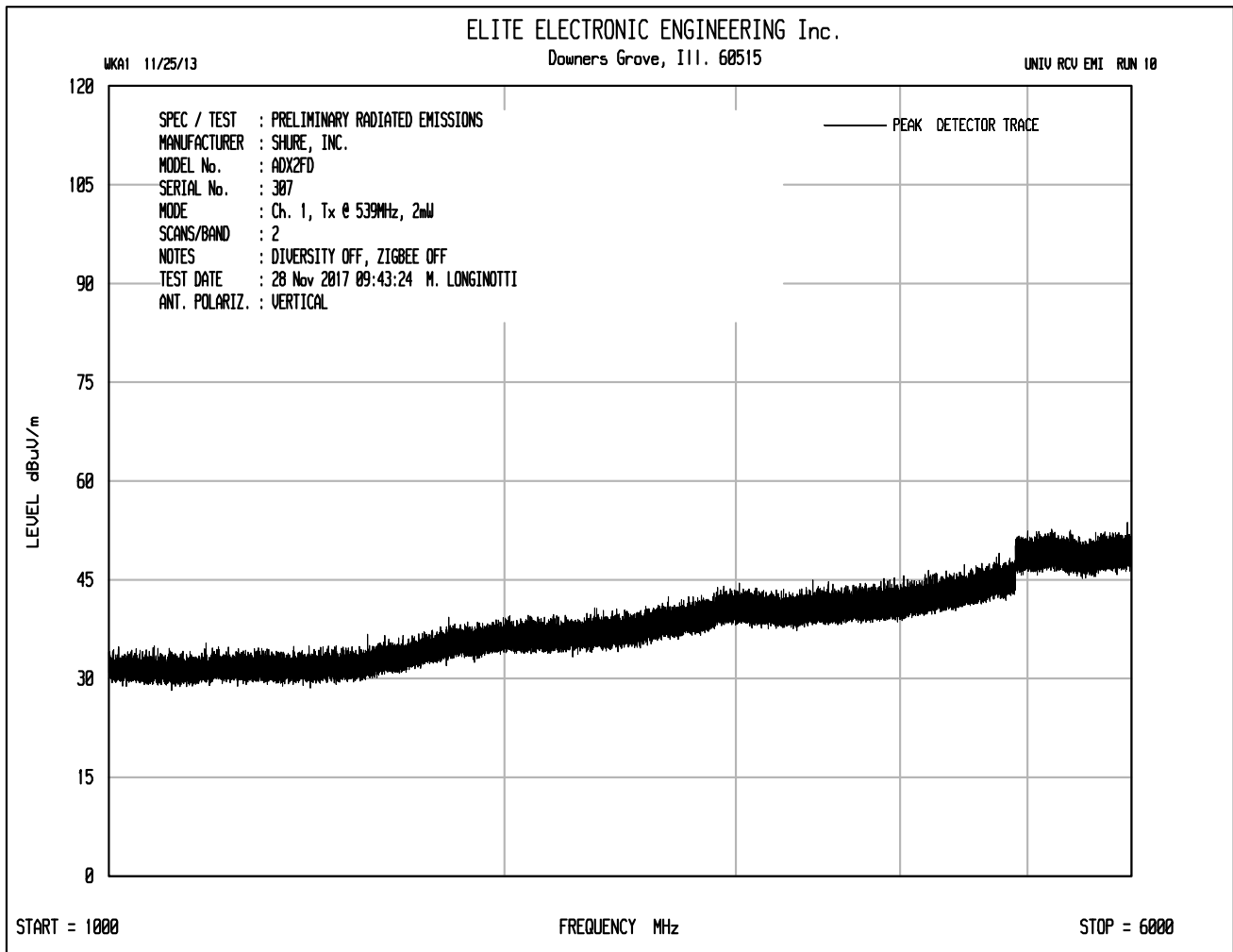
Temperature °C	Input Voltage	Nominal Frequency Hz	Measured Frequency Hz	Frequency Variation in %			Pass/Fail
				Lower Limit %	Measured Variation %	Upper Limit %	
-30	3.6	539,000,000	538,999,629	-0.005000000	-0.000068831	0.005000000	Pass
-20	3.6	539,000,000	538,999,822	-0.005000000	-0.000033024	0.005000000	Pass
-10	3.6	539,000,000	538,999,910	-0.005000000	-0.000016698	0.005000000	Pass
0	3.6	539,000,000	538,999,905	-0.005000000	-0.000017625	0.005000000	Pass
+10	3.6	539,000,000	538,999,900	-0.005000000	-0.000018553	0.005000000	Pass
+20	3.6	539,000,000	538,999,902	-0.005000000	-0.000018182	0.005000000	Pass
+30	3.6	539,000,000	538,999,950	-0.005000000	-0.000009276	0.005000000	Pass
+40	3.6	539,000,000	538,999,947	-0.005000000	-0.000009833	0.005000000	Pass
+50	3.6	539,000,000	538,999,932	-0.005000000	-0.000012616	0.005000000	Pass
+21	3.2	539,000,000	538,999,925	-0.005000000	-0.000013915	0.005000000	Pass

Checked By: MARK E. LONGINOTTI
 Mark E. Longinotti









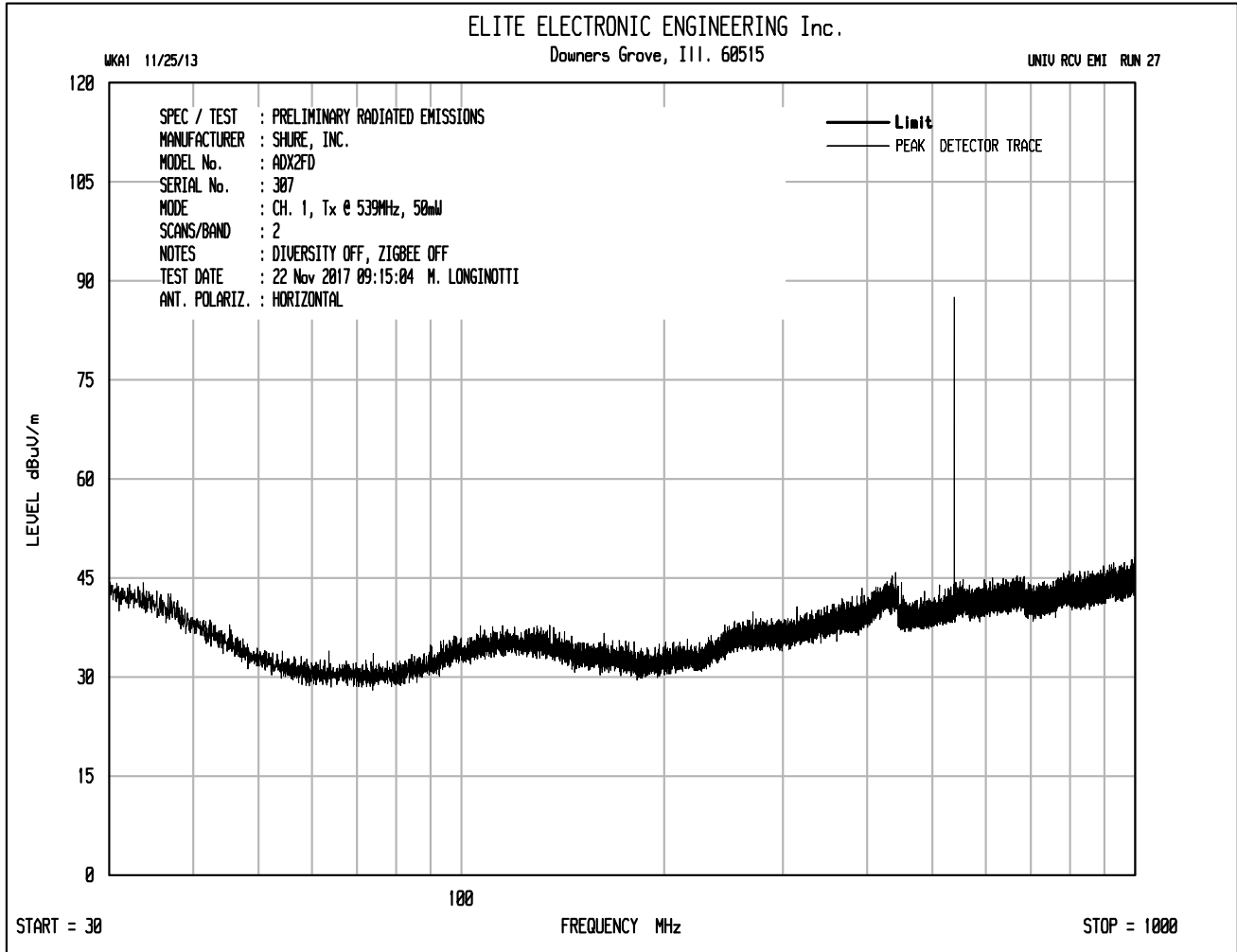


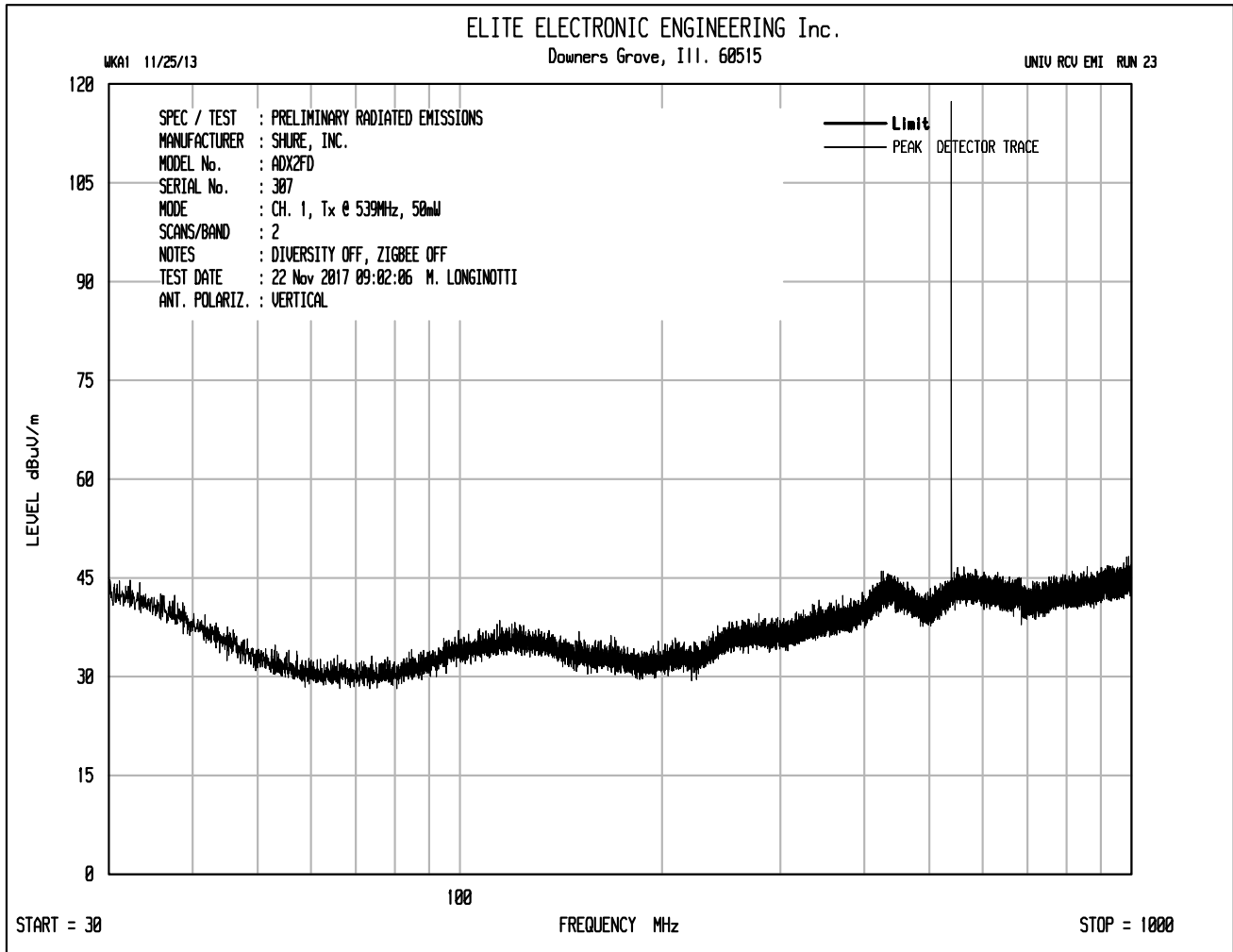
MANUFACTURER : Shure Incorporated
 MODEL NO. : ADX2FD
 SERIAL NO. : 307
 SPECIFICATION : FCC 74.861(e)(6)(iii) Spurious Radiated Emissions
 DATE : November 22, 2017 through November 28, 2017
 MODE : Transmit at 539.000MHz, 2mW nominal power
 UNIT : G57
 EQUIPMENT USED : NTA3, NWQ0, RBG2, NWQ2, GRE2, CDX8
 NOTES : Channel 1 On, Channel 2 Off, Diversity Off, Zigbee Off

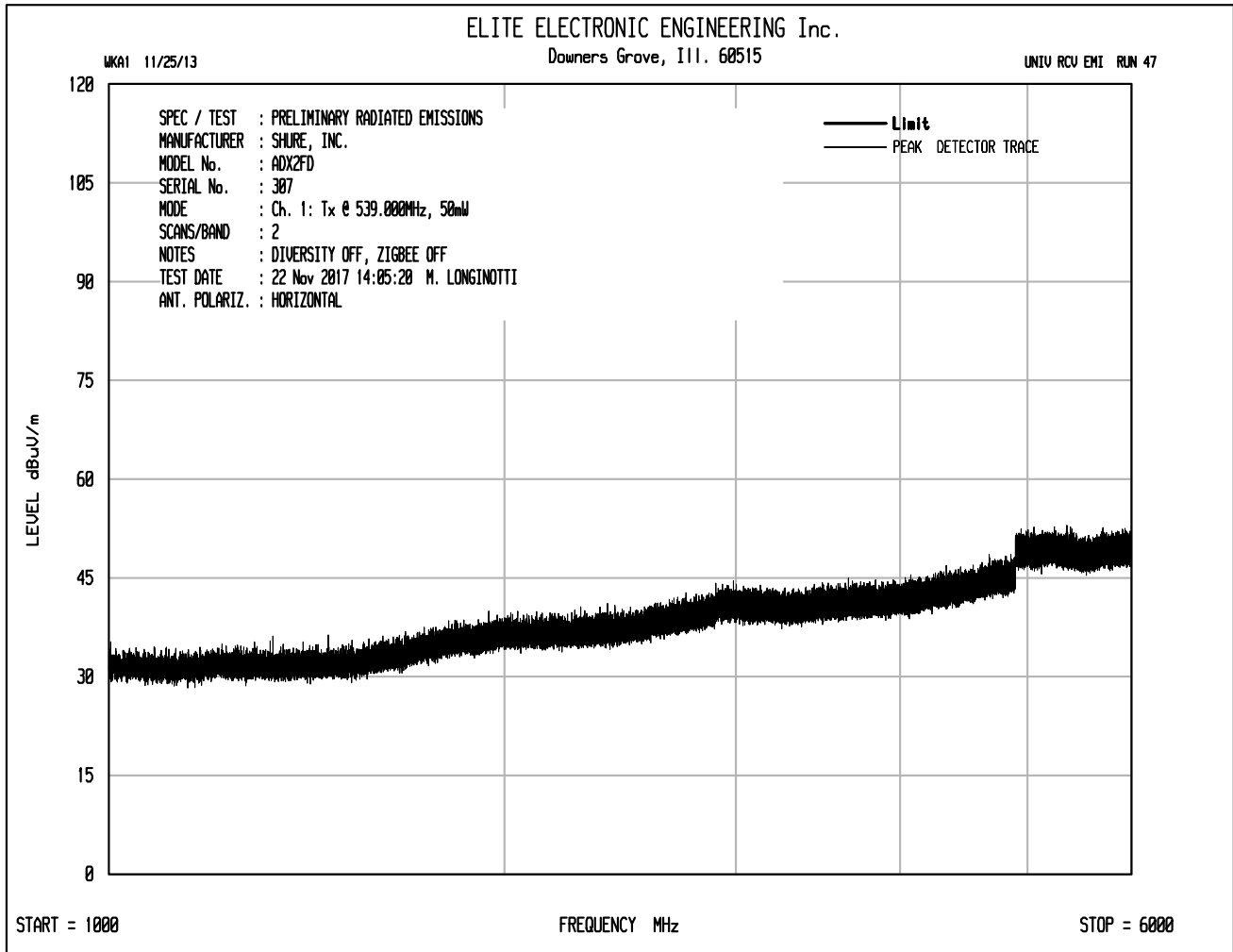
Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	ERP (dBm)	Attenuation Below Output Power (dB)	Minimum Attenuation (dB)
1078.00	H	-0.8	Ambient	-71.2	0.3	2.2	-73.2	76.2	16.0
1078.00	V	-0.8	Ambient	-69.8	0.3	2.2	-71.8	74.8	16.0
1617.00	H	-0.2	Ambient	-72.0	3.4	2.8	-71.4	74.4	16.0
1617.00	V	-0.2	Ambient	-68.3	3.4	2.8	-67.7	70.7	16.0
2156.00	H	0.6	Ambient	-65.1	3.0	3.2	-65.3	68.3	16.0
2156.00	V	0.6	Ambient	-63.8	3.0	3.2	-64.0	67.0	16.0
2695.00	H	1.3	Ambient	-64.4	4.2	3.7	-63.9	66.9	16.0
2695.00	V	1.3	Ambient	-63.0	4.2	3.7	-62.5	65.5	16.0
3234.00	H	1.8	Ambient	-63.5	5.2	4.0	-62.4	65.4	16.0
3234.00	V	1.8	Ambient	-61.7	5.2	4.0	-60.6	63.6	16.0
3773.00	H	2.1	Ambient	-61.1	6.4	4.3	-59.1	62.1	16.0
3773.00	V	2.1	Ambient	-60.6	6.4	4.3	-58.6	61.6	16.0
4312.00	H	2.6	Ambient	-59.9	7.0	4.6	-57.5	60.5	16.0
4312.00	V	2.6	Ambient	-59.7	7.0	4.6	-57.3	60.3	16.0
4851.00	H	3.5	Ambient	-57.3	7.7	4.9	-54.5	57.5	16.0
4851.00	V	3.5	Ambient	-56.7	7.7	4.9	-53.9	56.9	16.0
5390.00	H	6.5	Ambient	-53.3	7.9	5.1	-50.5	53.5	16.0
5390.00	V	6.5	Ambient	-54.0	7.9	5.1	-51.2	54.2	16.0

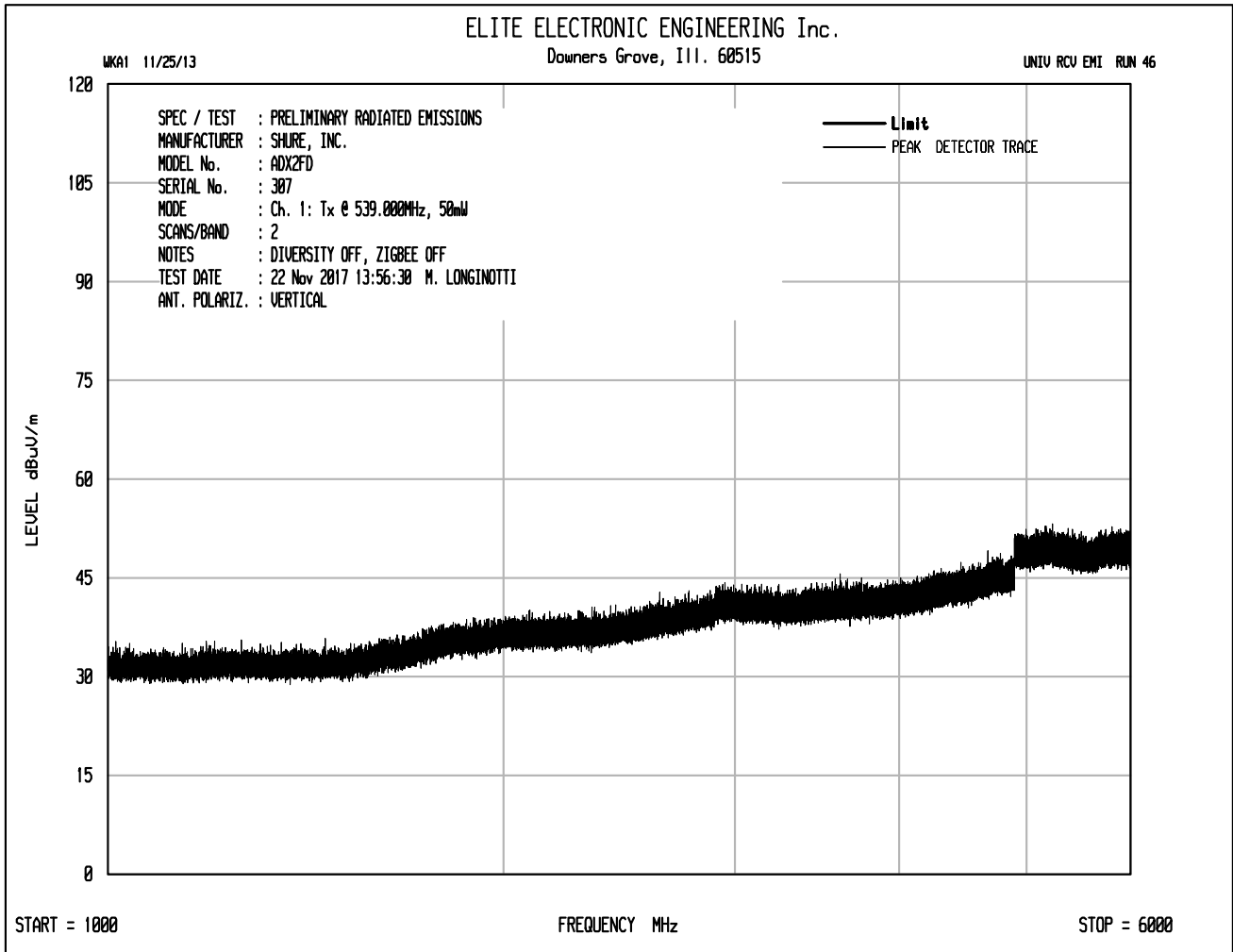
ERP(dBm) = Matched Sig. Gen. Reading (dBm) + Equivalent Antenna Gain (dB) – Cable Loss (dB)

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 Mark E. Longinotti









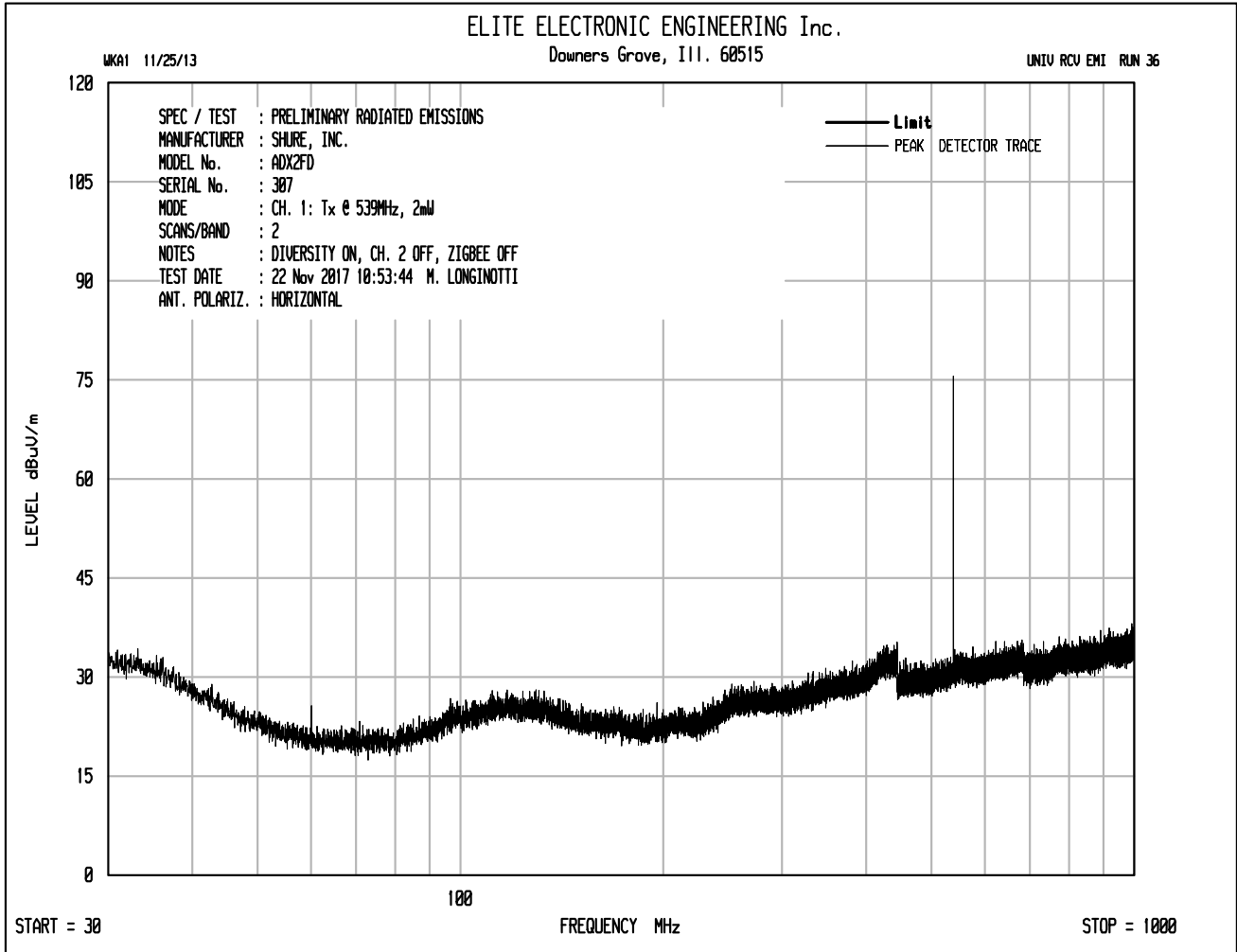


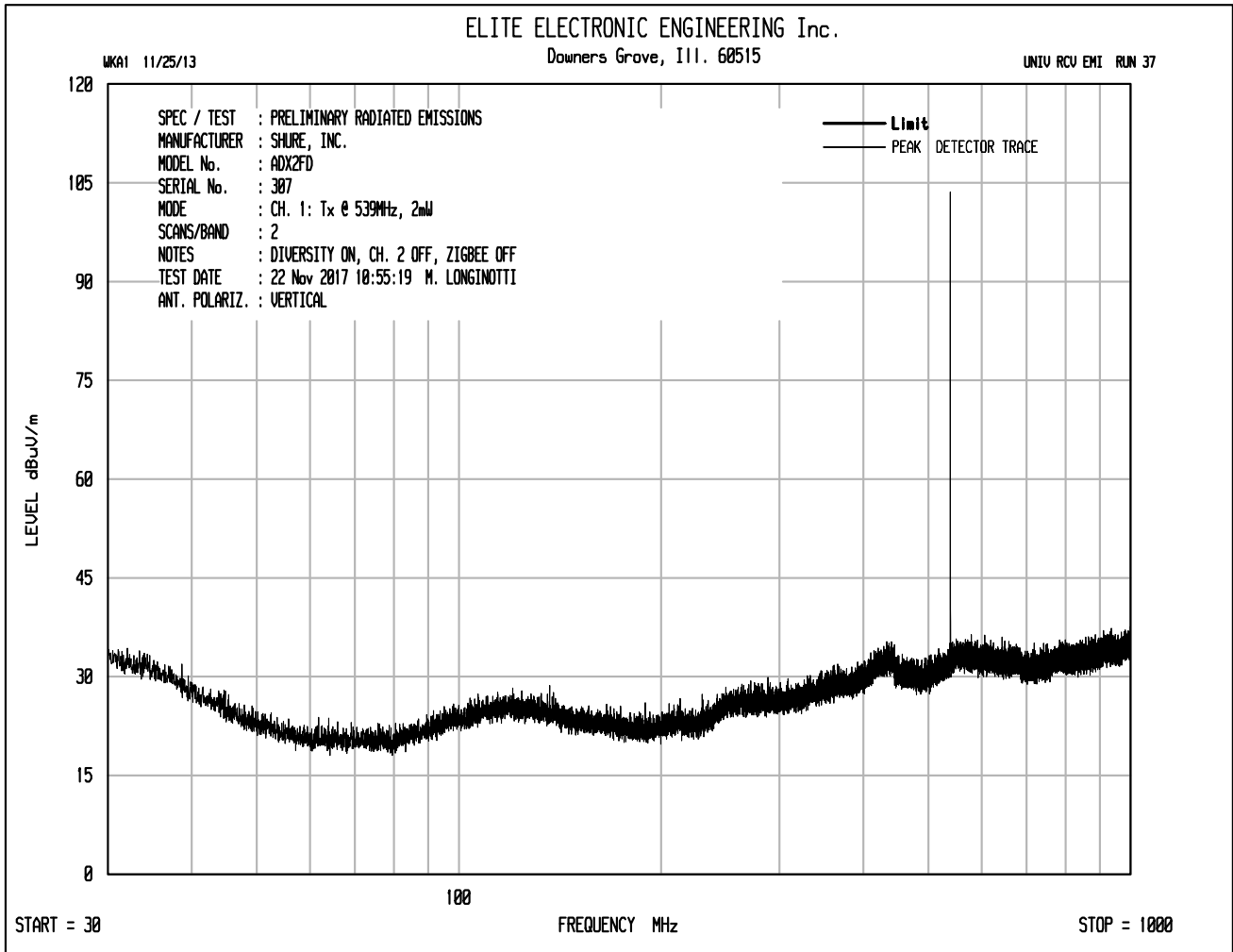
MANUFACTURER : Shure Incorporated
 MODEL NO. : ADX2FD
 SERIAL NO. : 307
 SPECIFICATION : FCC 74.861(e)(6)(iii) Spurious Radiated Emissions
 DATE : November 22, 2017
 MODE : Transmit at 539.000MHz, 50mW nominal power
 UNIT : G57
 EQUIPMENT USED : NTA3, NWQ0, RBG2, NWQ2, GRE2, CDX8
 NOTES : Channel 1 On, Channel 2 Off, Diversity Off, Zigbee Off

