SHURE

ELECTROMAGNETIC COMPATIBILITY LABORATORY
TEST REPORT

TEST REPORT TITLE: Electromagnetic Compatibility Tests of the Shure ULXD8 J50A and ULXD8W J50A Digital Wireless Transmitters operating in the 572MHz to 607MHz and 614 to 616MHz Bands

TEST ITEM DESCRIPTION:

The Shure ULXD8 is a digital wireless microphone transmitter, microprocessor controlled transmitter. The letter 'W' in the model number indicates that the unit is painted white.

For:	Shure Incorporated 5800 West Touhy Avenue Niles, IL 60714
Project ID Number:	SEL-030/ULXD8 J50A
Date Tested:	November 27, 2017, January 25, 2018, February 6, 16, 19, 26, 27, 2018, March 13, 2018
Test Personnel:	Juan Castrejon, Alex Mishinger, and Craig Kozokar
Test Specification:	FCC Part 15C, Section 15.236g RSS 210 Issue 9, Annex G
FCC ID :	DD4ULXD8J50
IC :	616A-ULXD8J50

TEST REPORT BY: Craig Kozokar	Global Compliance Engineer	May 1, 2018	
APPROVED BY: Thomas E Bearden	GC Project Engineer	May 1, 2018	
Signature	Position	Date	

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LIST OF APPENDICIES

APPENDIX	TEST DESCRIPTION
A	Radiated RF Spurious Emissions Measurement, 30 MHz to 10 GHz
B	Maximum Radiated Power
C	Necessary Bandwidth

REPORT REVISION HISTORY

Revision	Date	Description
0	March 30, 2018	Initial release
1	November 14, 2018	Updated to include RSS 210 certification information
2	December 27, 2018	Updated to include model variants of ULXD8 J50A

1. INTRODUCTION

1.1. Scope of Tests

This report presents the results of testing per FCC Part 15C, Section 236g, Radiated RF Spurious Emissions, Necessary Bandwidth, and Maximum Radiated Power and RSS 210 Issue 9, Annex G: Low-Power Radio Apparatus Operating in the Television Bands. The following data was taken following the measurement method as described in the document section(s) listed on page 1 of this document. Provided is the data for the test sample. Also included is a summary of the measurements made and a description of the measurement setup. The test sample meet the requirements of the above standards. The equipment under test (EUT) contained a transmitter that was designed to transmit in the UHF TV frequency bands shown in Table 1.

Model	Band	Frequency (MHz)	Output Power (mW)
ULXD8	J50A	572 to 607 and 614 to 616	1, 10, and 20

Table 1. EUT Frequencies and Power Levels

1.2. Purpose

This series of testing was performed to determine if the test item would meet the requirements of FCC Part 15C, Section 236g and RSS 210 Issue 9, Annex G.

1.3. Deviations, Additions and Exclusions

The ULXD8W J50A variant is electrically identical to the ULXD8 J50A with a white finish rather than the black.

1.4. EMC Laboratory Identification

The electromagnetic compatibility tests were performed at the Shure Electromagnetic Laboratory, Shure Incorporated, 5800 West Touhy Ave, Niles, Illinois 60714-4608. This laboratory is registered with Industry Canada as Site # 616A-1. The Shure Electromagnetic Laboratory is accredited by the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP). The NVLAP Lab Code is: 200946-0.

1.5. Summary of Tests Performed

The following electromagnetic compatibility tests (Table 2) were performed on the test item in accordance with ETSI specifications.

Table 2. Summary of tests performed

Test Spec	Description	Tested Frequency	Appendix	Test Results
FCC Part 15C RSS 210.9	Radiated Spurious Emissions	30 MHz to 10 GHz	A	Pass
FCC Part 15C RSS 210.9	Maximum Radiated Power	572.125MHz, 589.500MHz, 606.875MHz, 614.125MHz, 615.875MHz	B	Pass
FCC Part 15C RSS 210.9	Necessary Bandwidth Measurements	572.125MHz, 589.500MHz, 606.875MHz, 614.125MHz, 615.875MHz	C	Pass

2. APPLICABLE DOCUMENTS

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

FCC Part 15C, Section 236g

RSS 210 Issue 9, Annex G: Low-Power Radio Apparatus Operating in the Television Bands

EN 300 422-1 v1.4.2 (2011-08), “Wireless Microphone “Electromagnetic Compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25MHz to 3GHz frequency range; Part 1; Technical characteristics and methods of measurements”

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"

3. EUT SET-UP AND OPERATION

3.1. General Description

The test sample used was Shure ULXD8 digital wireless microphone transmitter. The EUT was arranged and tested per individual Appendices.