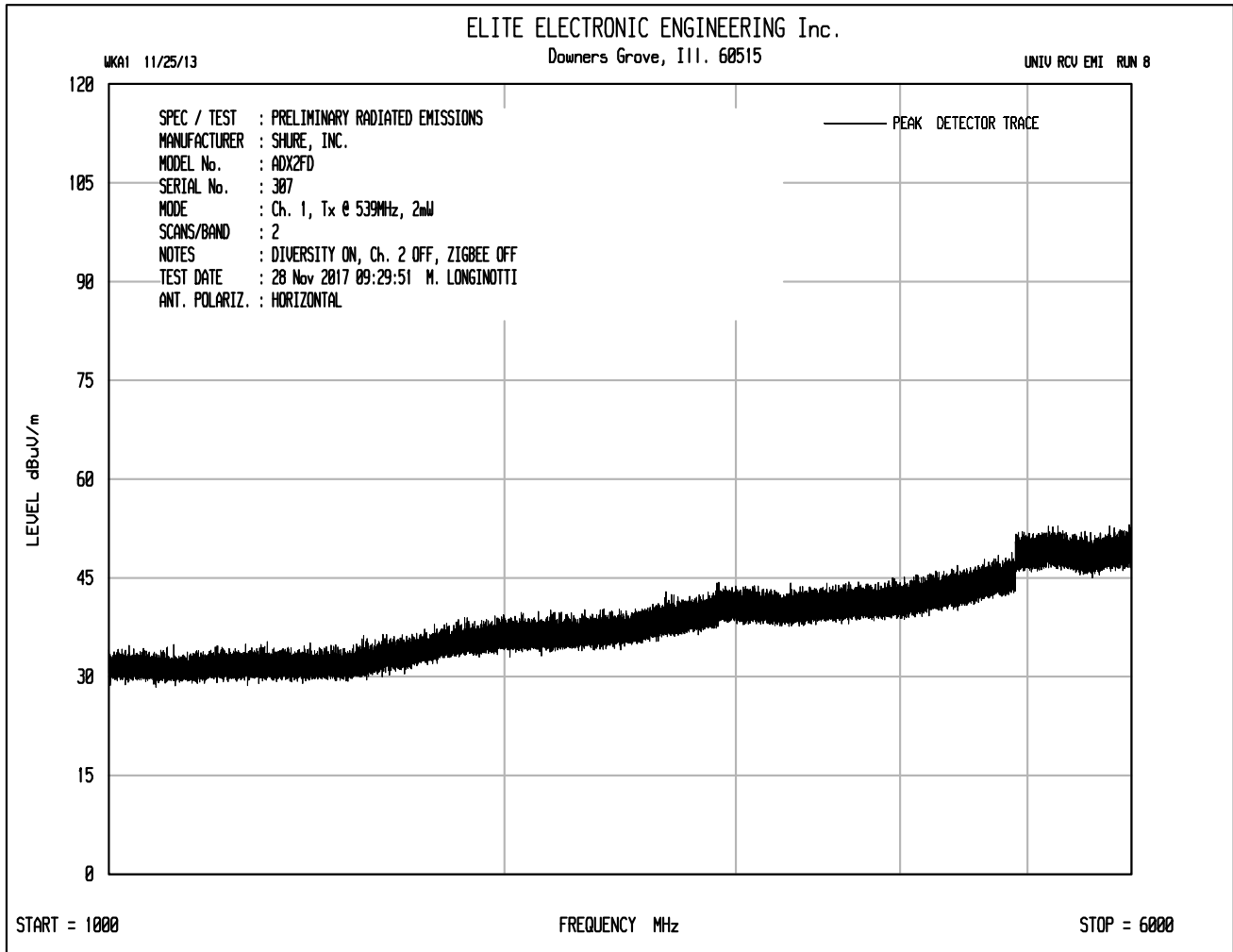
Freq. MHz	Ant Pol	Meter Reading (dBUV)	Ambient	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	ERP (dBm)	Attenuation Below Output Power (dB)	Minimum Attenuation (dB)
1078.00	H	-0.8	Ambient	-71.2	0.3	2.2	-73.2	90.1	30.0
1078.00	V	0.1	Ambient	-69.1	0.3	2.2	-71.1	88.0	30.0
1617.00	H	-0.3	Ambient	-72.3	3.4	2.8	-71.7	88.6	30.0
1617.00	V	-0.3	Ambient	-68.4	3.4	2.8	-67.8	84.7	30.0
2156.00	H	0.6	Ambient	-65.1	3.0	3.2	-65.3	82.3	30.0
2156.00	V	0.6	Ambient	-63.8	3.0	3.2	-64.0	81.0	30.0
2695.00	H	1.3	Ambient	-64.4	4.2	3.7	-63.9	80.9	30.0
2695.00	V	1.3	Ambient	-63.0	4.2	3.7	-62.5	79.5	30.0
3234.00	H	1.9	Ambient	-63.4	5.2	4.0	-62.3	79.3	30.0
3234.00	V	1.9	Ambient	-61.6	5.2	4.0	-60.5	77.5	30.0
3773.00	H	2.2	Ambient	-61.0	6.4	4.3	-59.0	76.0	30.0
3773.00	V	2.2	Ambient	-60.5	6.4	4.3	-58.5	75.5	30.0
4312.00	H	2.7	Ambient	-59.8	7.0	4.6	-57.4	74.4	30.0
4312.00	V	2.7	Ambient	-59.6	7.0	4.6	-57.2	74.2	30.0
4851.00	H	3.7	Ambient	-57.1	7.7	4.9	-54.3	71.3	30.0
4851.00	V	3.7	Ambient	-56.3	7.7	4.9	-53.5	70.5	30.0
5390.00	H	6.7	Ambient	-53.1	7.9	5.1	-50.3	67.3	30.0
5390.00	V	6.7	Ambient	-53.8	7.9	5.1	-51.0	68.0	30.0

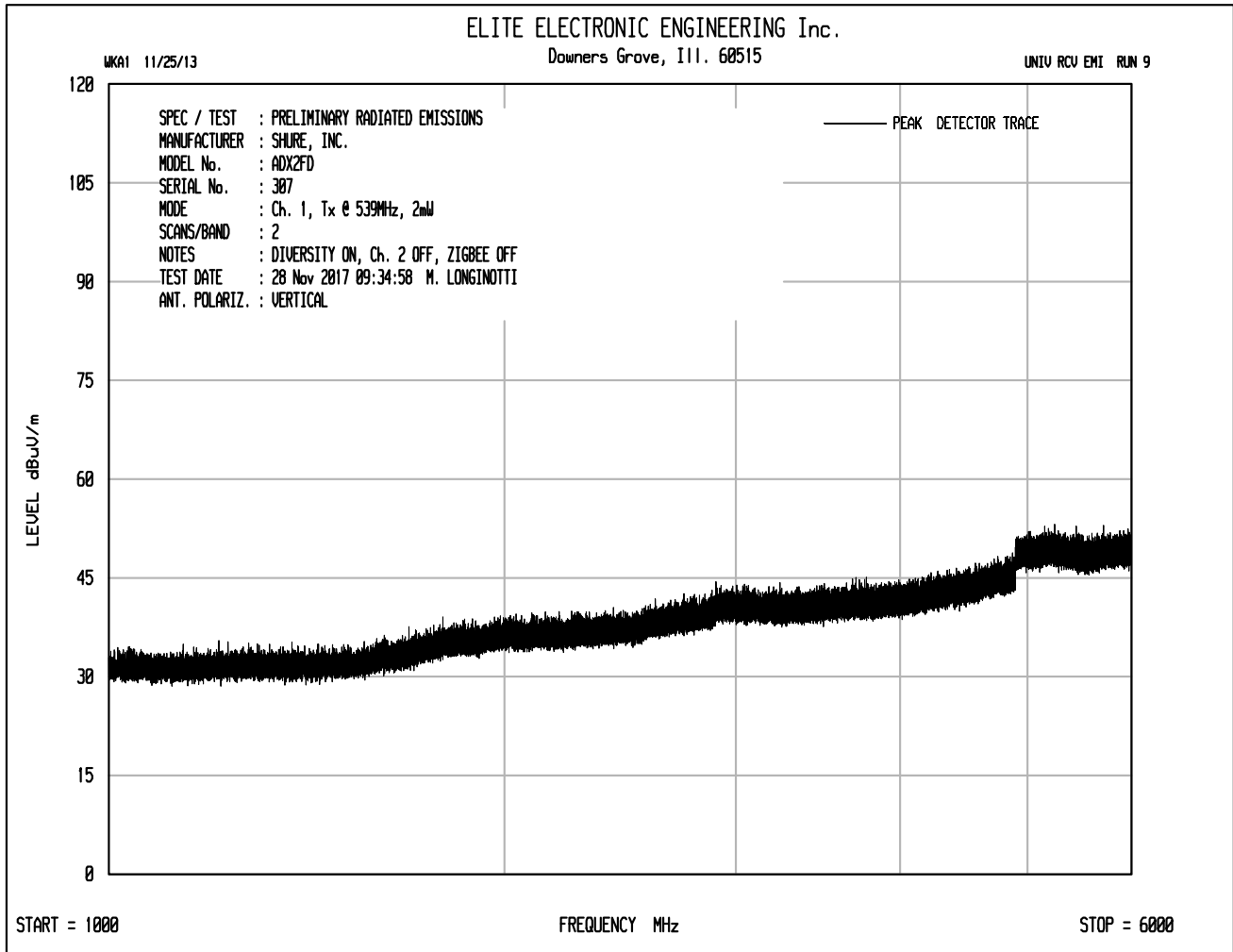
ERP (dBm) = Matched Sig. Gen. Reading (dBm) + Equivalent Antenna Gain (dB) – Cable Loss (dB)

Checked By: MARK E. LONGINOTTI
 Mark E. Longinotti









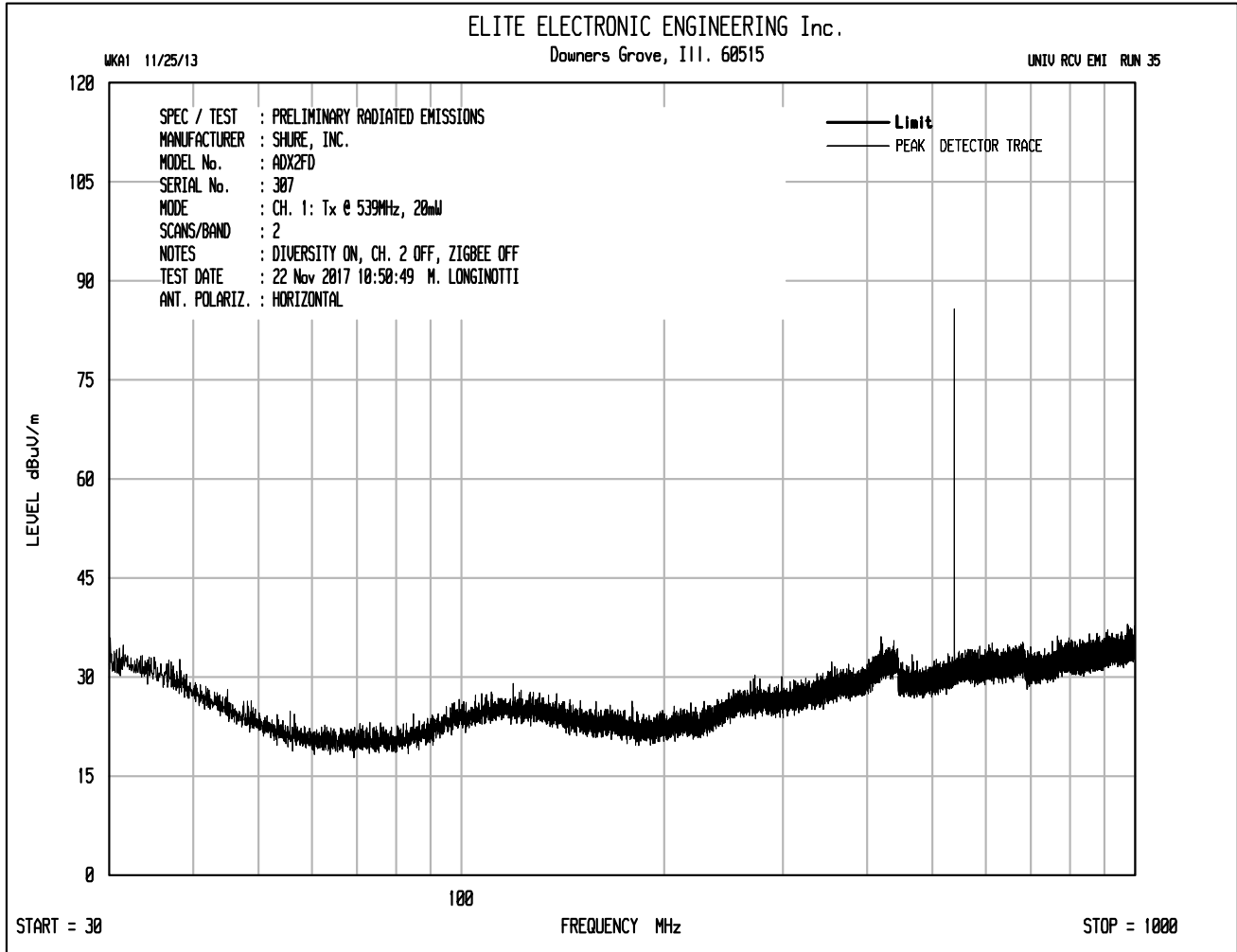


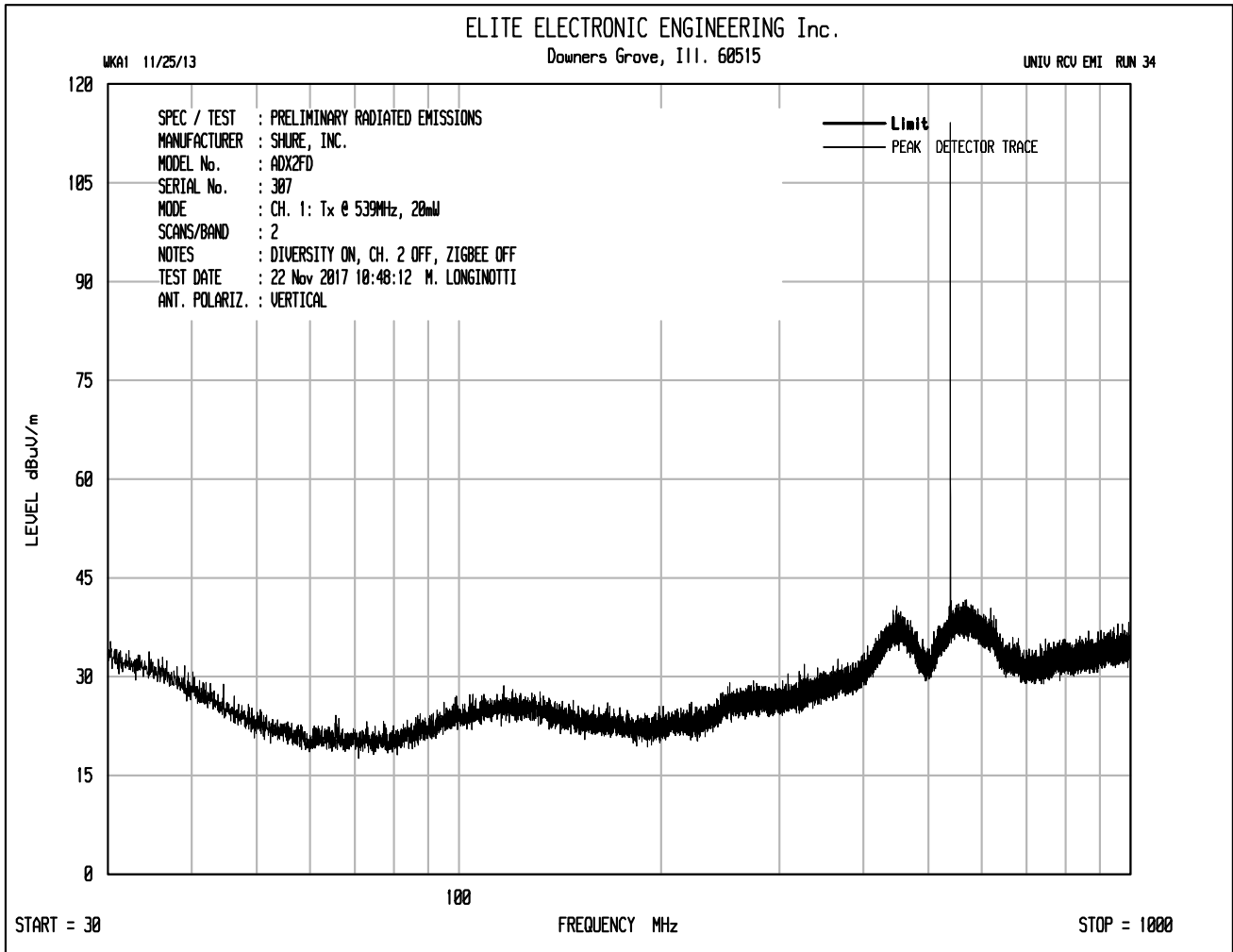
MANUFACTURER : Shure Incorporated
 MODEL NO. : ADX2FD
 SERIAL NO. : 307
 SPECIFICATION : FCC 74.861(e)(6)(iii) Spurious Radiated Emissions
 DATE : November 22, 2017 through November 28, 2017
 MODE : Transmit at 539.000MHz, 2mW nominal power
 UNIT : G57
 EQUIPMENT USED : NTA3, NWQ0, RBG2, NWQ2, GRE2, CDX8
 NOTES : Channel 1 On, Channel 2 Off, Diversity On, Zigbee Off

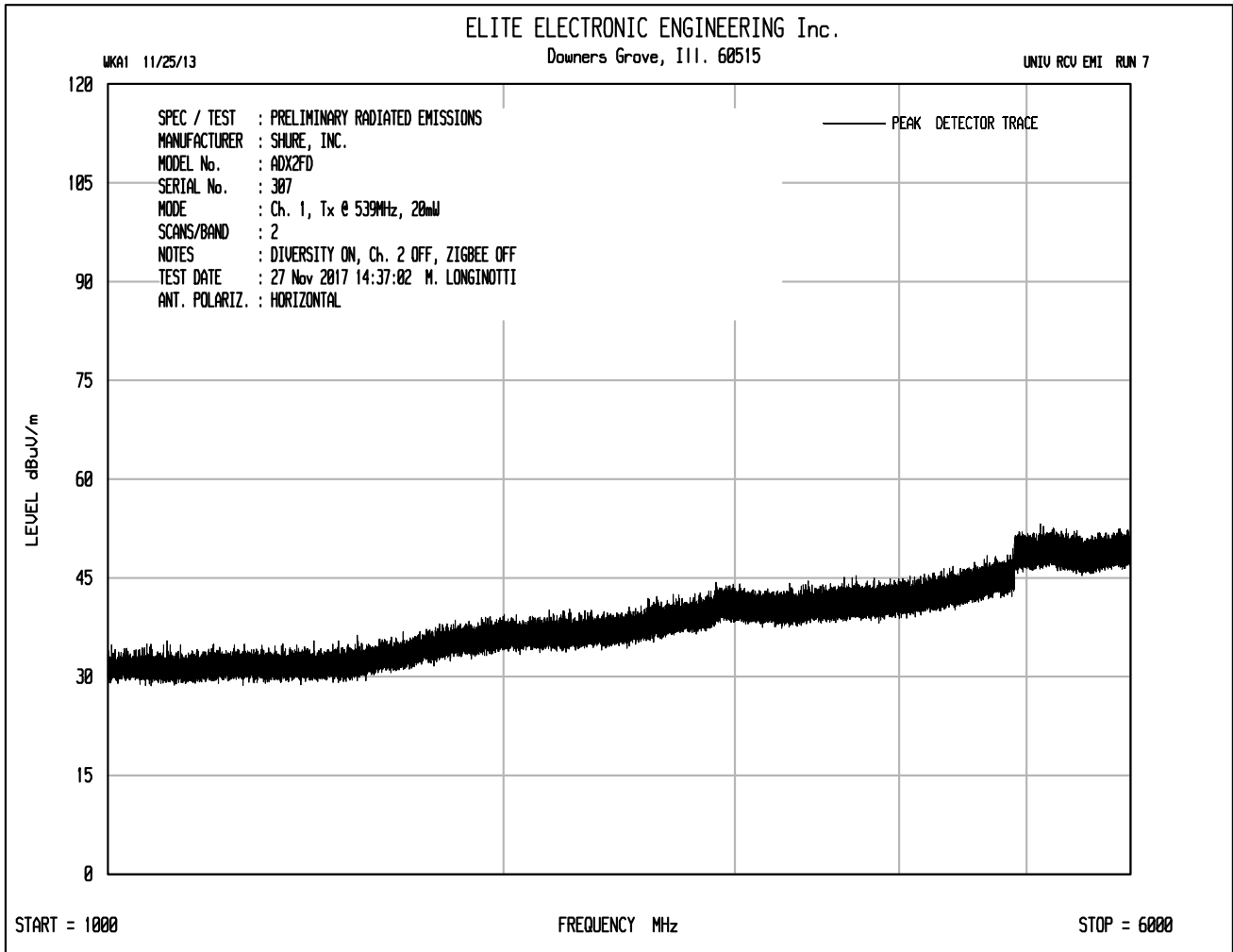
Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	ERP (dBm)	Attenuation Below Output Power (dB)	Minimum Attenuation (dB)
1078.00	H	-0.7	Ambient	-71.1	0.3	2.2	-73.1	76.1	16.0
1078.00	V	-0.6	Ambient	-69.6	0.3	2.2	-71.6	74.6	16.0
1617.00	H	-0.1	Ambient	-72.1	3.4	2.8	-71.5	74.5	16.0
1617.00	V	-0.2	Ambient	-68.3	3.4	2.8	-67.7	70.7	16.0
2156.00	H	0.6	Ambient	-65.1	3.0	3.2	-65.3	68.3	16.0
2156.00	V	0.6	Ambient	-63.8	3.0	3.2	-64.0	67.0	16.0
2695.00	H	1.3	Ambient	-64.4	4.2	3.7	-63.9	66.9	16.0
2695.00	V	1.3	Ambient	-63.0	4.2	3.7	-62.5	65.5	16.0
3234.00	H	1.8	Ambient	-63.5	5.2	4.0	-62.4	65.4	16.0
3234.00	V	1.8	Ambient	-61.7	5.2	4.0	-60.6	63.6	16.0
3773.00	H	2.1	Ambient	-61.1	6.4	4.3	-59.1	62.1	16.0
3773.00	V	2.1	Ambient	-60.6	6.4	4.3	-58.6	61.6	16.0
4312.00	H	2.5	Ambient	-60.0	7.0	4.6	-57.6	60.6	16.0
4312.00	V	2.5	Ambient	-59.8	7.0	4.6	-57.4	60.4	16.0
4851.00	H	3.5	Ambient	-57.3	7.7	4.9	-54.5	57.5	16.0
4851.00	V	3.4	Ambient	-56.6	7.7	4.9	-53.8	56.8	16.0
5390.00	H	6.5	Ambient	-53.3	7.9	5.1	-50.5	53.5	16.0
5390.00	V	6.5	Ambient	-54.0	7.9	5.1	-51.2	54.2	16.0

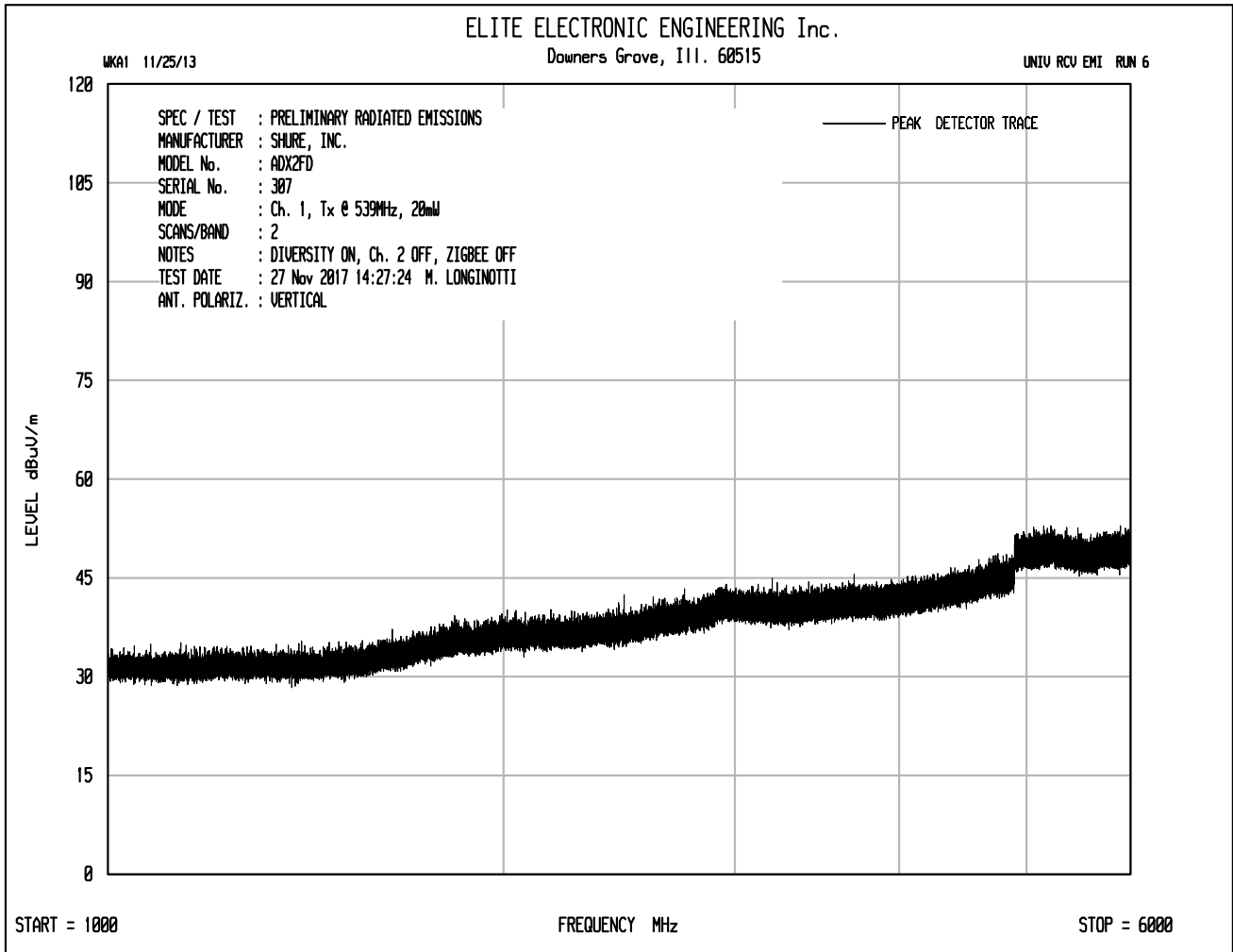
ERP (dBm) = Matched Sig. Gen. Reading (dBm) + Equivalent Antenna Gain (dB) – Cable Loss (dB)

Checked By: MARK E. LONGINOTTI
 Mark E. Longinotti









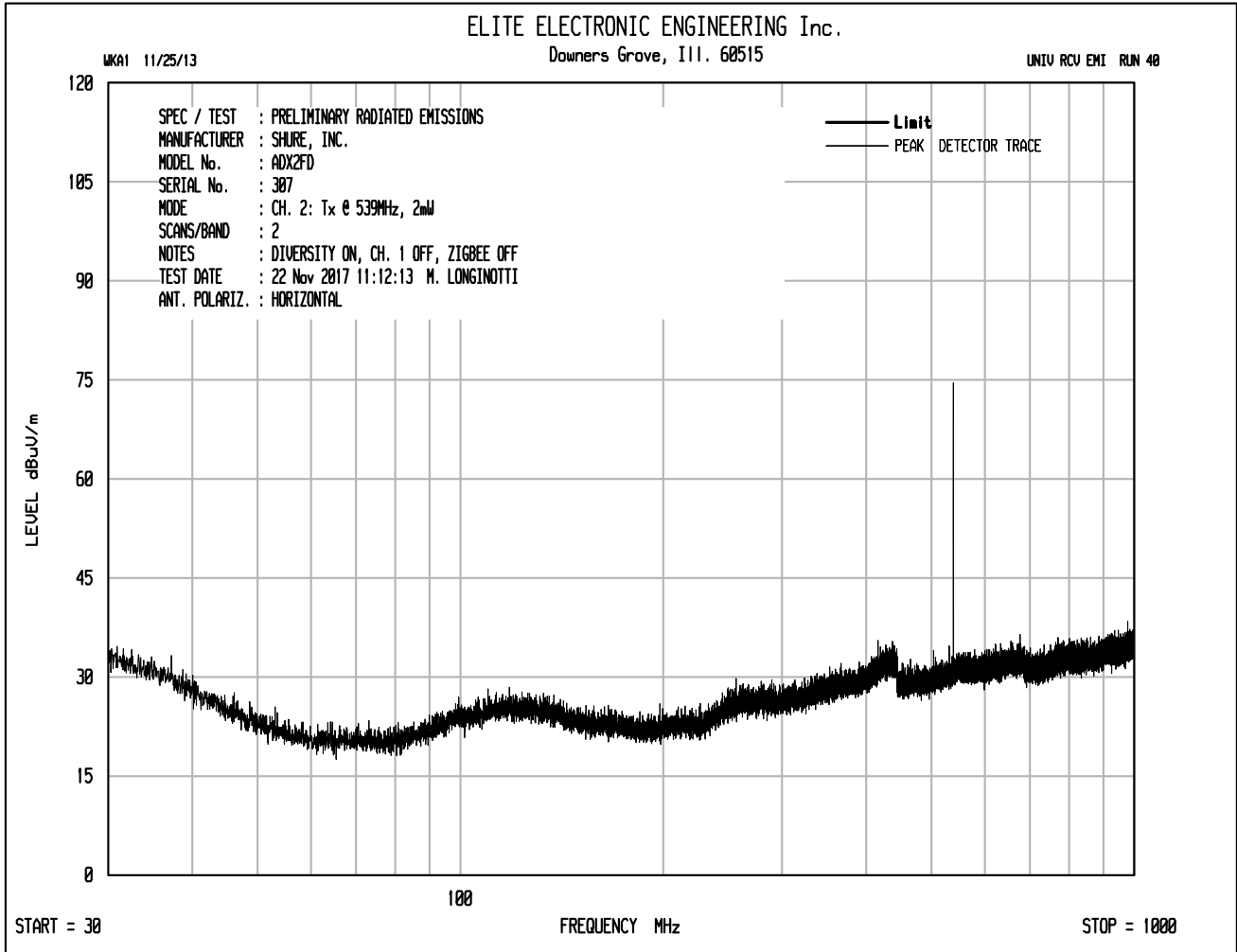


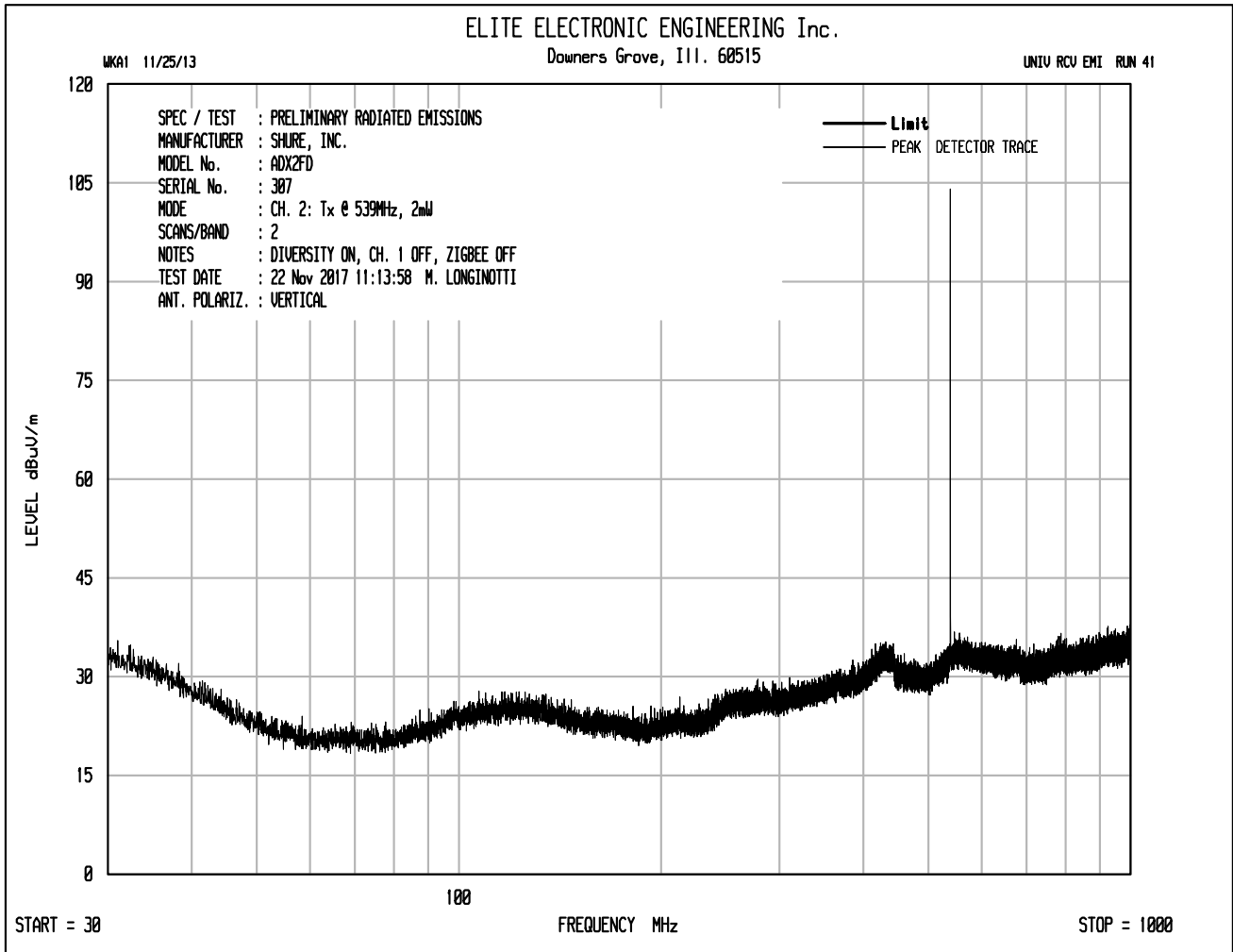
MANUFACTURER : Shure Incorporated
 MODEL NO. : ADX2FD
 SERIAL NO. : 307
 SPECIFICATION : FCC 74.861(e)(6)(iii) Spurious Radiated Emissions
 DATE : November 22, 2017 through November 27, 2107
 MODE : Transmit at 539.000MHz, 20mW nominal power
 UNIT : G57
 EQUIPMENT USED : NTA3, NWQ0, RBG2, NWQ2, GRE2, CDX8
 NOTES : Channel 1 On, Channel 2 Off, Diversity On, Zigbee Off

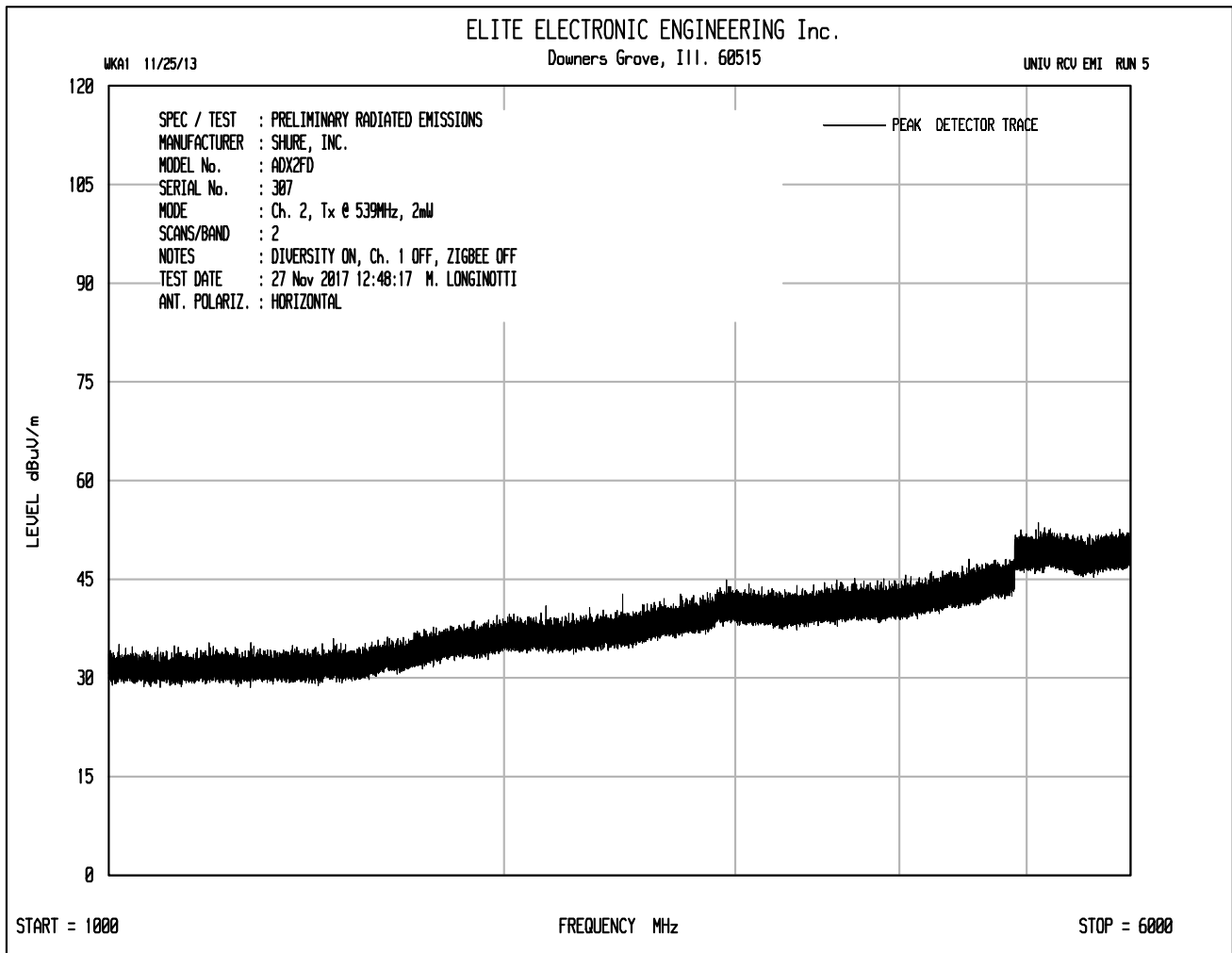
Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	ERP (dBm)	Attenuation Below Output Power (dB)	Minimum Attenuation (dB)
1078.00	H	-0.9	Ambient	-71.3	0.3	2.2	-73.3	86.3	26.0
1078.00	V	0.0	Ambient	-69.0	0.3	2.2	-71.0	84.0	26.0
1617.00	H	-0.4	Ambient	-71.8	3.4	2.8	-71.2	84.2	26.0
1617.00	V	-0.3	Ambient	-68.4	3.4	2.8	-67.8	80.8	26.0
2156.00	H	0.5	Ambient	-65.2	3.0	3.2	-65.4	78.4	26.0
2156.00	V	0.5	Ambient	-63.9	3.0	3.2	-64.1	77.1	26.0
2695.00	H	1.2	Ambient	-64.5	4.2	3.7	-64.0	77.0	26.0
2695.00	V	1.2	Ambient	-62.9	4.2	3.7	-62.4	75.4	26.0
3234.00	H	1.8	Ambient	-63.5	5.2	4.0	-62.4	75.4	26.0
3234.00	V	1.8	Ambient	-61.7	5.2	4.0	-60.6	73.6	26.0
3773.00	H	2.1	Ambient	-61.1	6.4	4.3	-59.1	72.1	26.0
3773.00	V	2.1	Ambient	-60.6	6.4	4.3	-58.6	71.6	26.0
4312.00	H	2.6	Ambient	-59.9	7.0	4.6	-57.5	70.5	26.0
4312.00	V	2.6	Ambient	-59.7	7.0	4.6	-57.3	70.3	26.0
4851.00	H	3.5	Ambient	-57.3	7.7	4.9	-54.5	67.5	26.0
4851.00	V	3.5	Ambient	-56.7	7.7	4.9	-53.9	66.9	26.0
5390.00	H	6.6	Ambient	-53.2	7.9	5.1	-50.4	63.4	26.0
5390.00	V	6.6	Ambient	-53.9	7.9	5.1	-51.1	64.1	26.0

ERP(dBm) = Matched Sig. Gen. Reading (dBm) + Equivalent Antenna Gain (dB) – Cable Loss (dB)

Checked By: MARK E. LONGINOTTI
 Mark E. Longinotti







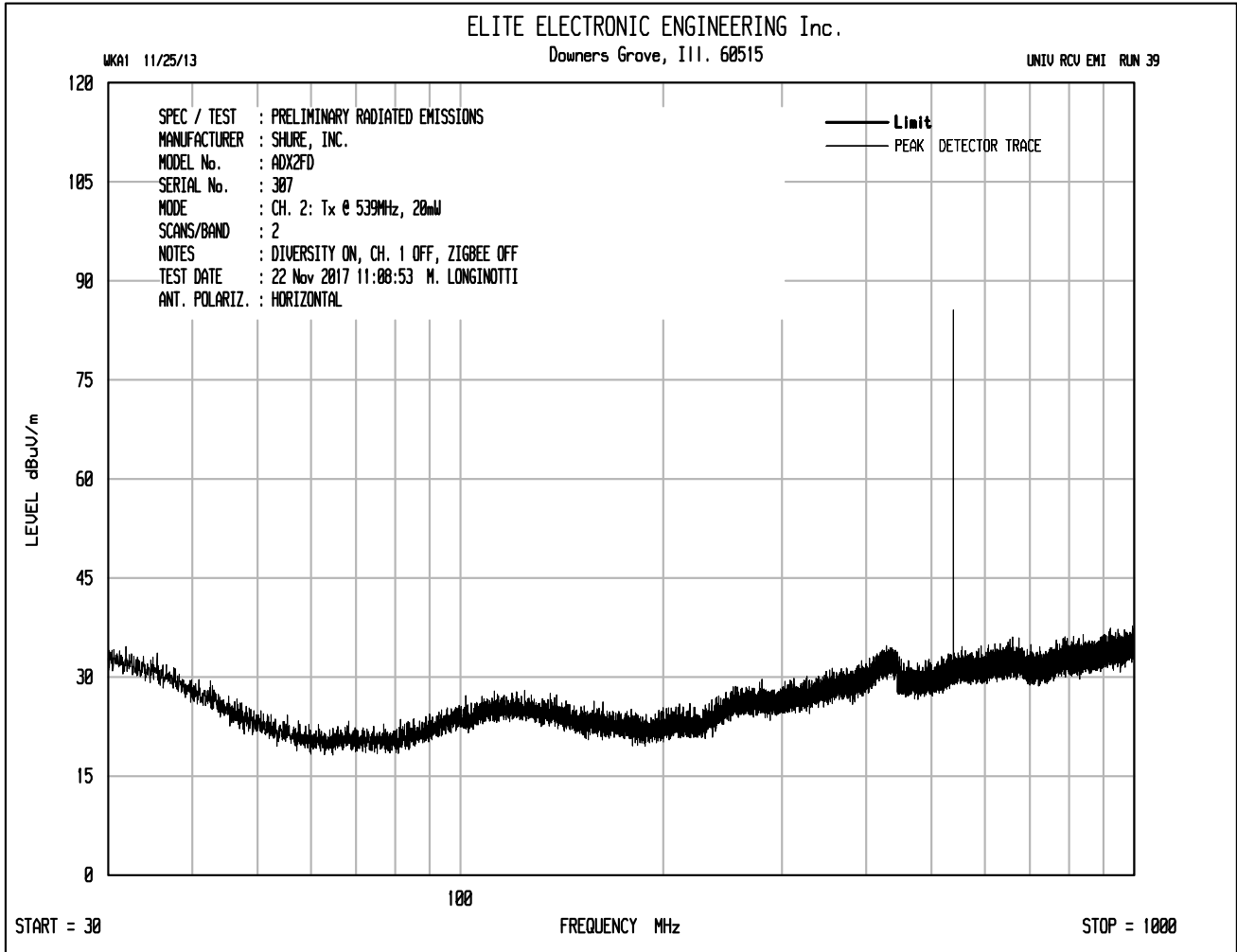


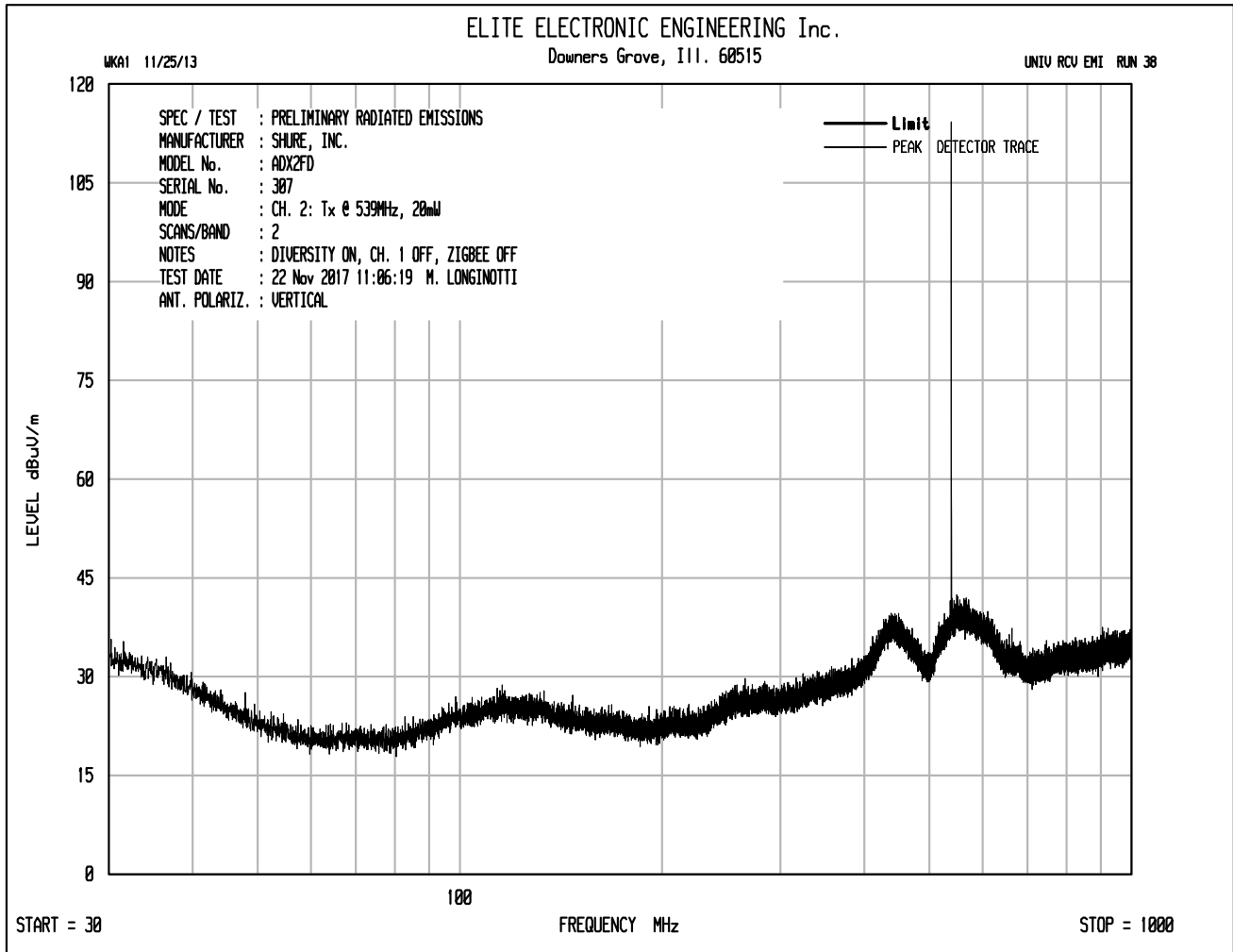
MANUFACTURER : Shure Incorporated
 MODEL NO. : ADX2FD
 SERIAL NO. : 307
 SPECIFICATION : FCC 74.861(e)(6)(iii) Spurious Radiated Emissions
 DATE : November 22, 2017 through November 27, 2017
 MODE : Transmit at 539.000MHz, 2mW nominal power
 UNIT : G57
 EQUIPMENT USED : NTA3, NWQ0, RBG2, NWQ2, GRE2, CDX8
 NOTES : Channel 1 Off, Channel 2 On, Diversity On, Zigbee Off

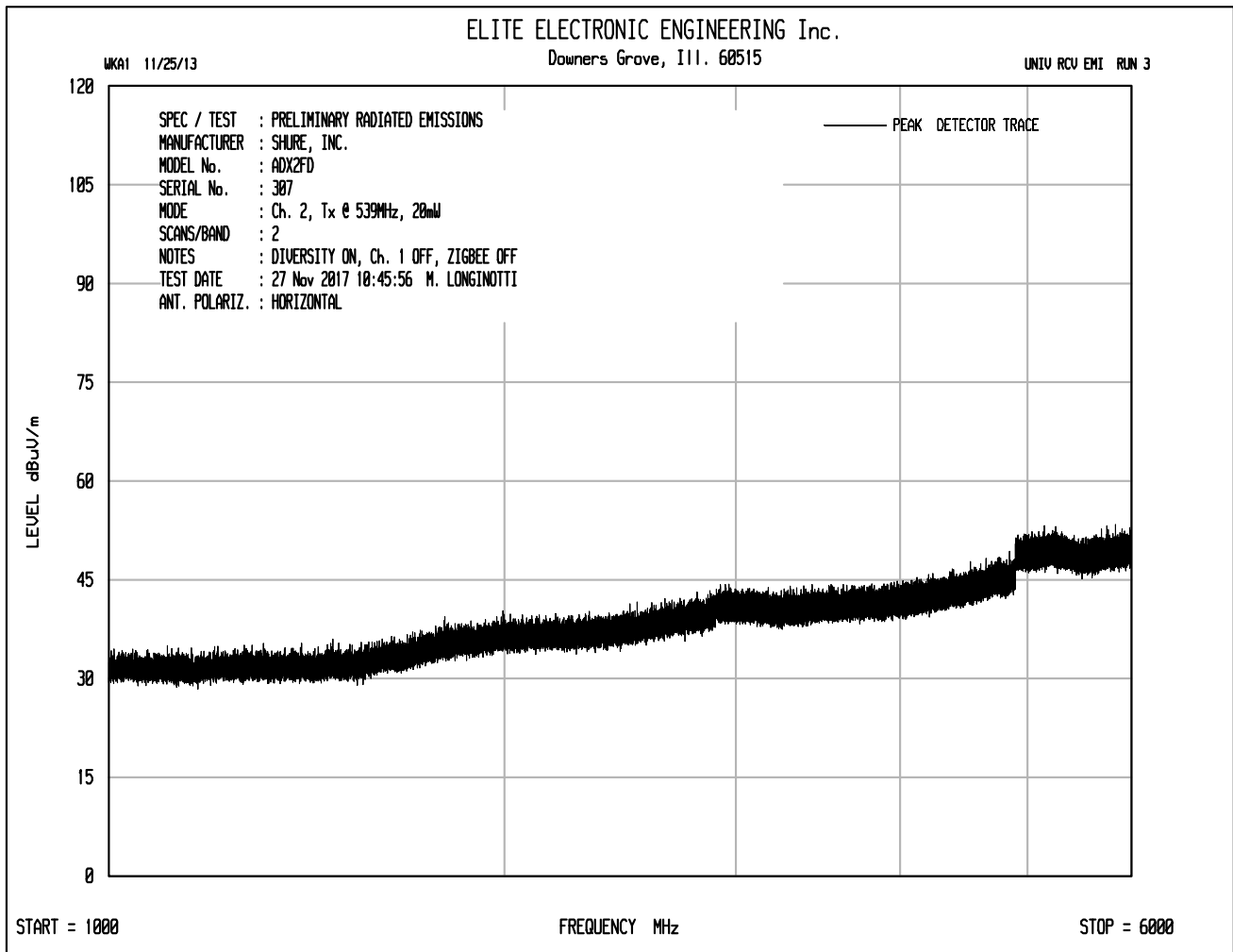
Freq. MHz	Ant Pol	Meter Reading (dBUV)	Ambient	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	ERP (dBm)	Attenuation Below Output Power (dB)	Minimum Attenuation (dB)
1078.00	H	-0.9	Ambient	-71.3	0.3	2.2	-73.3	76.3	16.0
1078.00	V	-0.8	Ambient	-69.8	0.3	2.2	-71.8	74.8	16.0
1617.00	H	-0.4	Ambient	-71.8	3.4	2.8	-71.2	74.2	16.0
1617.00	V	-0.4	Ambient	-68.5	3.4	2.8	-67.9	70.9	16.0
2156.00	H	0.4	Ambient	-65.3	3.0	3.2	-65.5	68.5	16.0
2156.00	V	0.5	Ambient	-63.9	3.0	3.2	-64.1	67.1	16.0
2695.00	H	1.2	Ambient	-64.5	4.2	3.7	-64.0	67.0	16.0
2695.00	V	1.2	Ambient	-63.1	4.2	3.7	-62.6	65.6	16.0
3234.00	H	1.7	Ambient	-63.6	5.2	4.0	-62.5	65.5	16.0
3234.00	V	1.7	Ambient	-61.8	5.2	4.0	-60.7	63.7	16.0
3773.00	H	2.1	Ambient	-61.1	6.4	4.3	-59.1	62.1	16.0
3773.00	V	2.1	Ambient	-60.6	6.4	4.3	-58.6	61.6	16.0
4312.00	H	2.5	Ambient	-60.0	7.0	4.6	-57.6	60.6	16.0
4312.00	V	2.5	Ambient	-59.8	7.0	4.6	-57.4	60.4	16.0
4851.00	H	3.5	Ambient	-57.3	7.7	4.9	-54.5	57.5	16.0
4851.00	V	3.5	Ambient	-56.5	7.7	4.9	-53.7	56.7	16.0
5390.00	H	6.5	Ambient	-53.3	7.9	5.1	-50.5	53.5	16.0
5390.00	V	6.5	Ambient	-54.0	7.9	5.1	-51.2	54.2	16.0

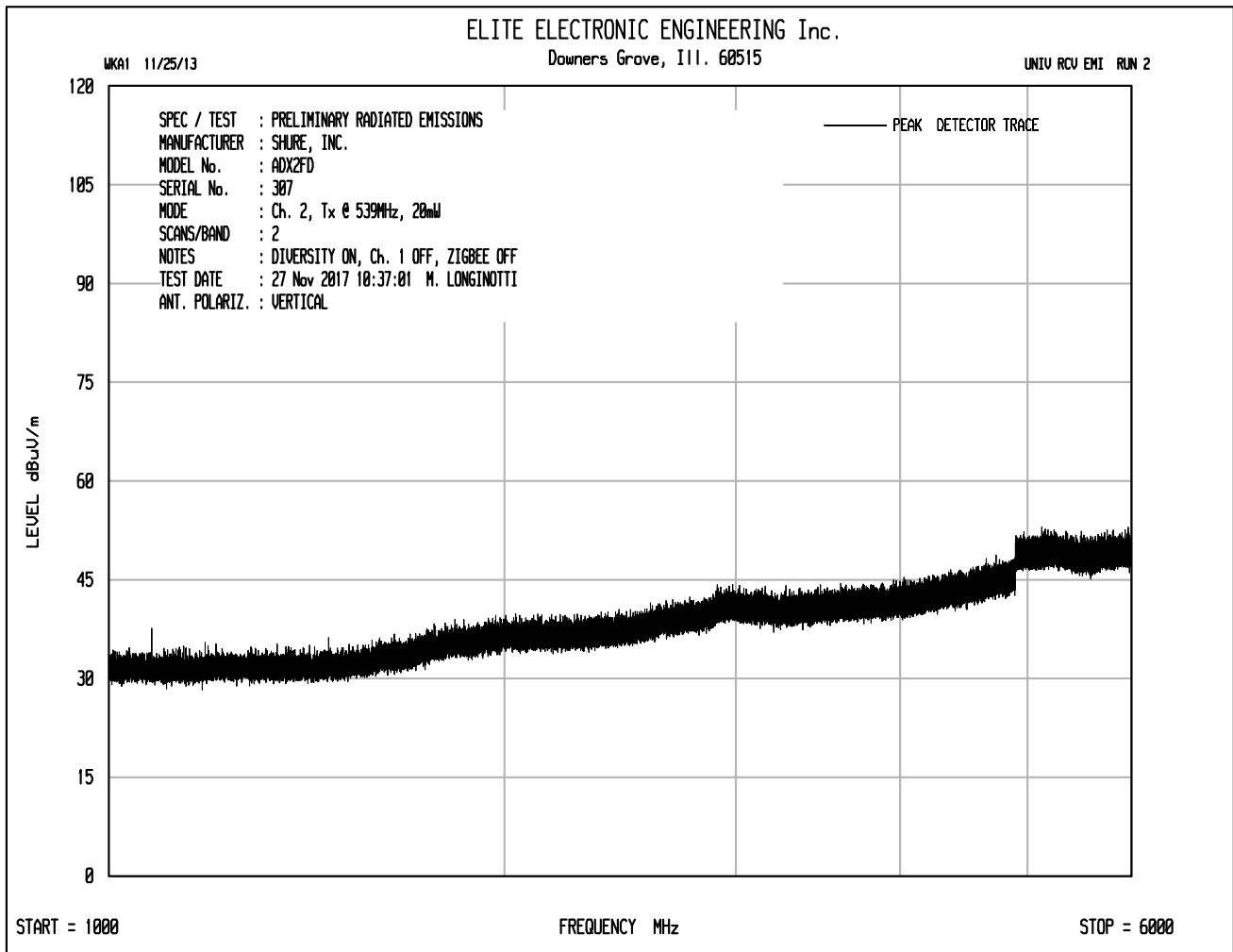
ERP (dBm) = Matched Sig. Gen. Reading (dBm) + Equivalent Antenna Gain (dB) – Cable Loss (dB)

Checked By: MARK E. LONGINOTTI
 Mark E. Longinotti









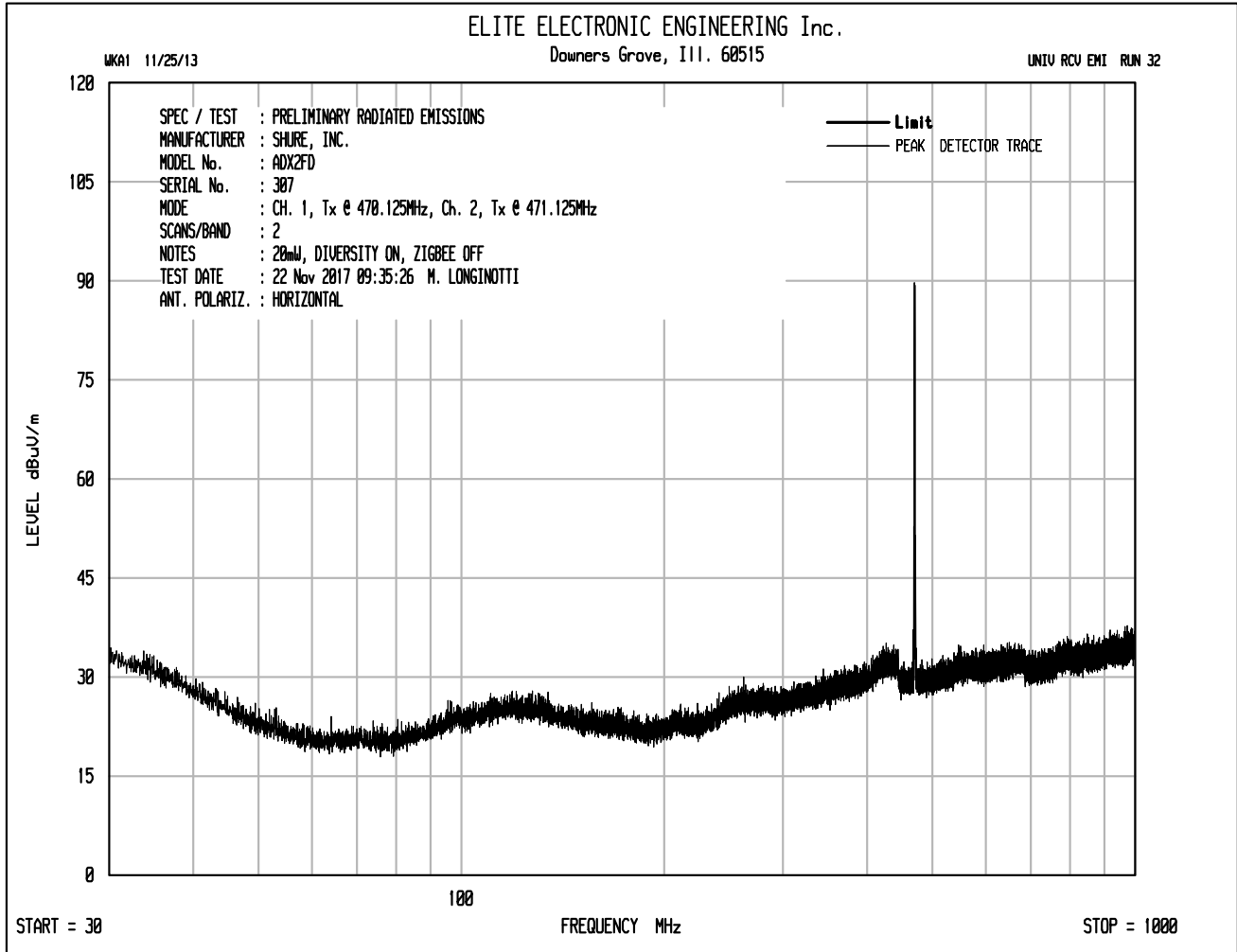


MANUFACTURER : Shure Incorporated
 MODEL NO. : ADX2FD
 SERIAL NO. : 307
 SPECIFICATION : FCC 74.861(e)(6)(iii) Spurious Radiated Emissions
 DATE : November 22, 2017 through November 27, 2017
 MODE : Transmit at 539.000MHz, 20mW nominal power
 UNIT : G57
 EQUIPMENT USED : NTA3, NWQ0, RBG2, NWQ2, GRE2, CDX8
 NOTES : Channel 1 Off, Channel 2 On, Diversity On, Zigbee Off

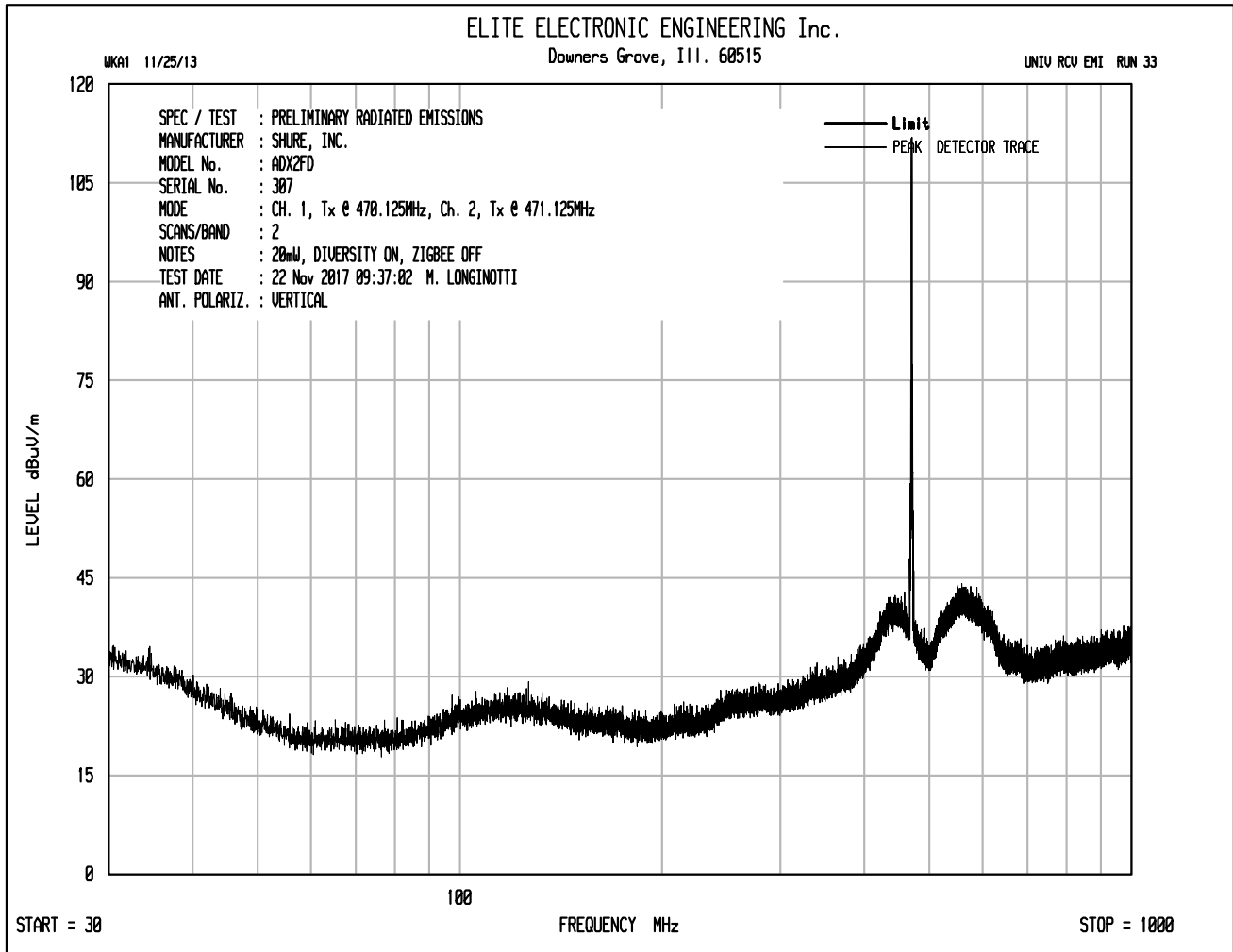
Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	ERP (dBm)	Attenuation Below Output Power (dB)	Minimum Attenuation (dB)
1078.00	H	-0.8	Ambient	-71.2	0.3	2.2	-73.2	86.2	26.0
1078.00	V	1.5		-67.5	0.3	2.2	-69.5	82.5	26.0
1617.00	H	-0.2	Ambient	-72.2	3.4	2.8	-71.6	84.6	26.0
1617.00	V	-0.2	Ambient	-68.3	3.4	2.8	-67.7	80.7	26.0
2156.00	H	0.6	Ambient	-65.1	3.0	3.2	-65.3	78.3	26.0
2156.00	V	0.6	Ambient	-63.8	3.0	3.2	-64.0	77.0	26.0
2695.00	H	1.3	Ambient	-64.4	4.2	3.7	-63.9	76.9	26.0
2695.00	V	1.3	Ambient	-63.0	4.2	3.7	-62.5	75.5	26.0
3234.00	H	1.8	Ambient	-63.5	5.2	4.0	-62.4	75.4	26.0
3234.00	V	1.9	Ambient	-61.6	5.2	4.0	-60.5	73.5	26.0
3773.00	H	2.2	Ambient	-61.0	6.4	4.3	-59.0	72.0	26.0
3773.00	V	2.2	Ambient	-60.5	6.4	4.3	-58.5	71.5	26.0
4312.00	H	2.6	Ambient	-59.9	7.0	4.6	-57.5	70.5	26.0
4312.00	V	2.6	Ambient	-59.7	7.0	4.6	-57.3	70.3	26.0
4851.00	H	3.5	Ambient	-57.3	7.7	4.9	-54.5	67.5	26.0
4851.00	V	3.4	Ambient	-56.6	7.7	4.9	-53.8	66.8	26.0
5390.00	H	6.6	Ambient	-53.2	7.9	5.1	-50.4	63.4	26.0
5390.00	V	6.5	Ambient	-54.0	7.9	5.1	-51.2	64.2	26.0

ERP (dBm) = Matched Sig. Gen. Reading (dBm) + Equivalent Antenna Gain (dB) – Cable Loss (dB)

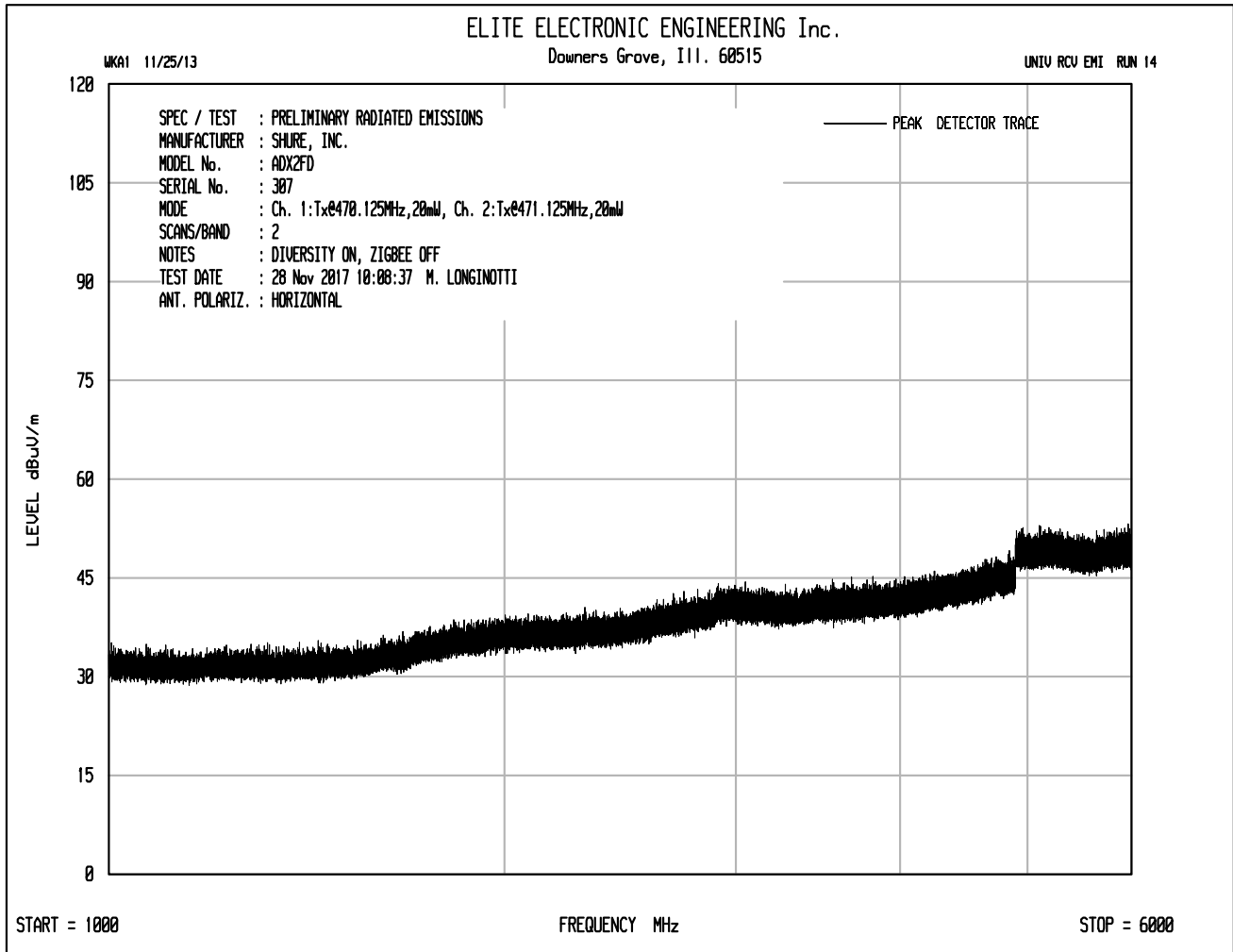
Checked By: MARK E. LONGINOTTI
 Mark E. Longinotti

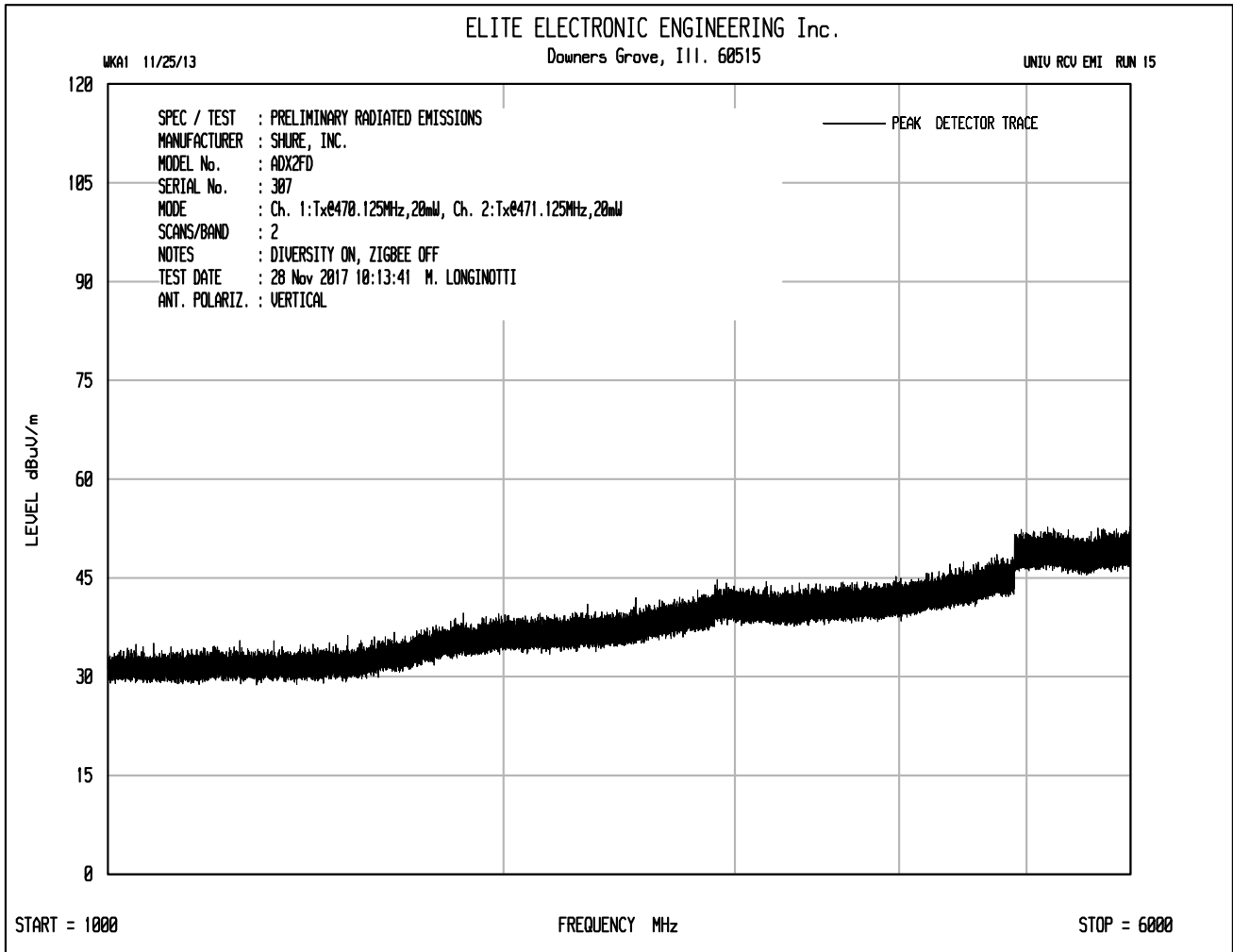


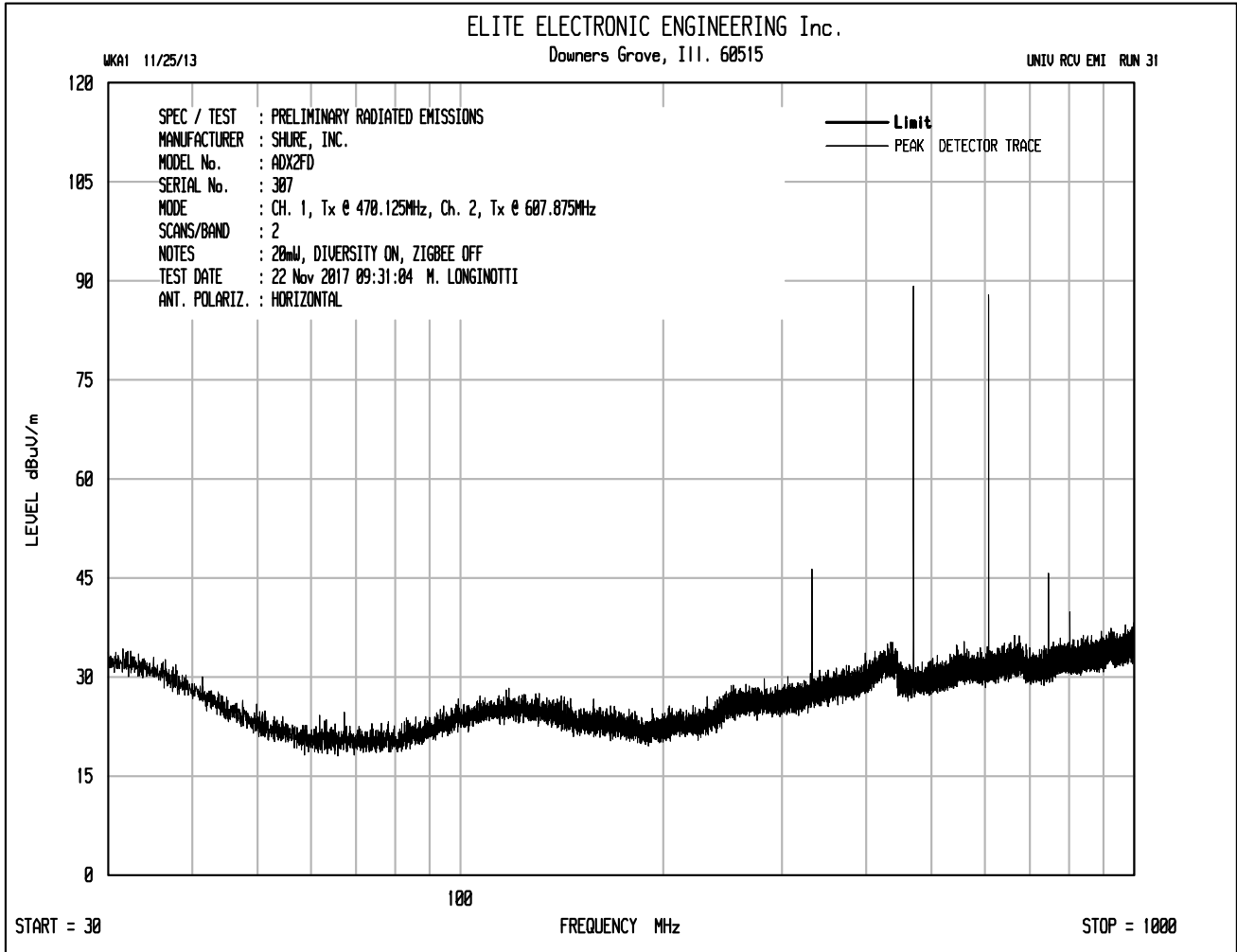
Plot shows emissions at 470.125MHz and 471.125MHz from UHF transmitters



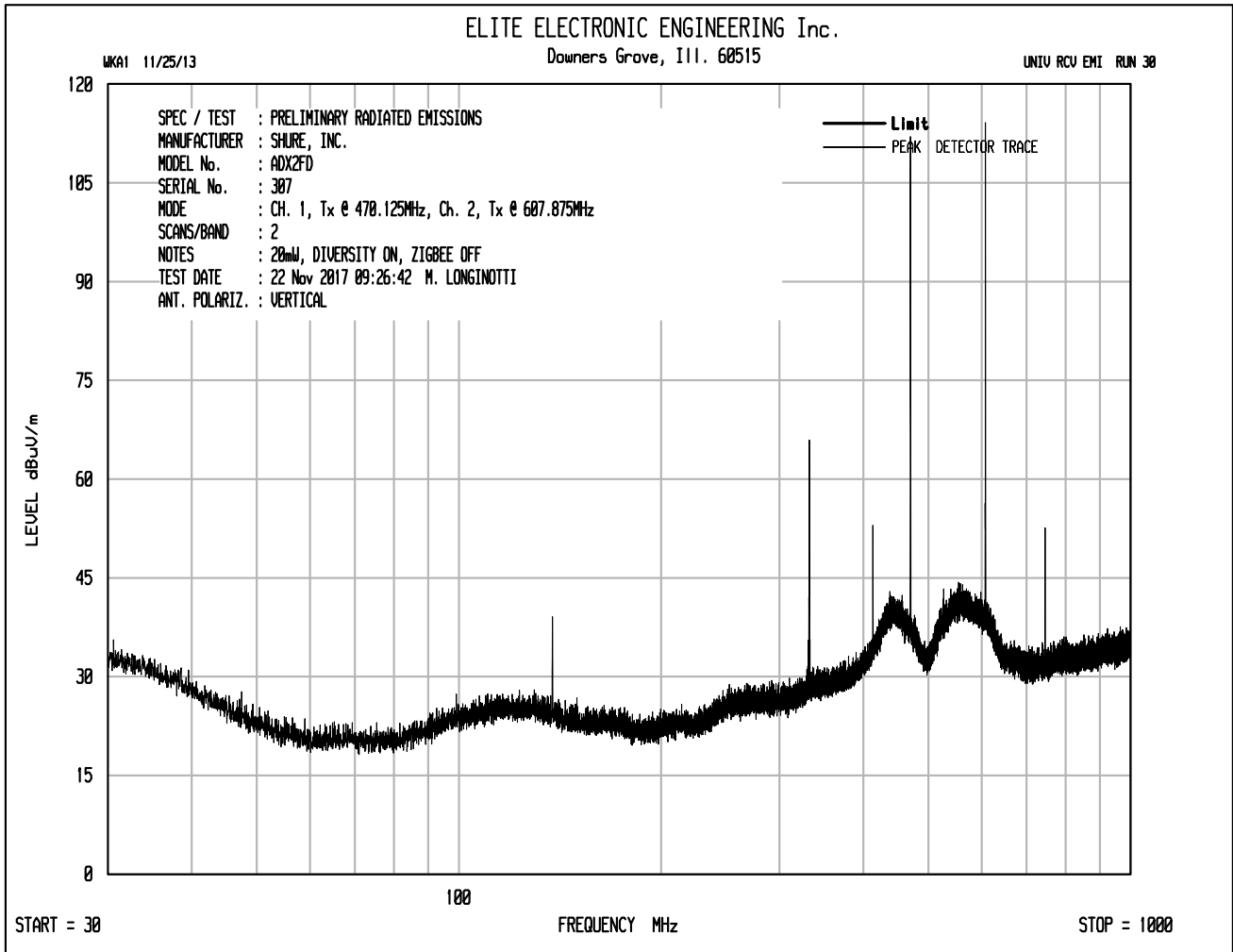
Plot shows emissions at 470.125MHz and 471.125MHz from UHF transmitters



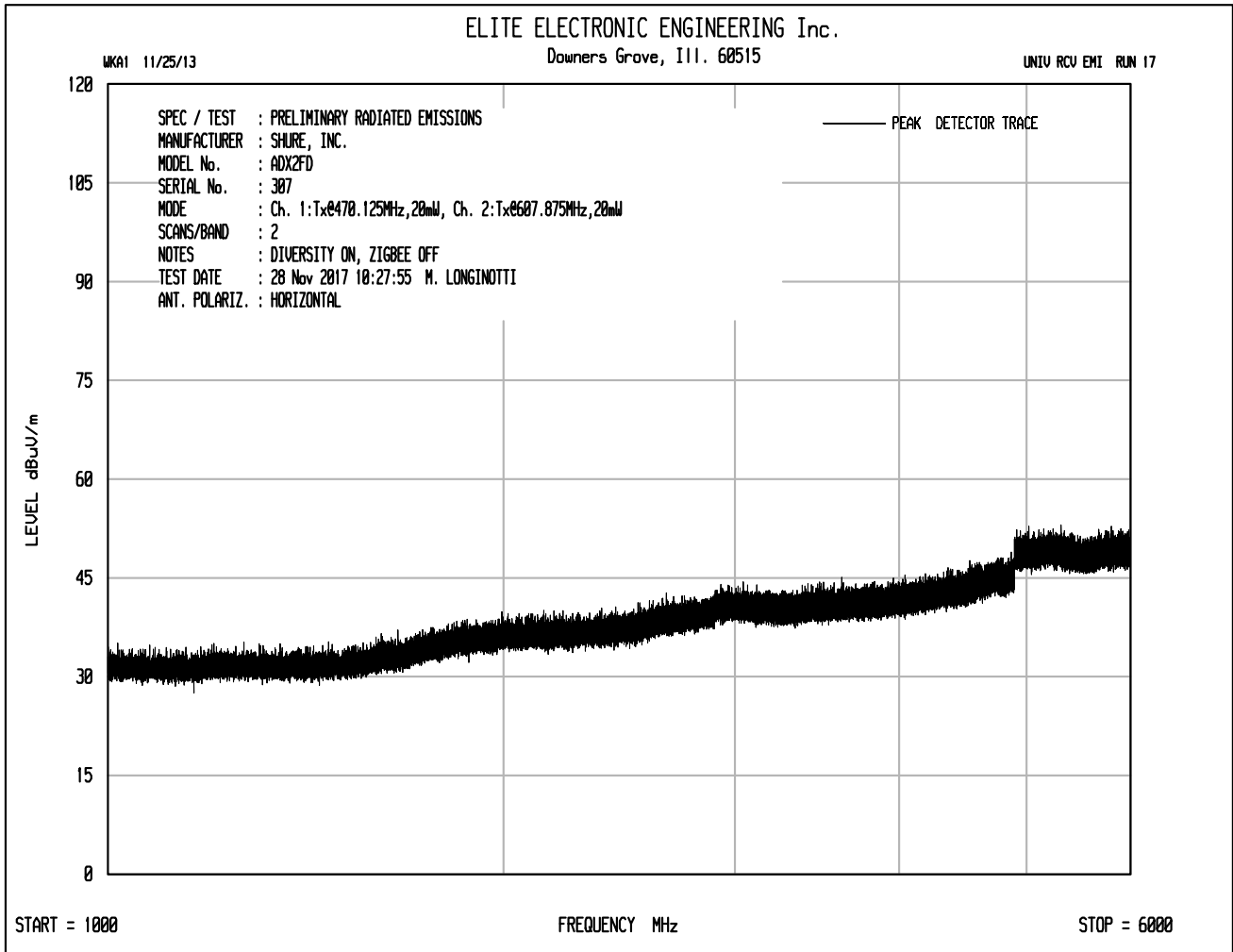


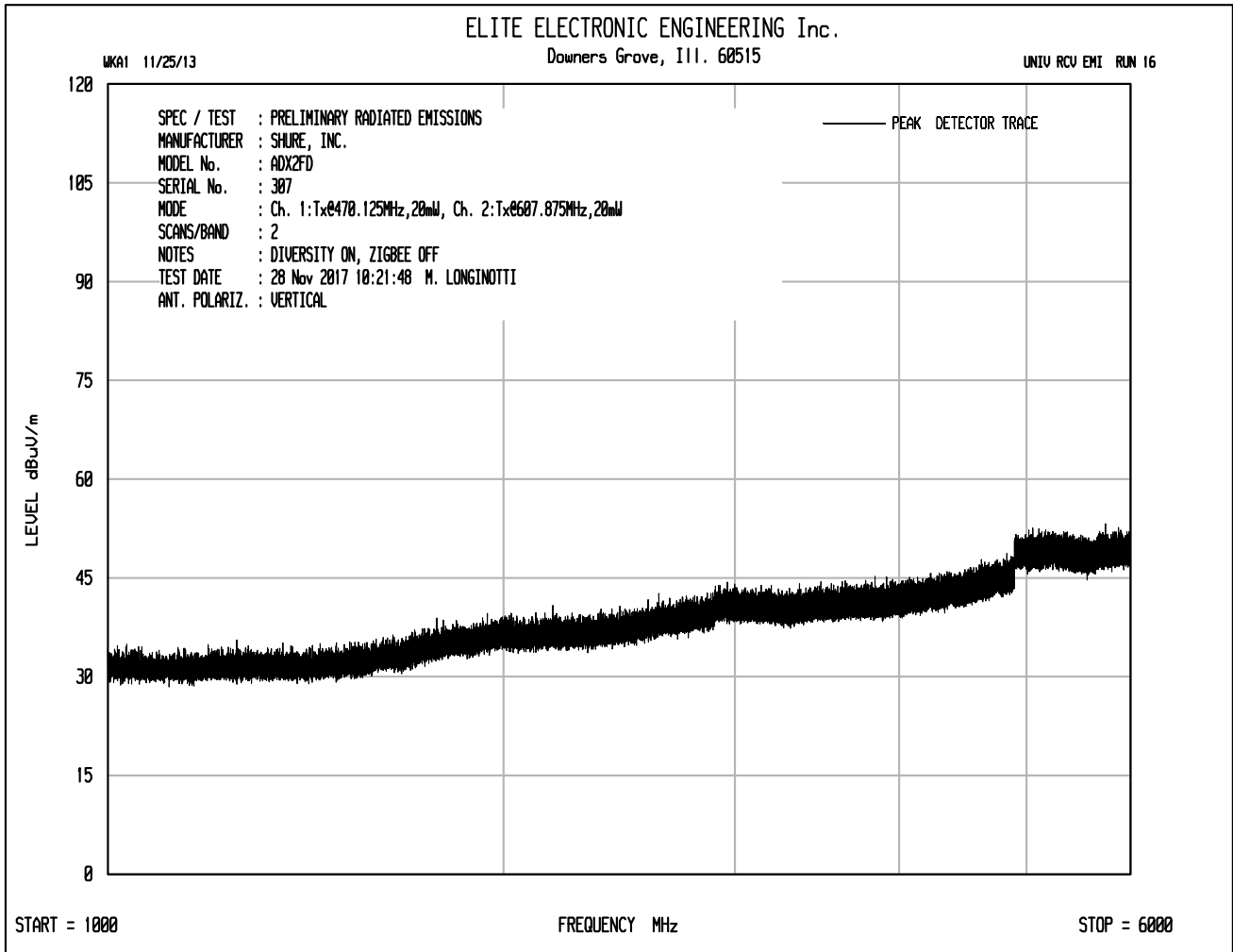


Plot shows emissions at 332.375MHz (2 x (470.125MHz) – (607.875MHz))
 Plot shows emissions at 470.125MHz from UHF transmitter.
 Plot shows emissions at 607.875MHz from UHF transmitter.
 Plot shows emissions at 745.625MHz (2 x (607.875MHz) -470.125MHz)



Plot shows emissions at 137.75MHz (607.875MHz – 470.125MHz)
 Plot shows emissions at 332.375MHz (2 x (470.125MHz) – (607.875MHz))
 Plot shows emissions at 413.25MHz (3 x (607.875MHz) – 3 x (470.125MHz))
 Plot shows emissions at 470.125MHz from UHF transmitter.
 Plot shows emissions at 607.875MHz from UHF transmitter.
 Plot shows emissions at 745.625MHz (2 x (607.875MHz) -470.125MHz)





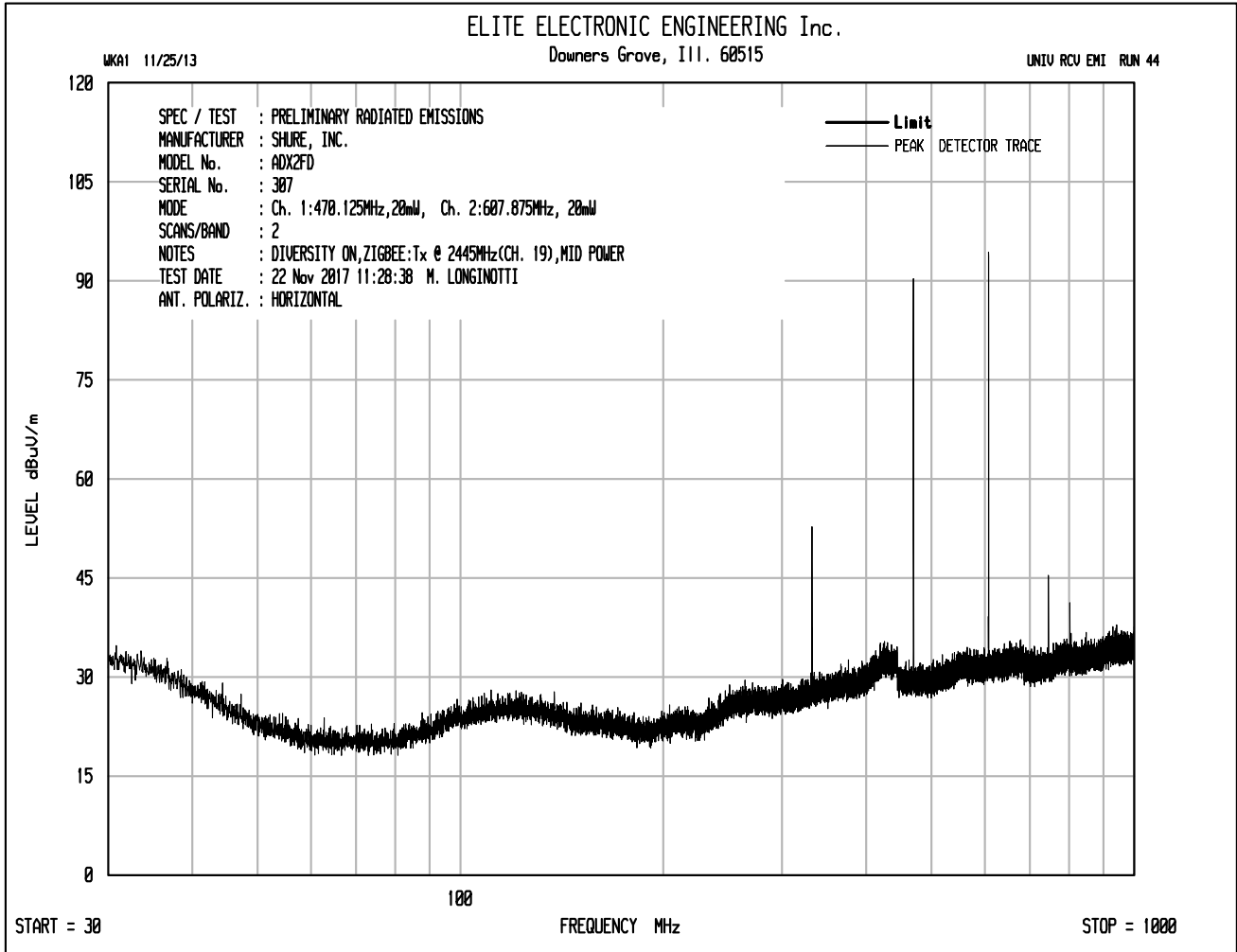


MANUFACTURER : Shure Incorporated
 MODEL NO. : ADX2FD
 SERIAL NO. : 307
 SPECIFICATION : FCC 74.861(e)(6)(iii) Spurious Radiated Emissions
 DATE : November 22, 2017 through November 28, 2017
 MODE : Ch. 1: Transmit at 470.125MHz, 20mW
 : Ch. 2: Transmit at 607.875MHz, 20mW,
 : Zigbee Transmit at 2445MHz (Ch. 19) mid power
 UNIT : G57
 EQUIPMENT USED : NTA3, NWQ0, RBG2, NWQ2, GRE2, CDX8
 NOTES : Channel 1 On, Channel 2 On, Diversity On, Zigbee On

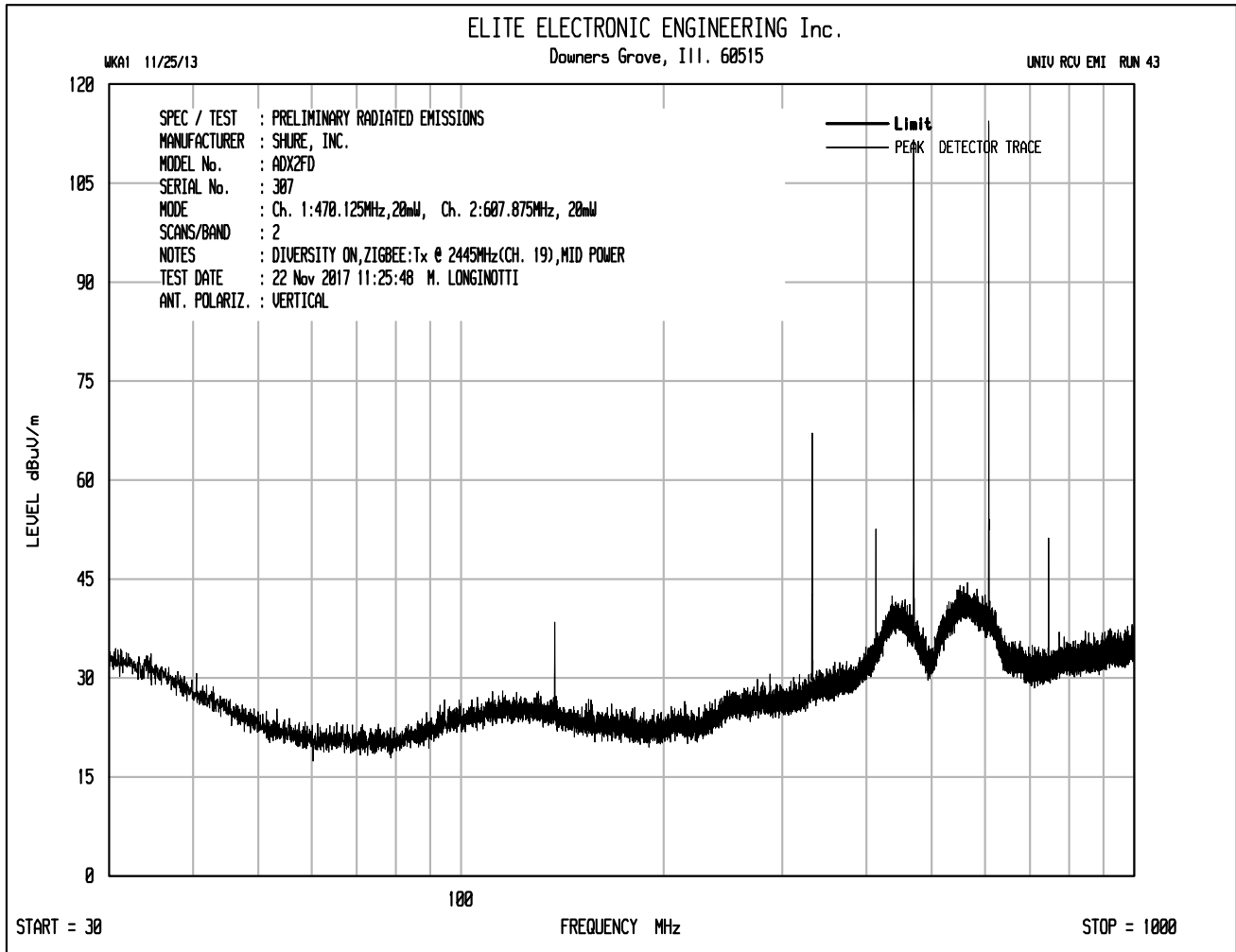
Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	ERP (dBm)	Attenuation Below Output Power (dB)	Minimum Attenuation (dB)
137.75	H	1.4		-85.0	0.0	0.8	-85.8	102.8	30.0
137.75	V	16.7		-65.8	0.0	0.8	-66.6	83.6	30.0
275.50	H	-2.0	Ambient	-85.4	0.0	1.1	-86.5	103.5	30.0
275.50	V	4.7		-73.4	0.0	1.1	-74.5	91.5	30.0
332.38	H	15.1		-66.2	0.0	1.2	-67.4	84.4	30.0
332.38	V	33.7		-45.3	0.0	1.2	-46.5	63.5	30.0
413.25	H	-0.4	Ambient	-79.6	0.0	1.4	-81.0	98.0	30.0
413.25	V	10.4		-66.2	0.0	1.4	-67.6	84.6	30.0
745.63	H	13.7		-61.2	0.0	1.9	-63.1	80.0	30.0
745.63	V	23.1		-48.8	0.0	1.9	-50.7	67.6	30.0

ERP (dBm) = Matched Sig. Gen. Reading (dBm) + Equivalent Antenna Gain (dB) – Cable Loss (dB)

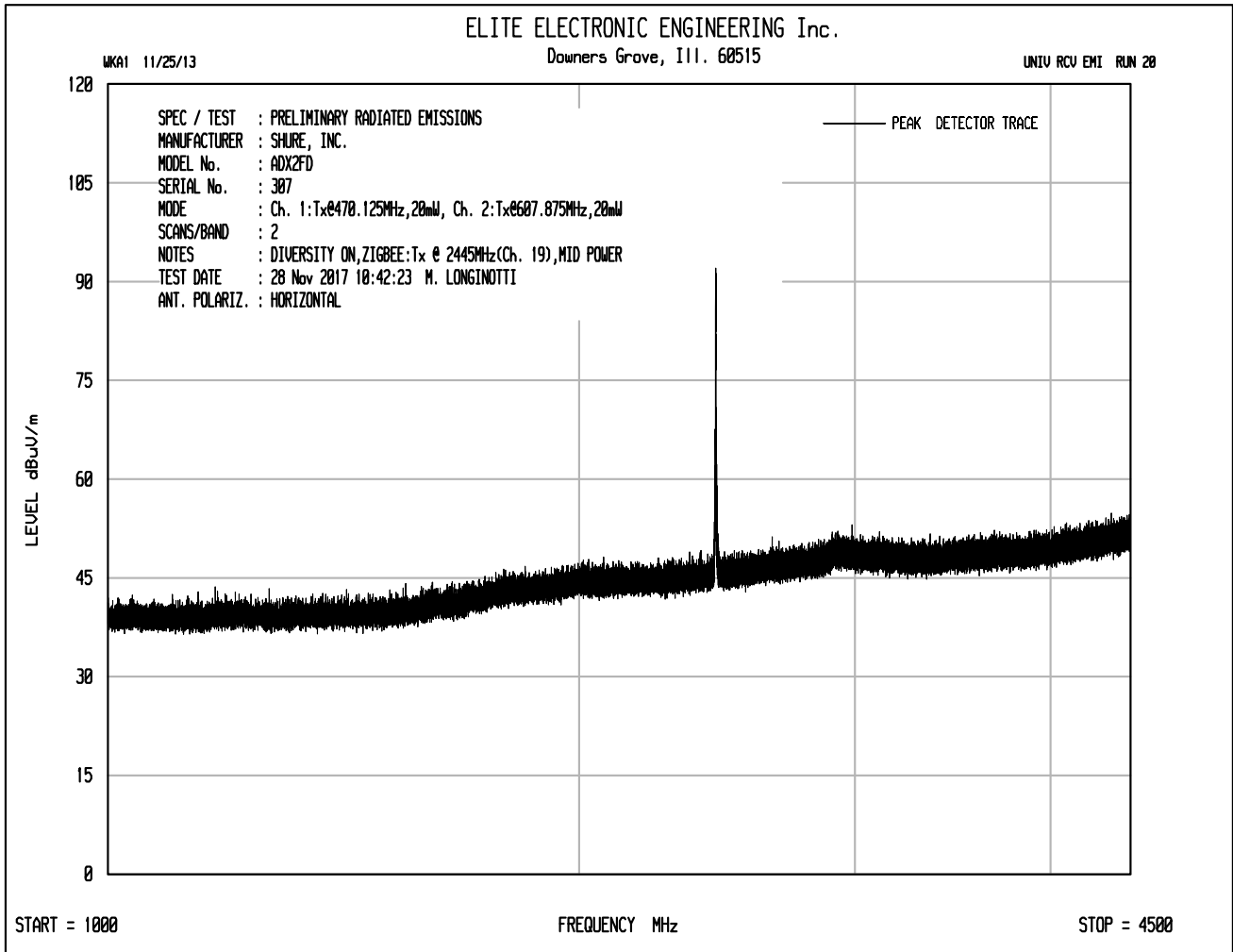
Checked By: MARK E. LONGINOTTI
 Mark E. Longinotti



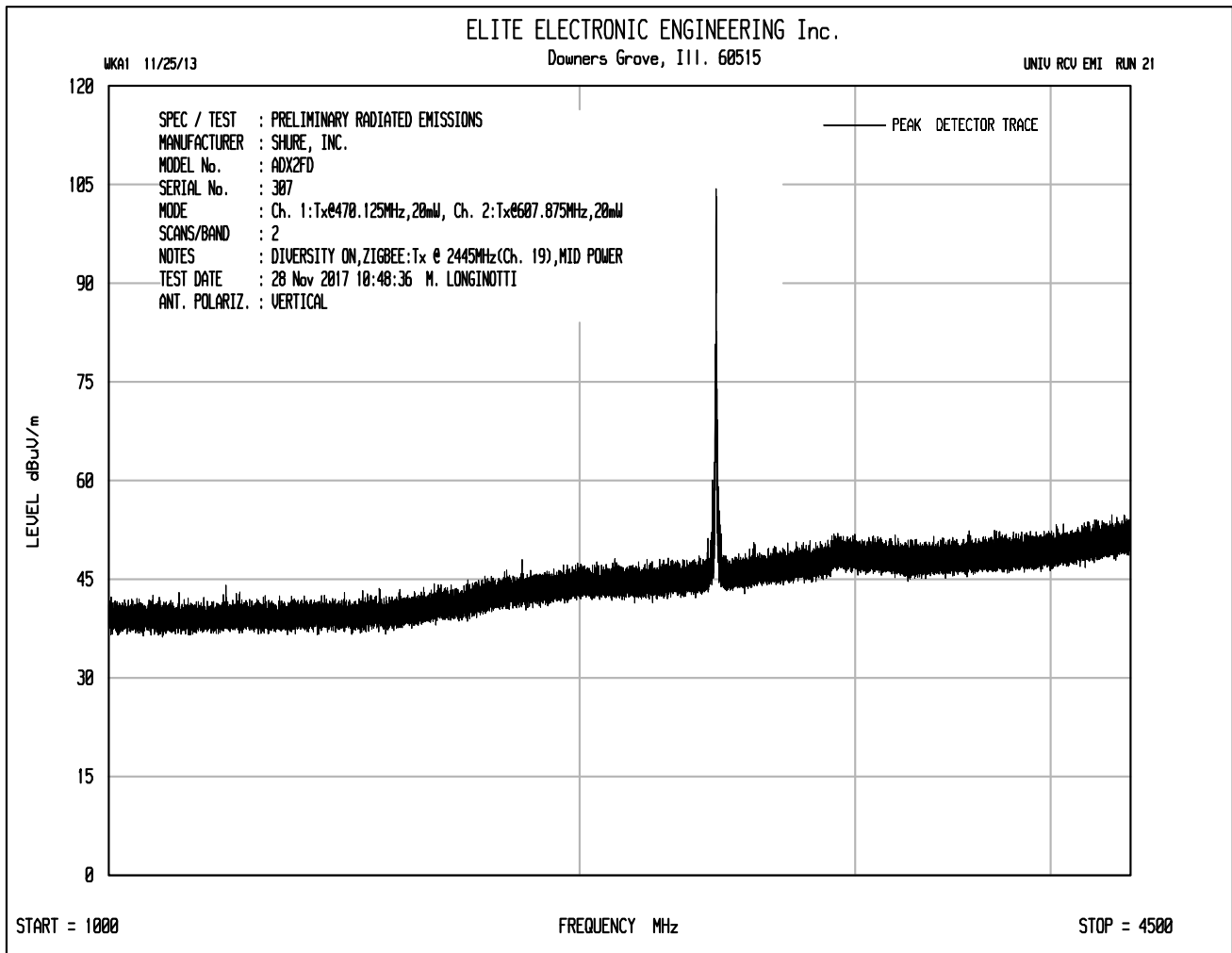
Plot shows emissions at 332.375MHz (2 x (470.125MHz) – (607.875MHz))
 Plot shows emissions at 470.125MHz from UHF transmitter.
 Plot shows emissions at 607.875MHz from UHF transmitter.
 Plot shows emissions at 745.625MHz (2 x (607.875MHz) -470.125MHz)



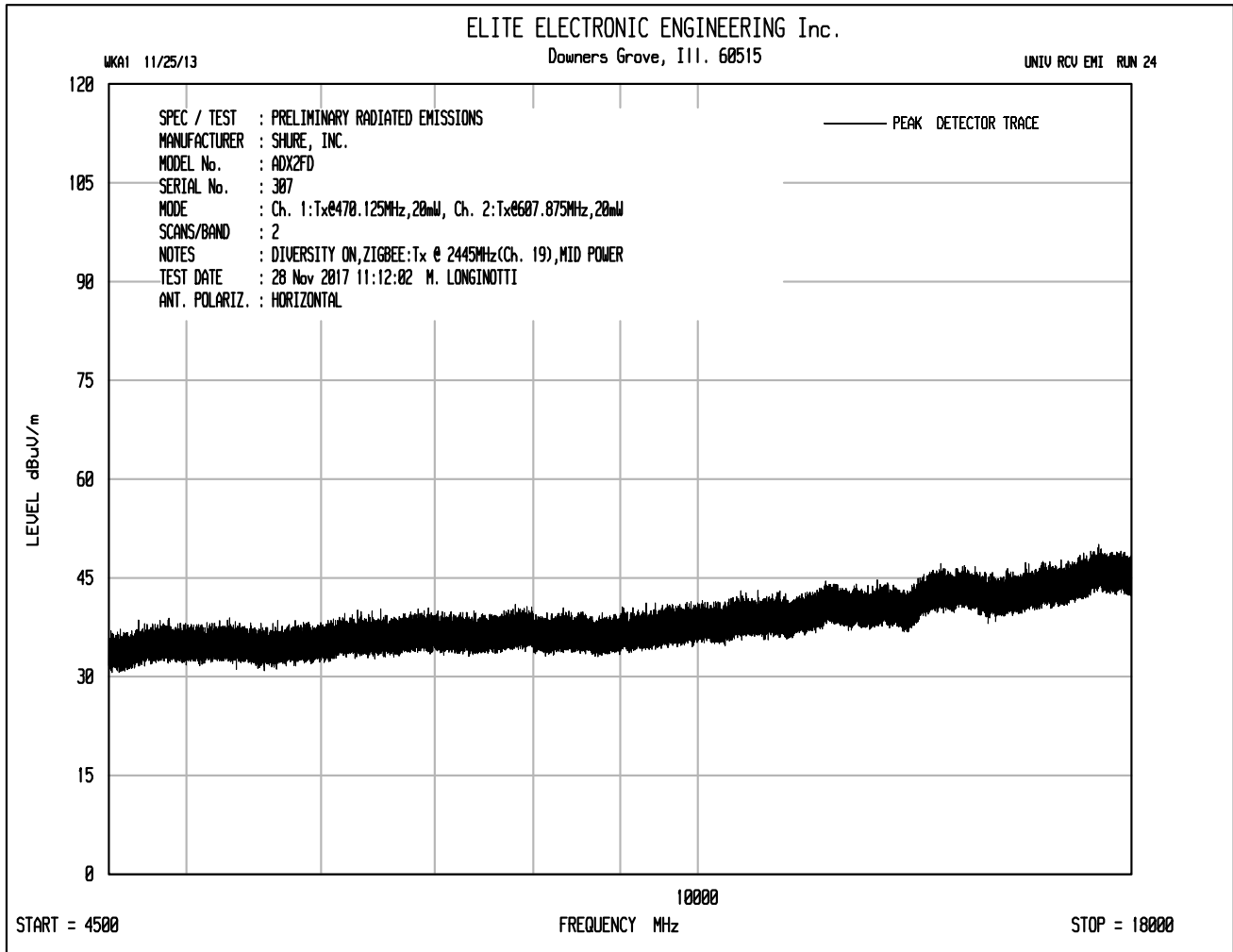
Plot shows emissions at 137.75MHz (607.875MHz – 470.125MHz)
 Plot shows emissions at 332.375MHz (2 x (470.125MHz) – (607.875MHz))
 Plot shows emissions at 413.25MHz (3 x (607.875MHz) – 3 x (470.125MHz))
 Plot shows emissions at 470.125MHz from UHF transmitter.
 Plot shows emissions at 607.875MHz from UHF transmitter.
 Plot shows emissions at 745.625MHz (2 x (607.875MHz) -470.125MHz)

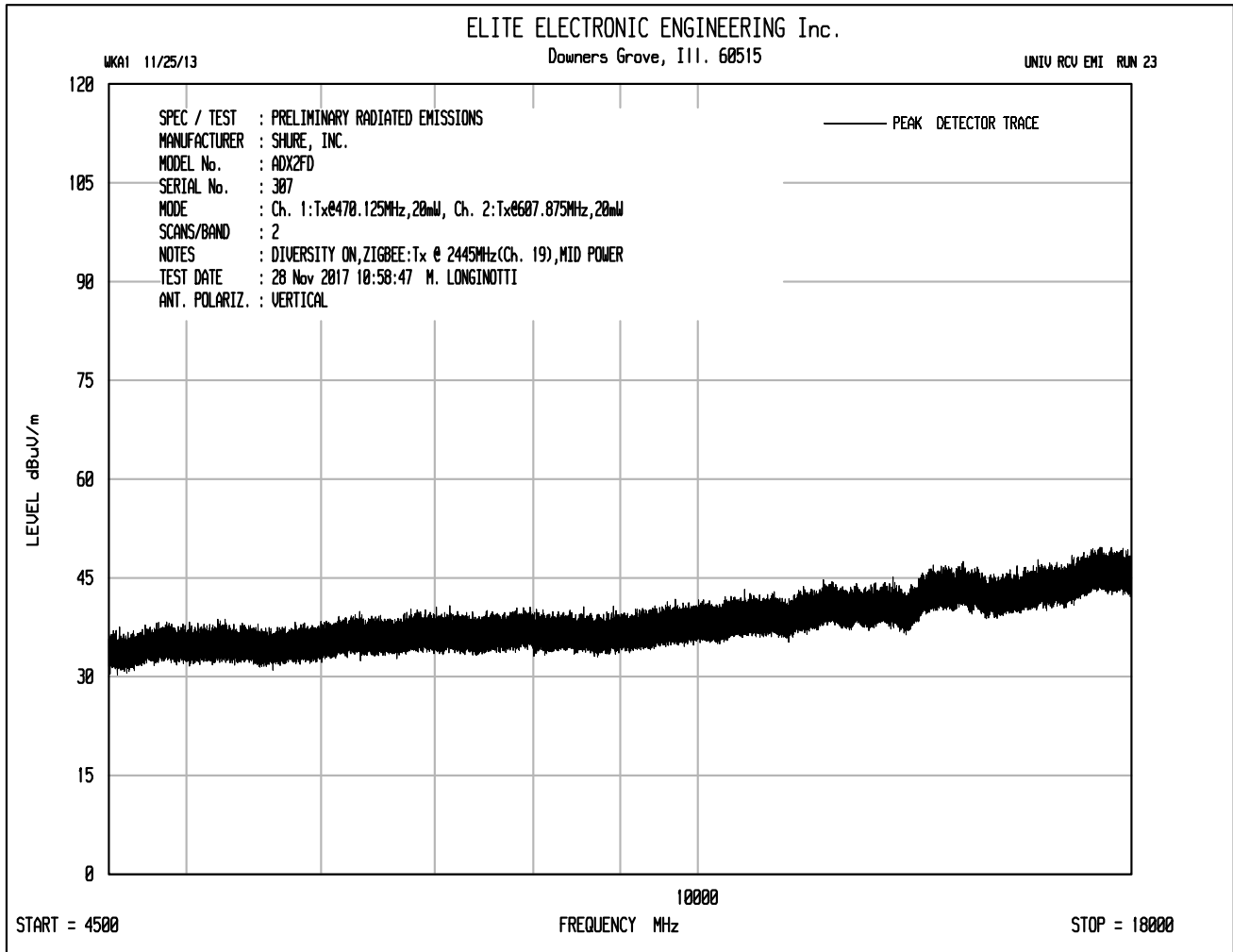


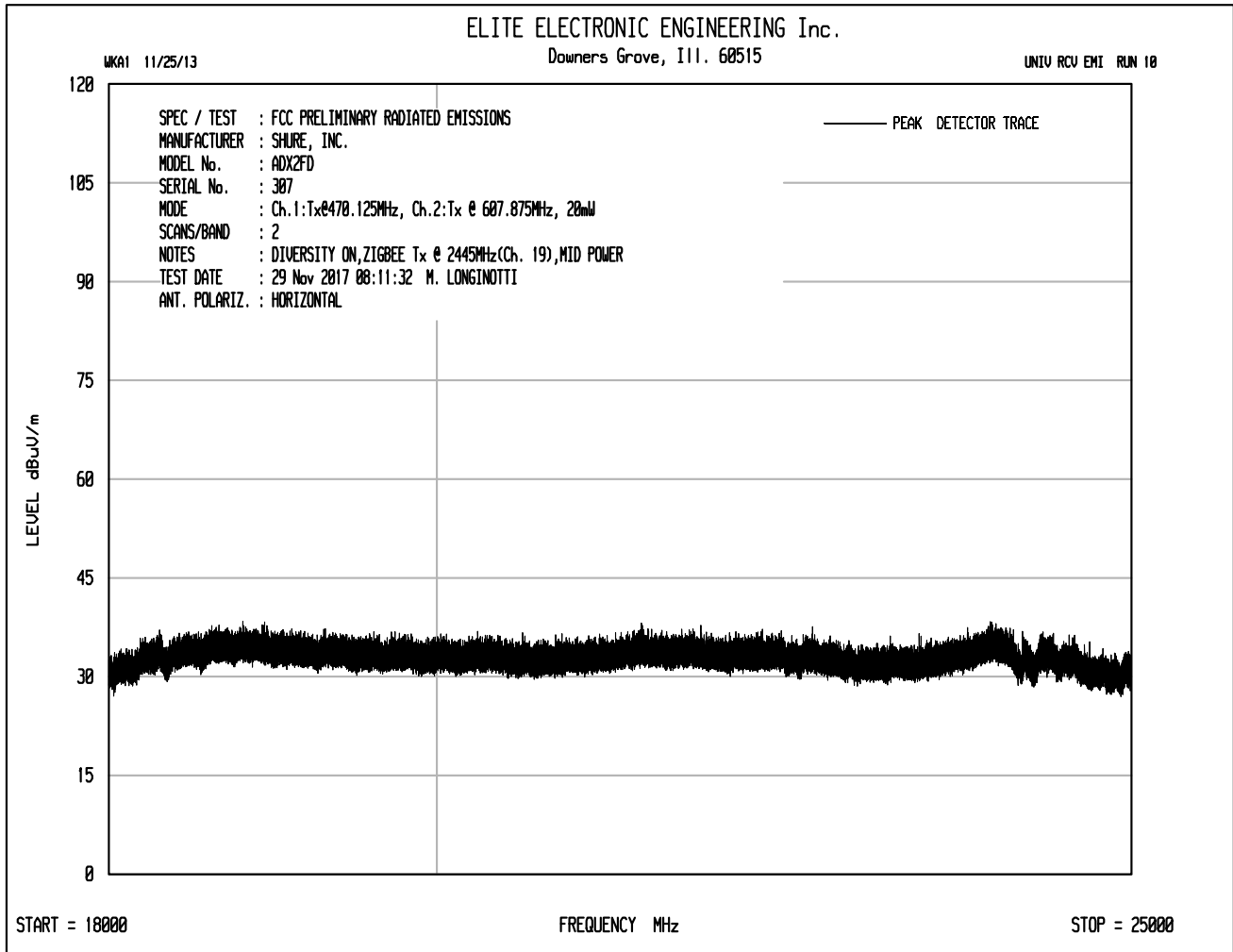
Plot shows emissions at 2445MHz from Zigbee transmitter.

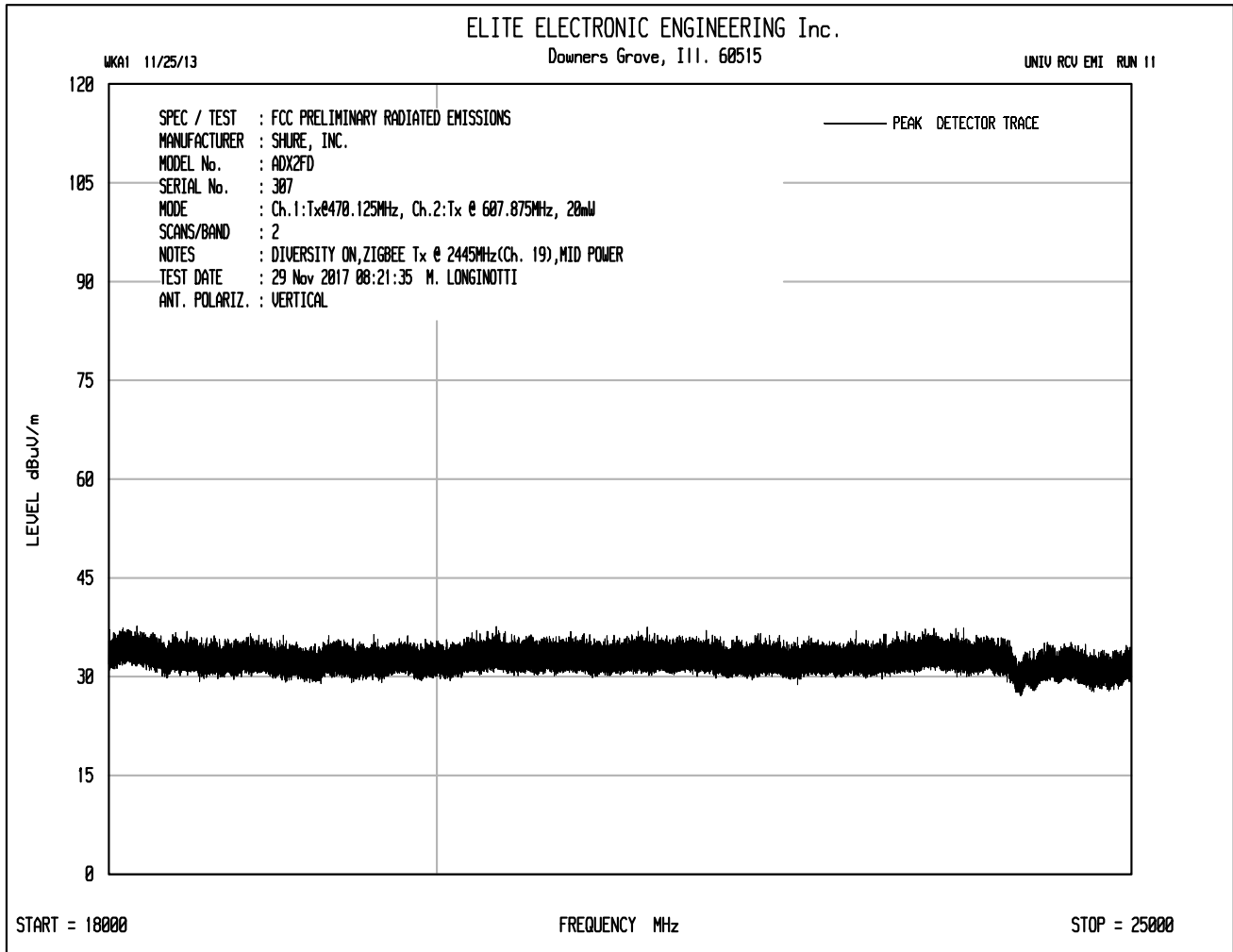


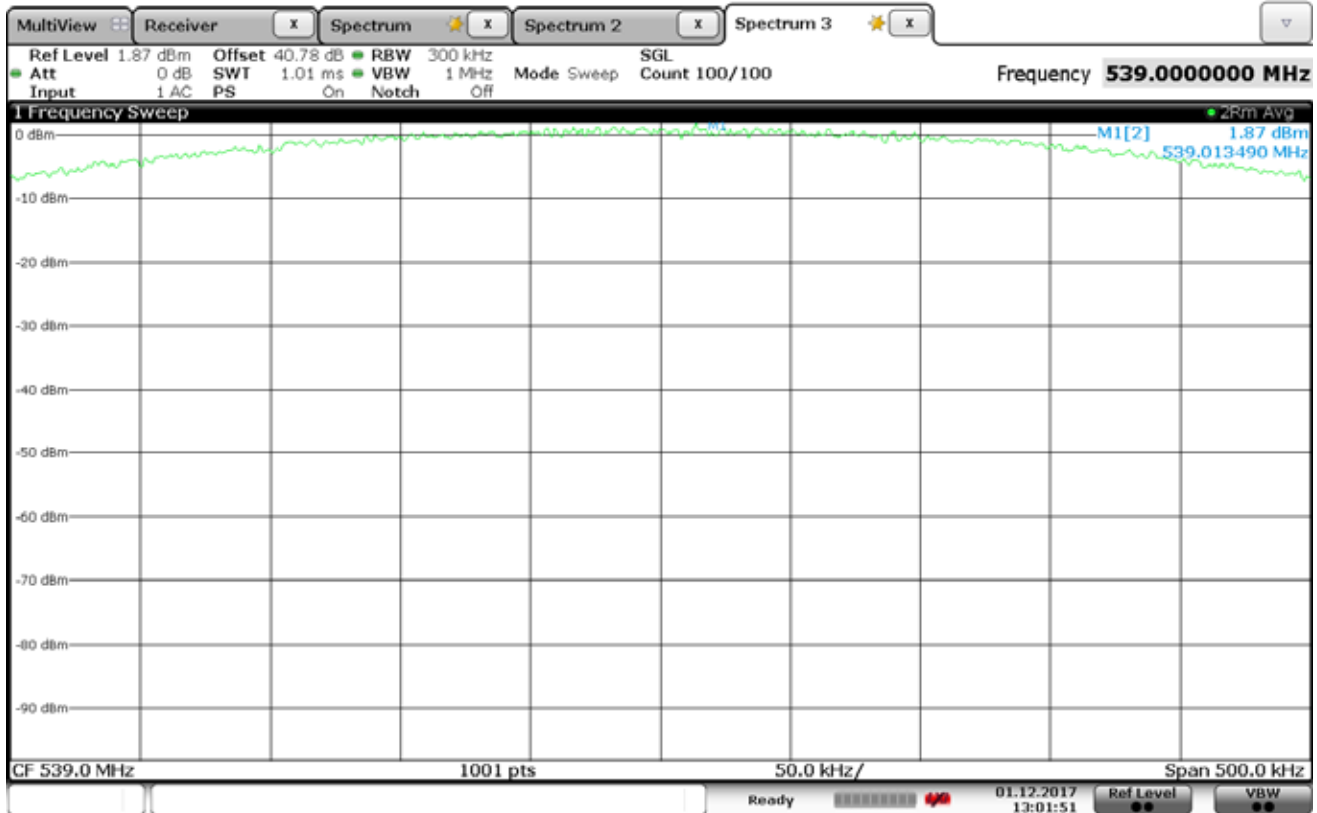
Plot shows emissions at 2445MHz from Zigbee transmitter.





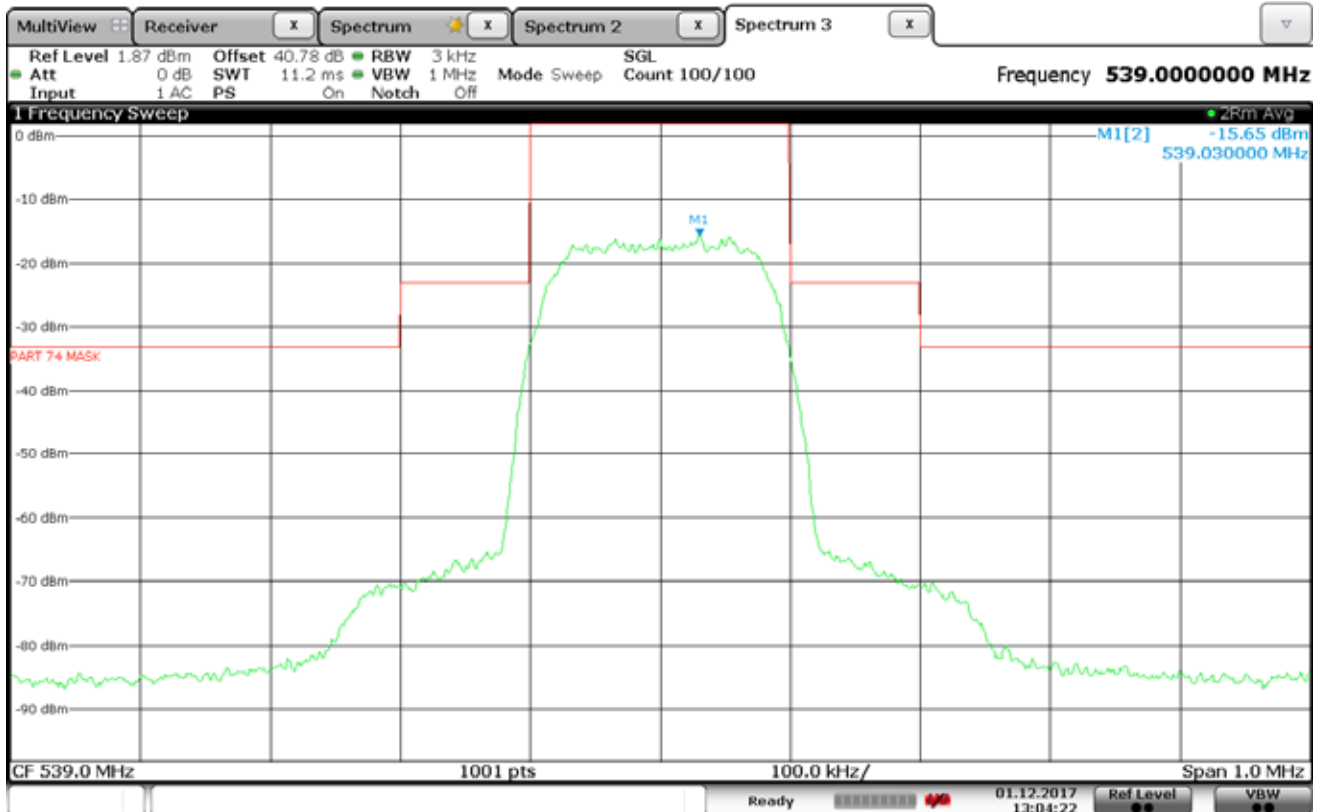






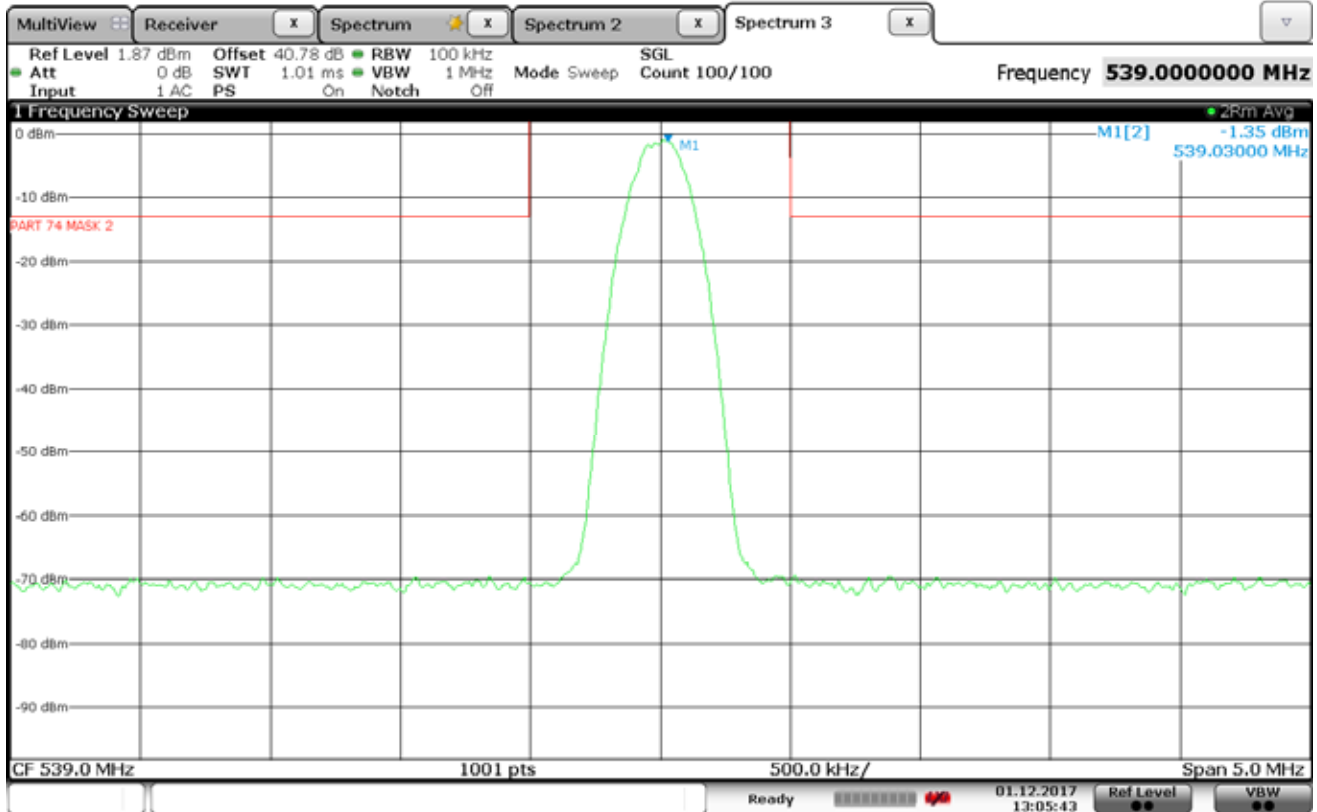
Date: 1.DEC.2017 13:01:51

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Transmit at 539MHz, 2mW
	: Ch. 2: Off
	: Diversity Off, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: Mean Power



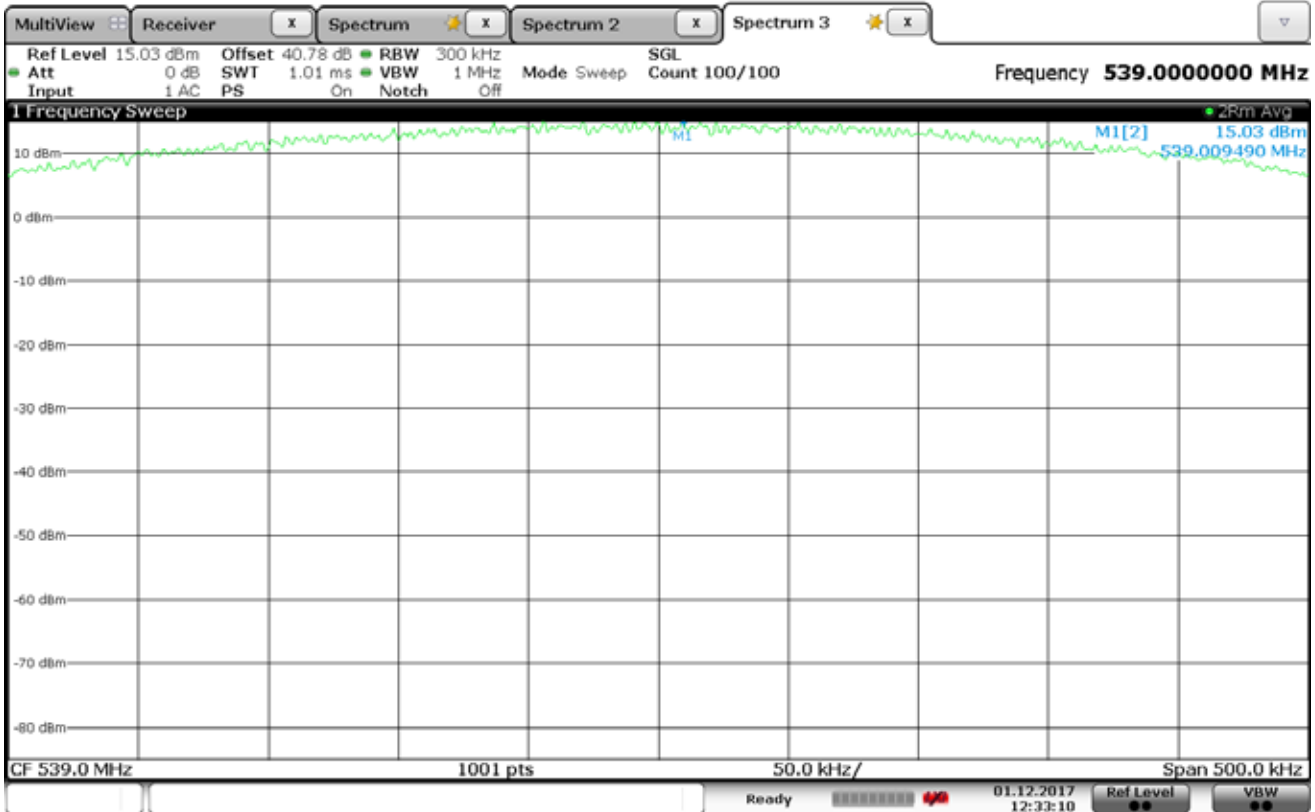
Date: 1.DEC.2017 13:04:22

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Transmit at 539MHz, 2mW : Ch. 2: Off : Diversity Off, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: 1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB; : 2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;



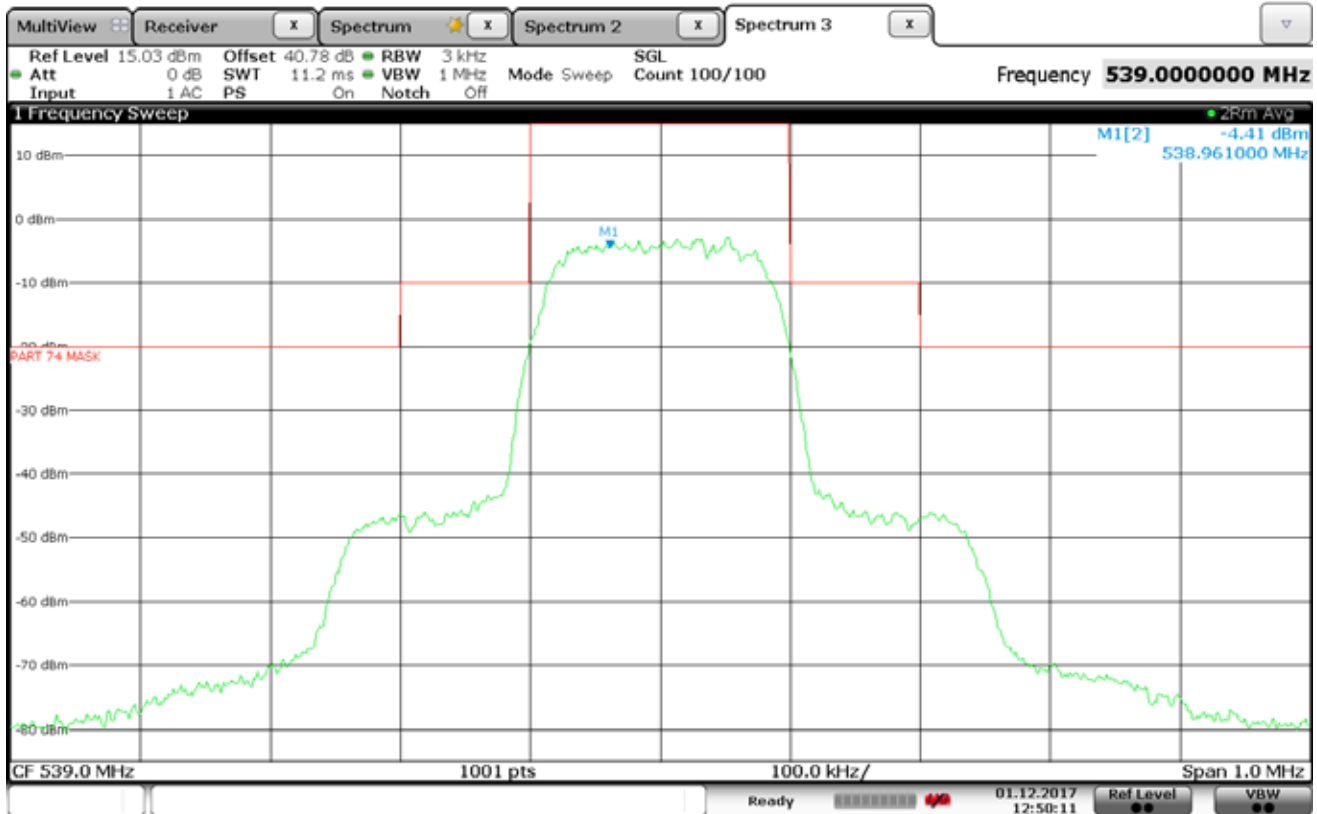
Date: 1.DEC.2017 13:05:43

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Transmit at 539MHz, 2mW
	: Ch. 2: Off
	: Diversity Off, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\log_{10}$ (mean output power in watts) dB.



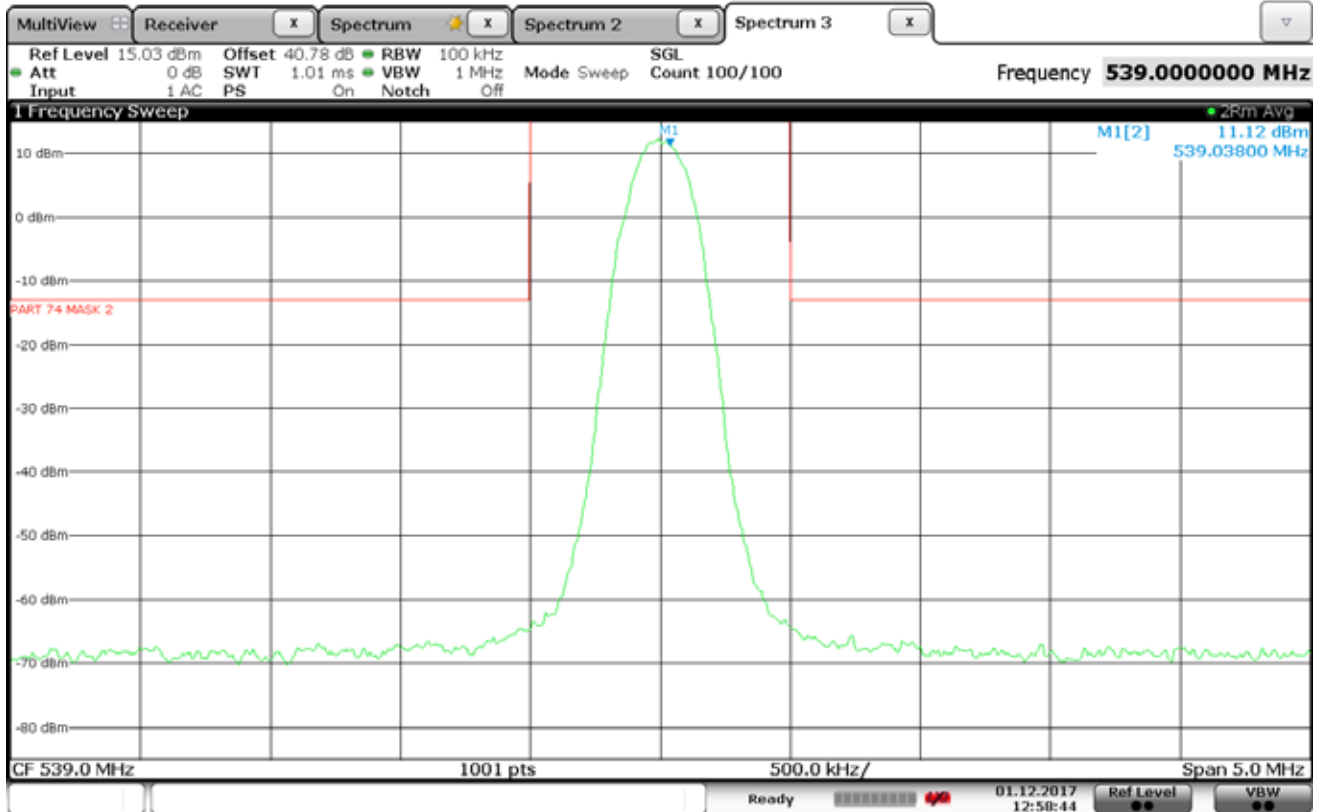
Date: 1.DEC.2017 12:33:10

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Transmit at 539MHz, 50mW
	: Ch. 2: Off
	: Diversity Off, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: Mean Power



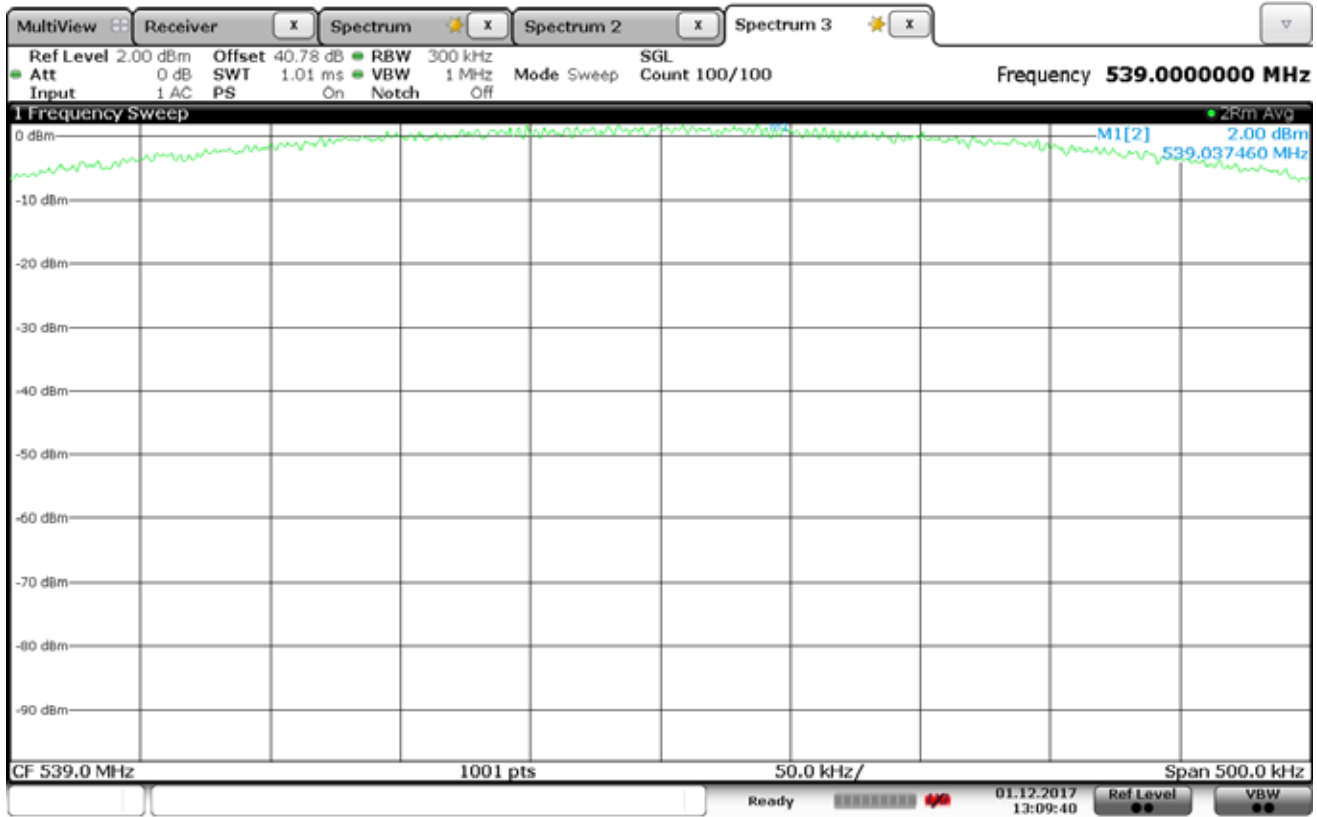
Date: 1.DEC.2017 12:50:11

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Transmit at 539MHz, 50mW : Ch. 2: Off : Diversity Off, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: 1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB; : 2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;



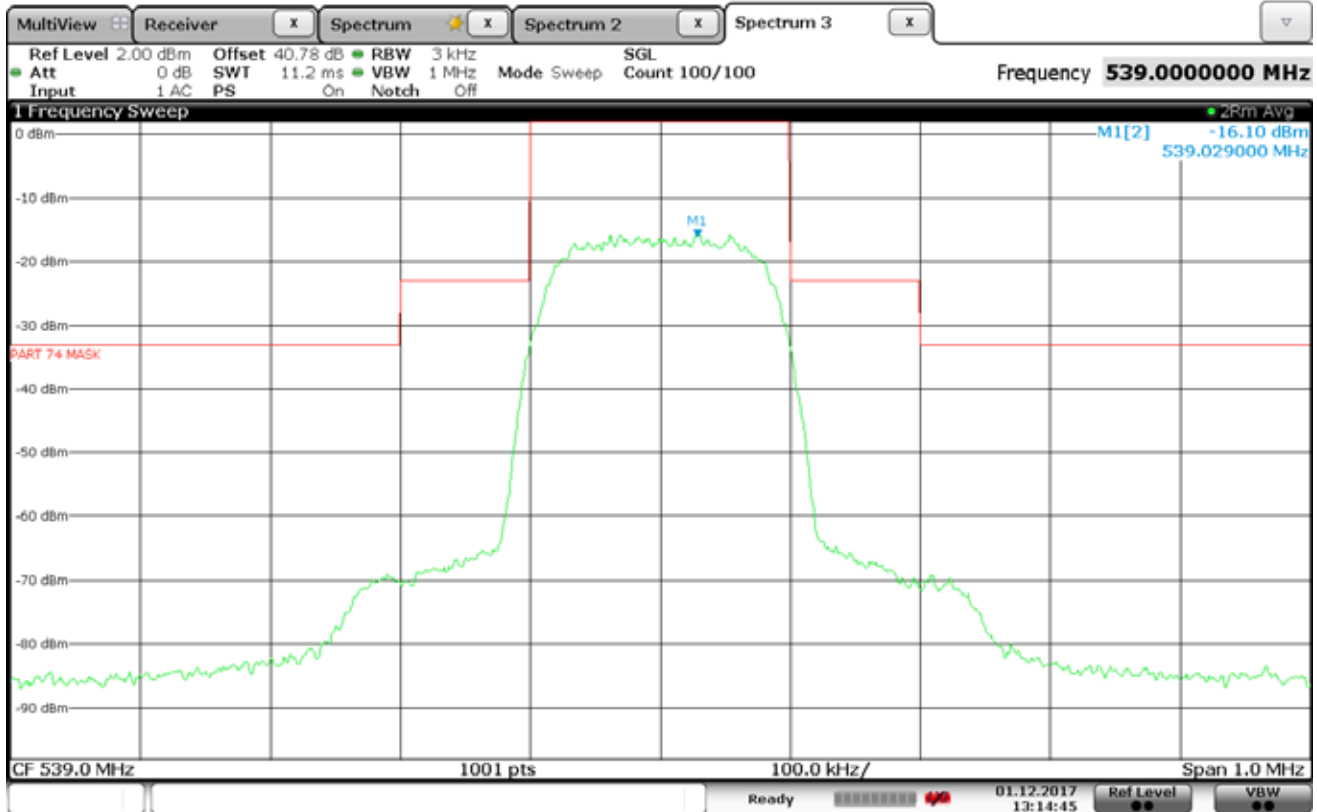
Date: 1.DEC.2017 12:58:44

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Transmit at 539MHz, 50mW
	: Ch. 2: Off
	: Diversity Off, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\log_{10}$ (mean output power in watts) dB.



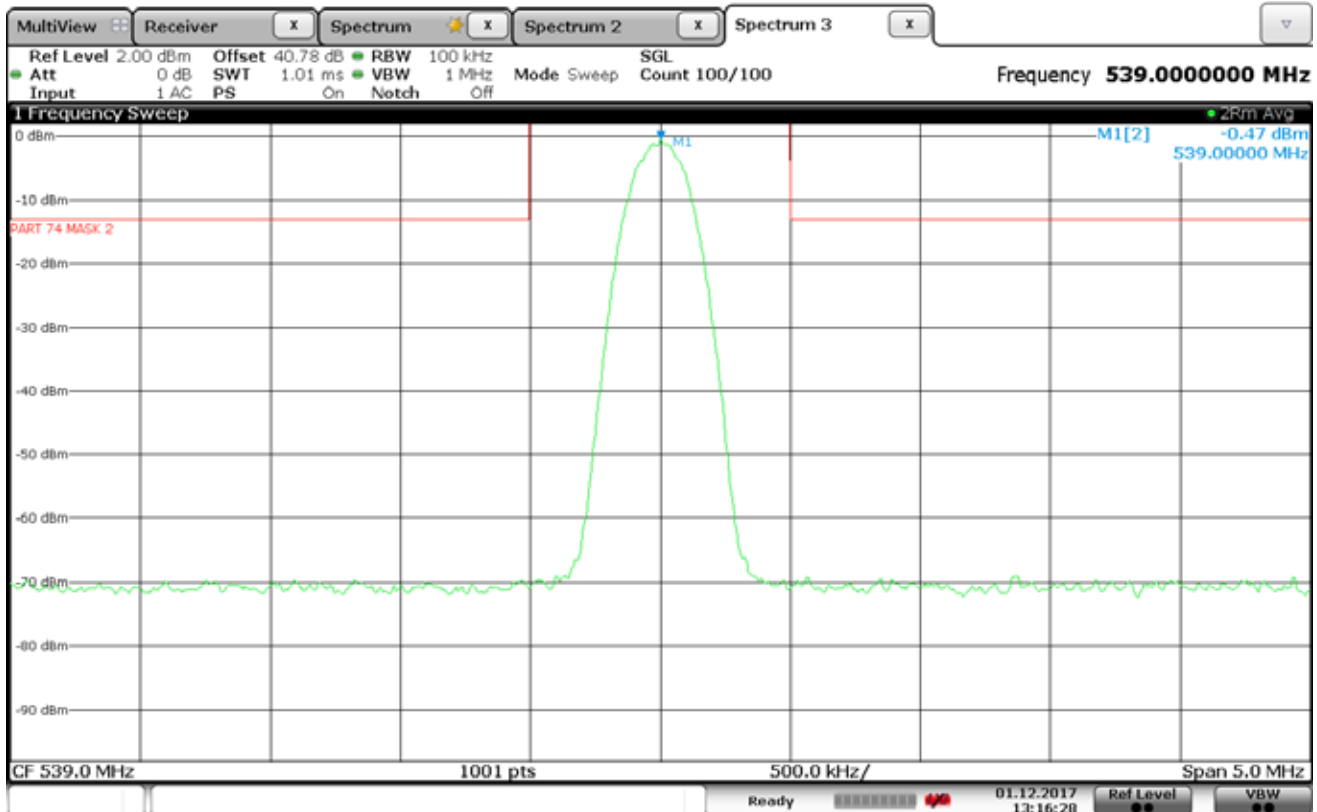
Date: 1.DEC.2017 13:09:40

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Transmit at 539MHz, 2mW
	: Ch. 2: Off
	: Diversity On, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: Mean Power



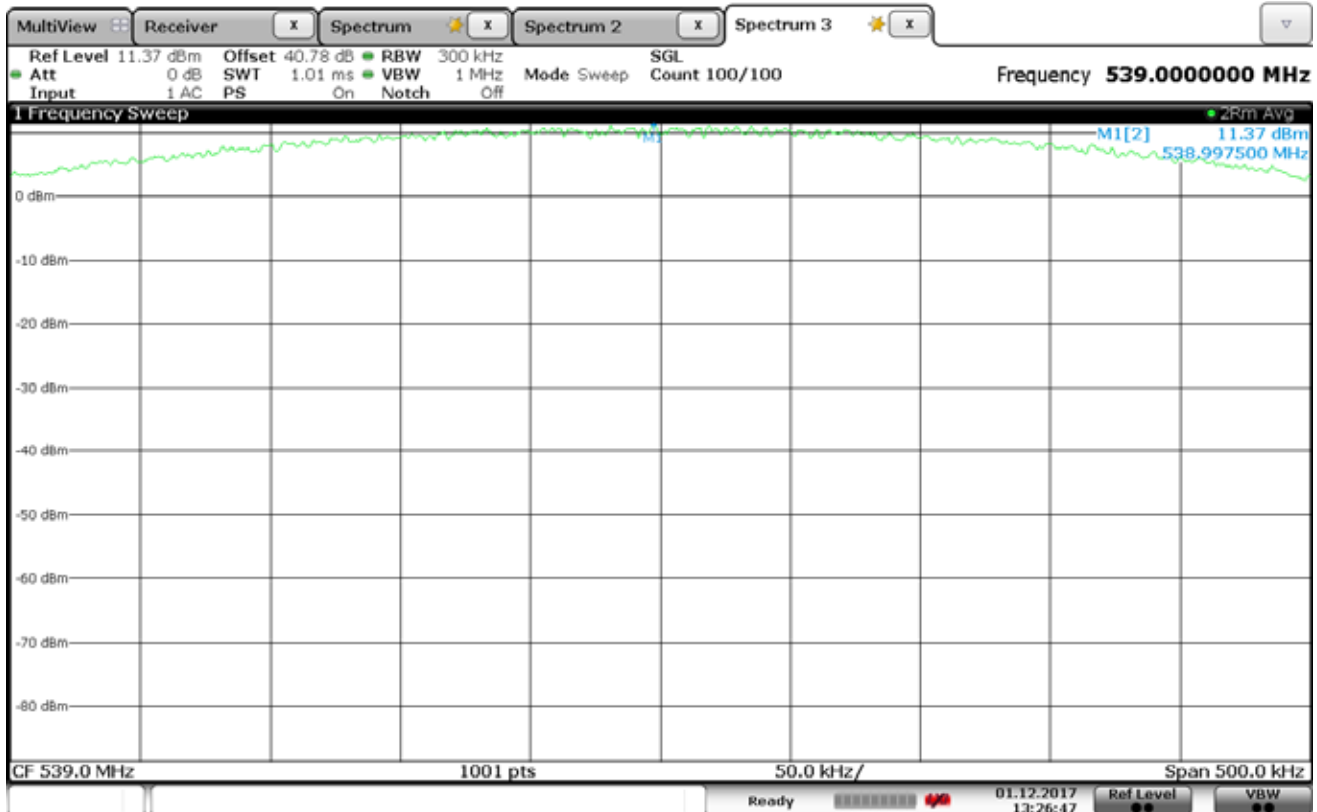
Date: 1.DEC 2017 13:14:45

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Transmit at 539MHz, 2mW : Ch. 2: Off : Diversity On, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: 1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB; : 2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;



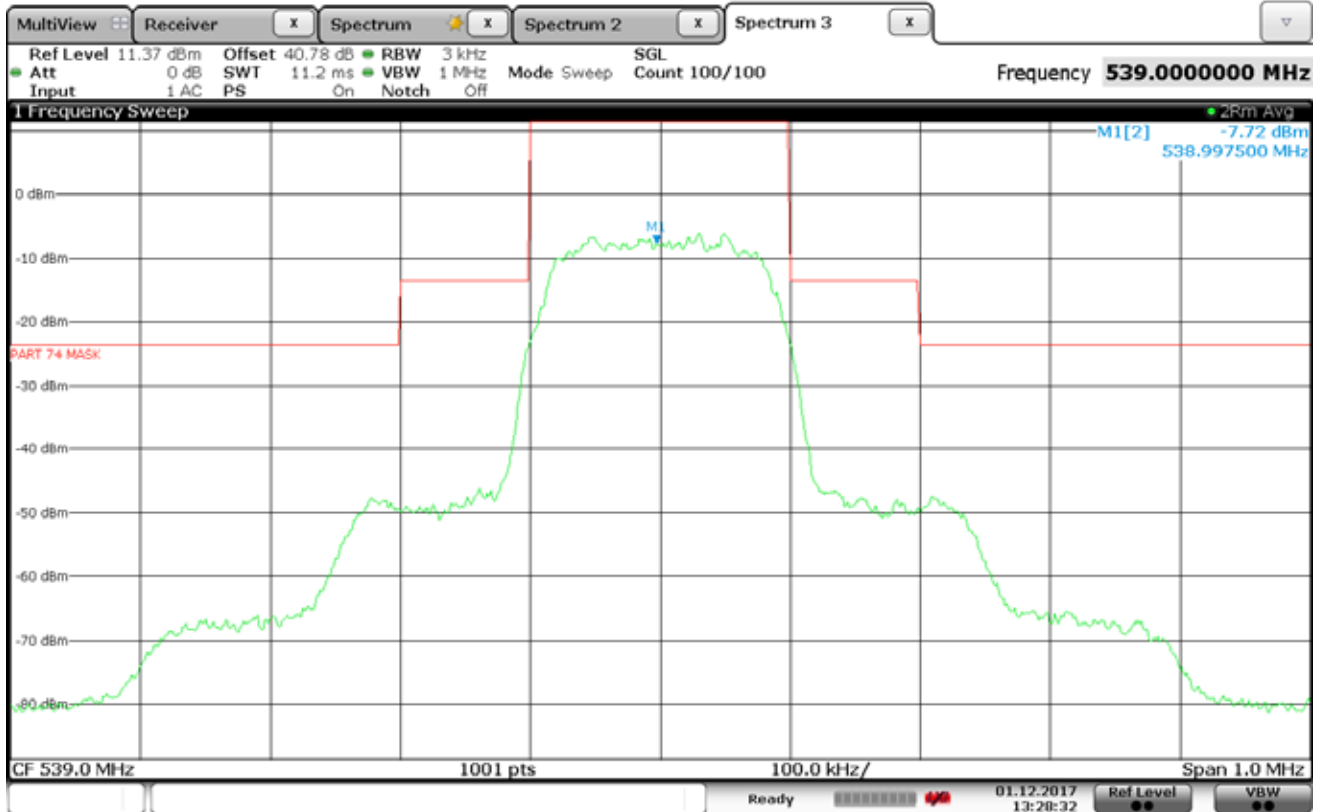
Date: 1.DEC.2017 13:16:28

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Transmit at 539MHz, 2mW : Ch. 2: Off : Diversity On, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\log_{10}$ (mean output power in watts) dB.



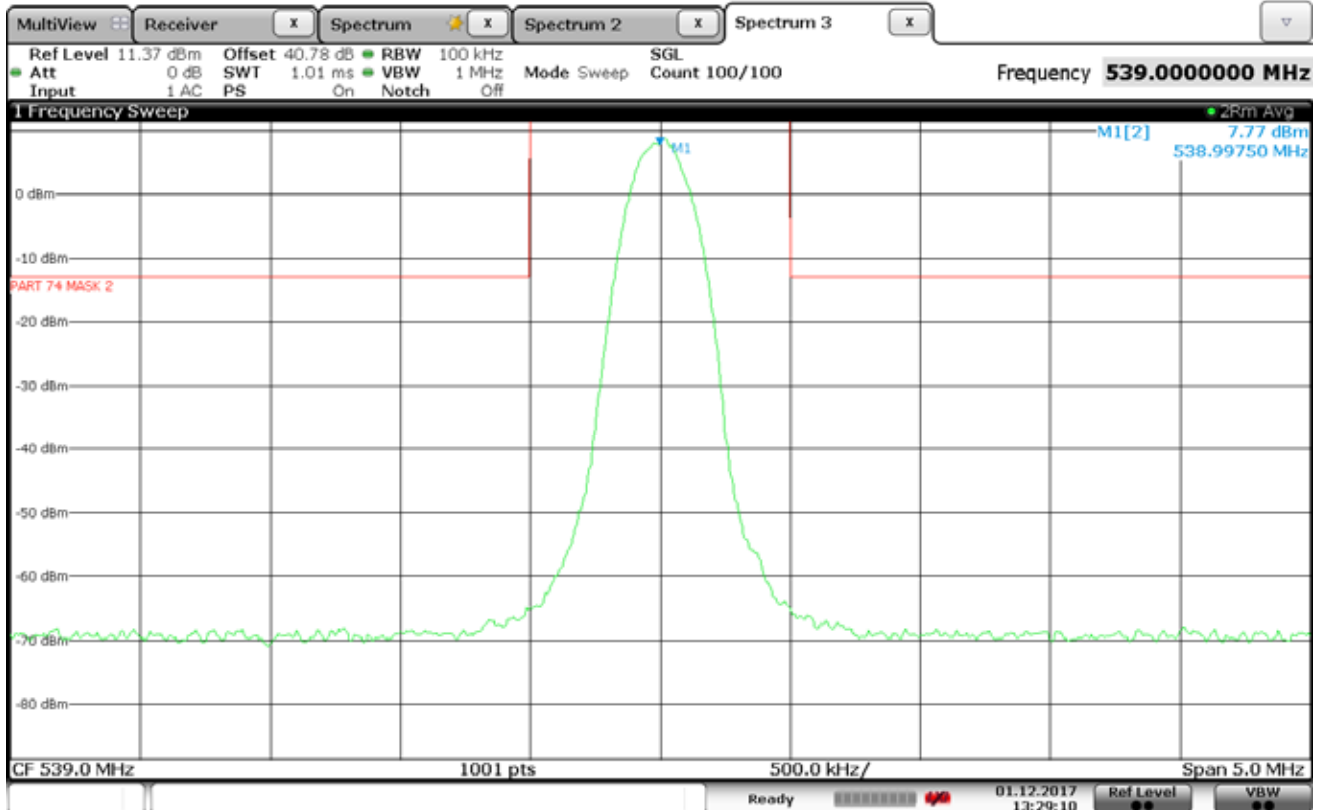
Date: 1.DEC.2017 13:26:47

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Transmit at 539MHz, 20mW : Ch. 2: Off : Diversity On, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: Mean Power



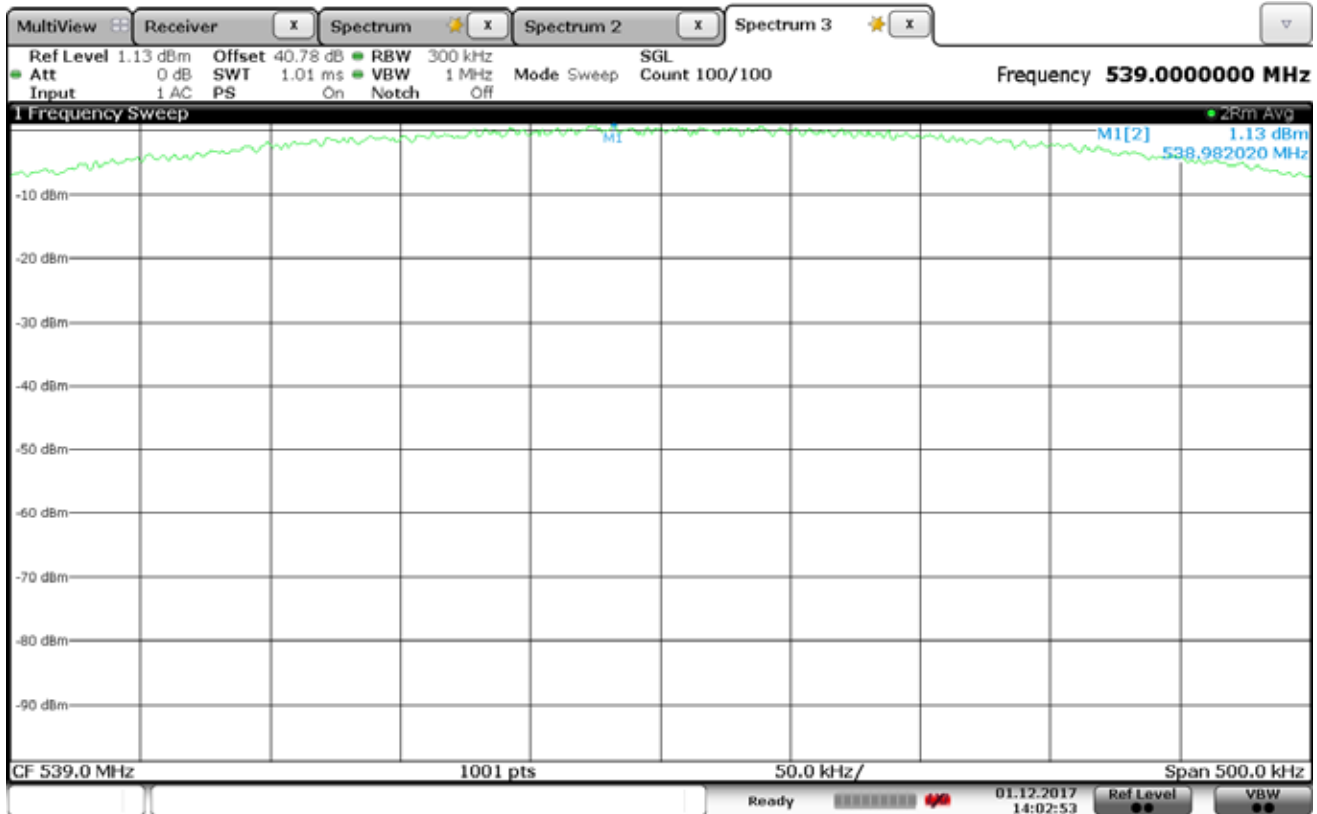
Date: 1.DEC 2017 13:28:31

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Transmit at 539MHz, 20mW : Ch. 2: Off : Diversity On, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: 1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB; : 2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;



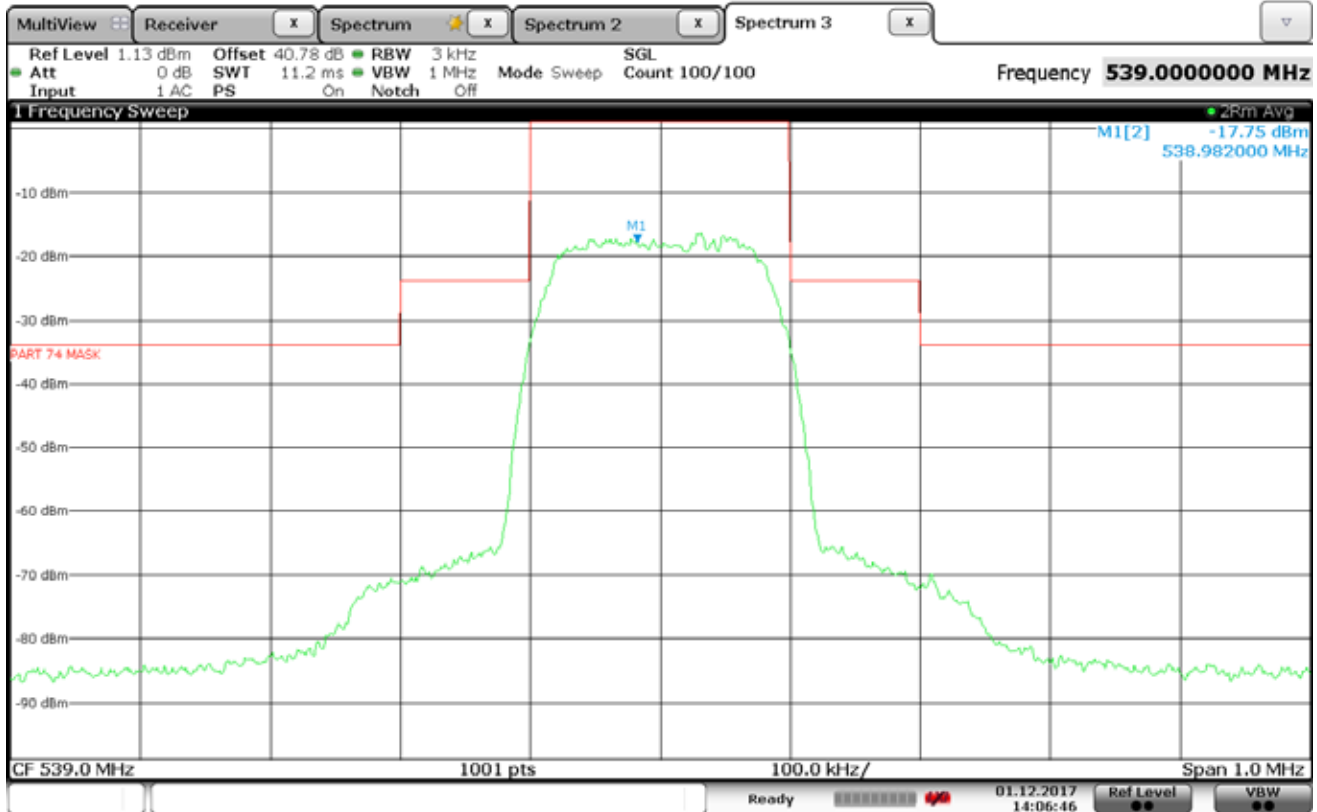
Date: 1.DEC 2017 13:29:11

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Transmit at 539MHz, 20mW : Ch. 2: Off : Diversity On, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\log_{10}$ (mean output power in watts) dB.



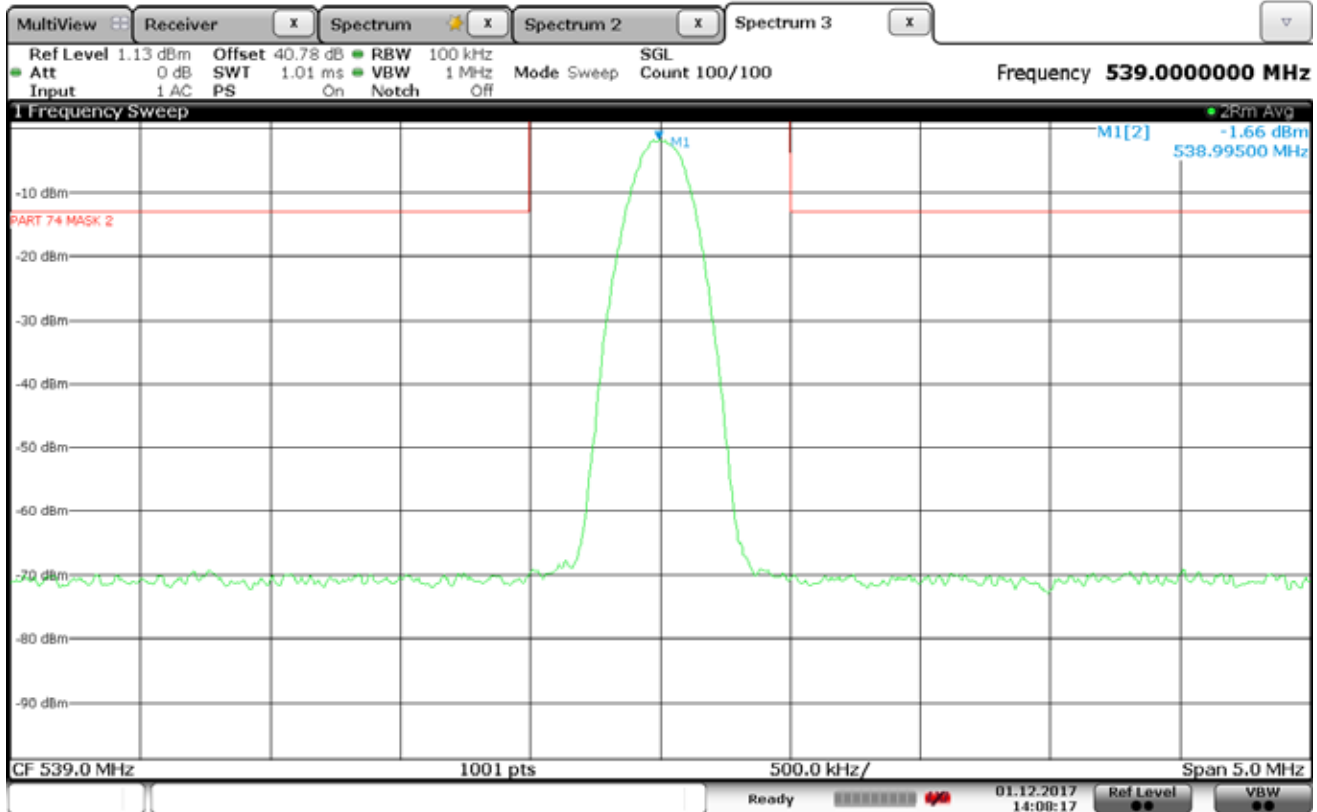
Date: 1.DEC 2017 14:02:53

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Off
	: Ch. 2: Transmit at 539MHz, 2mW
	: Diversity On, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: Mean Power



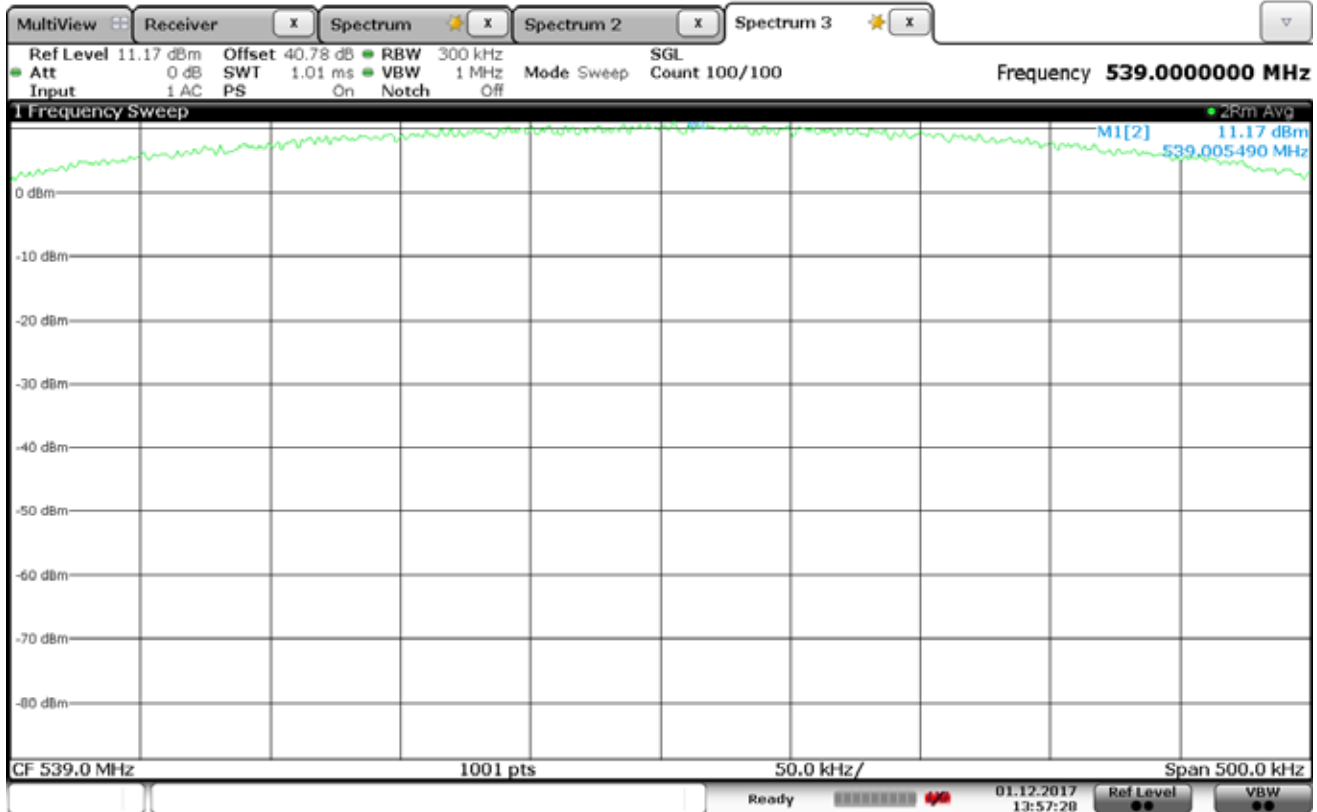
Date: 1.DEC.2017 14:08:47

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Off
	: Ch. 2: Transmit at 539MHz, 2mW
	: Diversity On, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: 1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;
	: 2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;



Date: 1.DEC 2017 14:08:16

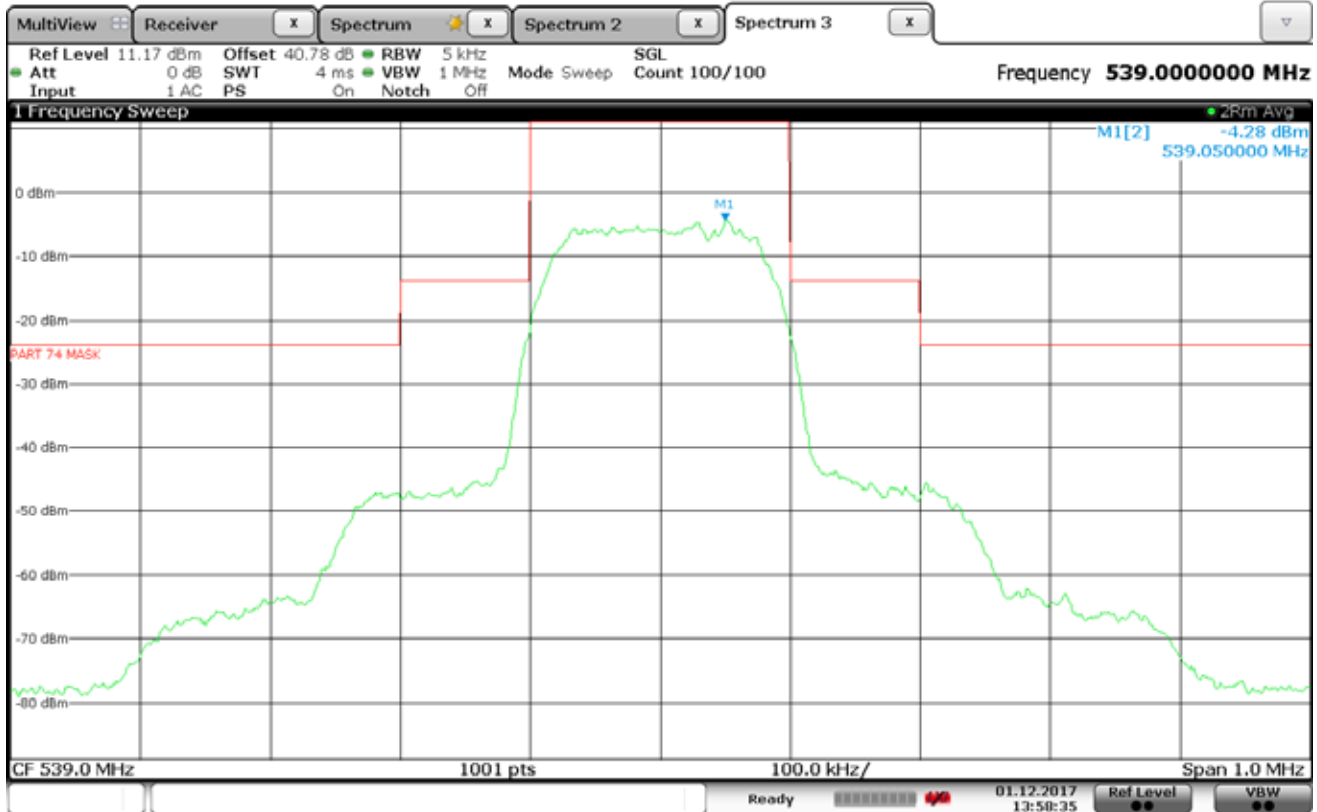
MANUFACTURER : Shure Incorporated
 MODEL NO. : ADX2FD
 SERIAL NO. : 292
 SPECIFICATION : FCC 74.861(e)(5) and (6) Occupied Bandwidth
 DATE : December 1, 2017
 MODE : Ch. 1: Off
 : Ch. 2: Transmit at 539MHz, 2mW
 : Diversity On, Zigbee Off
 UNIT : G57
 EQUIPMENT USED : RBG2, T2DN, T2D8
 NOTES : On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\log_{10}$ (mean output power in watts) dB.



Date: 1.DEC.2017 13:57:28

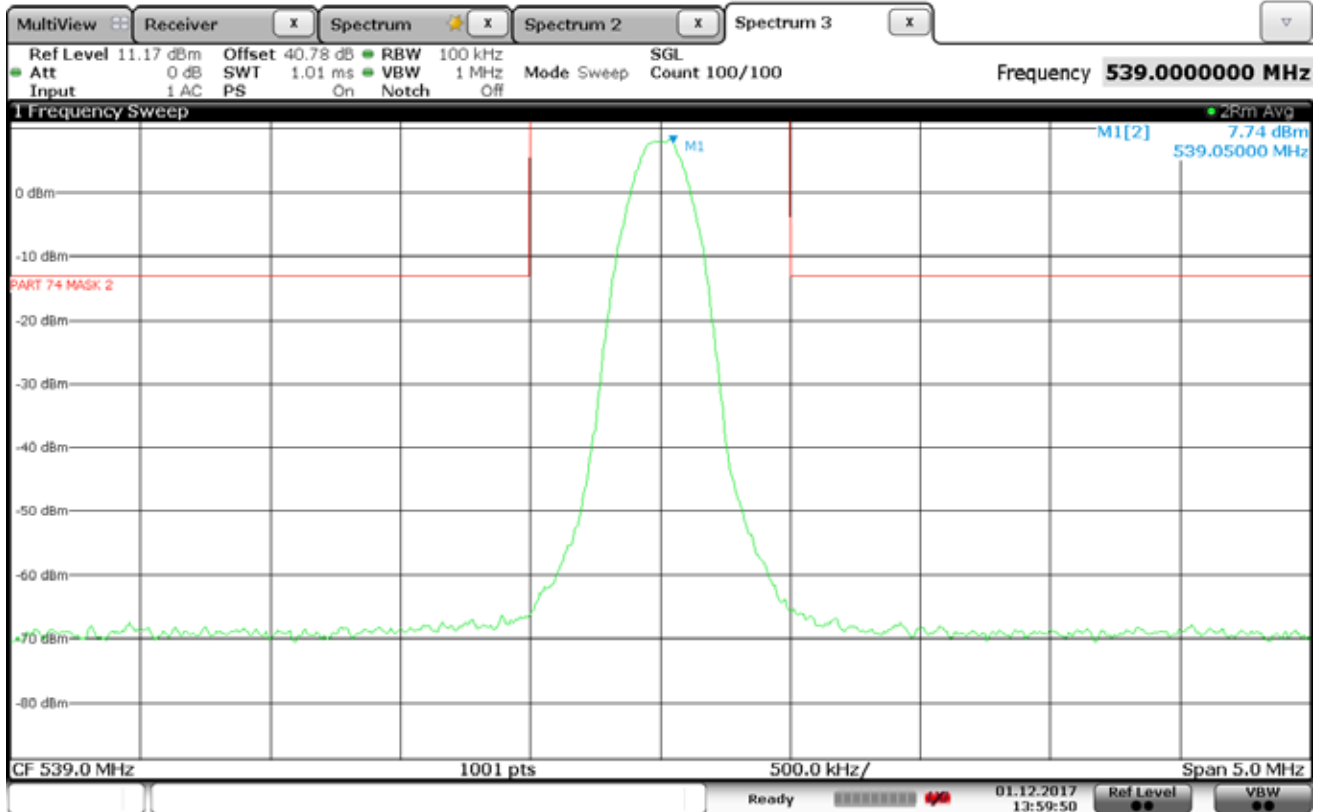
MANUFACTURER : Shure Incorporated
 MODEL NO. : ADX2FD
 SERIAL NO. : 292
 SPECIFICATION : FCC 74.861(e)(5) and (6) Occupied Bandwidth
 DATE : December 1, 2017
 MODE : Ch. 1: Off
 : Ch. 2: Transmit at 539MHz, 20mW
 : Diversity On, Zigbee Off

UNIT : G57
 EQUIPMENT USED : RBG2, T2DN, T2D8
 NOTES : Mean Power



Date: 1.DEC 2017 13:58:34

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Off : Ch. 2: Transmit at 539MHz, 20mW : Diversity On, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: 1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB; : 2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;



Date: 1.DEC 2017 13:59:49

MANUFACTURER	: Shure Incorporated
MODEL NO.	: ADX2FD
SERIAL NO.	: 292
SPECIFICATION	: FCC 74.861(e)(5) and (6) Occupied Bandwidth
DATE	: December 1, 2017
MODE	: Ch. 1: Off : Ch. 2: Transmit at 539MHz, 20mW : Diversity On, Zigbee Off
UNIT	: G57
EQUIPMENT USED	: RBG2, T2DN, T2D8
NOTES	: On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\log_{10}$ (mean output power in watts) dB.