3.2 Test Sample

The following product sample was tested:

Table 3: Shure ULXD8 J50A Digital Wireless Transmitter Sample

ULXD8/O J50A Serial Numbers
#1

3.3 Operational Mode

All radiated spurious emissions, maximum radiated power, and necessary bandwidth tests were performed at the below transmit frequency and output power modes shown in Table 4.

Band	Frequency in MHz	L/M/H	Power Level in mW
J50A	572.125	Low	20
J50A	589.500	Middle	20
J50A	606.875	High	20
J50A	614.125	Low	20
J50A	615.875	High	20

Table 4. EUT Frequencies and Power Levels

4. Test Instrumentation

A list of the test equipment used can be found in Table 10-1. All equipment used was within calibration during and throughout the duration of the tests. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

5. Procedure

The specific test procedures are presented in the individual appendices.

6. Other Test Conditions:

6.1. Test Personnel

All EMC tests were performed by qualified personnel from the Shure EMC Laboratory.

6.2. Disposition of the EUT

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

7. Results of Tests:

The results are presented in Appendices. It was found that the EUT meet the requirements of FCC Part 15C, Section 236g for Radiated RF Spurious Emissions, Maximum Radiated Output, and Necessary Bandwidth as well as the requirements for RSS 210 Issue 9, Annex G: Low-Power Radio Apparatus Operating in the Television Bands.

8. Conclusions:

It was determined that the Shure ULXD8 J50A Digital Wireless Microphone Transmitter did fully comply with the requirements of FCC Part 15C, Section 236g, Radiated RF Spurious Emissions, Maximum Radiated Output, and Necessary Bandwidth and RSS 210 Issue 9, Annex G: Low-Power Radio Apparatus Operating in the Television Bands.

9. Certification:

Shure EMC Laboratory 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 EUTs at the test date. Any electrical or mechanical modification made to the EUTs subsequent to the specified test date will serve to invalidate the data and void this certification.

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

10. Equipment List

Table 10-1 Test Equipment

L# or ID	Description	Manufacturer	Model #	Serial #	Frequency Range	Cal Date	Due Date
L23-011-01	3 meter RF Chamber	ETS Lindgren	FACT-3	AJ640	25MHz - 18GHz	8/8/2017	8/8/2018
L23-011-02	Electric Powered Turntable	ETS Lindgren	2088	N/A	N/A	N/A	N/A
L23-011-08	Controller	EMCO	2090	29799	N/A	N/A	N/A
L23-011-09	Antenna Positioner	ETS Lindgren	2071-2	35500	N/A	N/A	N/A
L23-011-15	BiConiLog Antenna	ETS Lindgren	3142C	34790	25MHz-1GHz	6/22/2017	6/22/2018
L23-011-44	BiConiLog Antenna	ETS Lindgren	3142C	79899	25MHz-1GHz	2/27/2017	2/27/2018
L23-011-54	EMI Test Receiver	Rohde & Schwarz	ESR26	100220	9kHz-26GHz	3/30/2017	3/30/2018
L23-011-31	EMI/EMS Test Software	Rohde & Schwarz	EMC32	V 9.21.00	N/A	N/A	N/A
L23-011-55	Horn antenna with pre-amplifier	ETS Lindgren	3117-PA	206583	1GHz to 18 GHz	4/27/2017	4/27/2018
L23-011-41	Horn Antenna	ETS Lindgren	3117	123511	1GHz to 18 GHz	5/7/2017	5/7/2018
L23-011-57	High Pass Filter	K&L	11SH10-940/X10000-0/0	3	940MHz – 10GHz	3/31/2017	3/31/2018
L23-022-02	Spectrum Analyzer	Rohde & Schwarz	FSW26	103788	9kHz-26GHz	3/28/2017	3/28/2018
L23-022-01	Spectrum Analyzer	Rohde & Schwarz	FSU26	201043	9kHz-26GHz	8/23/2017	8/23/2018
L23-040-09	20dB attenuator	Mini-Circuits	BW-S20W2	N/A	20MHz to 18GHz	2/21/2017	2/21/2018
L23-040-04	20dB attenuator	Mini-Circuits	BW-S20W5	1133	20MHz to 18GHz	7/18/2017	7/18/2018
L23-034-05	Temperature Hygrometer	Extech	445703	48254-66	N/A	9/15/2016	9/15/2018
L23-034-04	Temperature Hygrometer	Extech	445703	48254-13	N/A	9/15/2016	9/15/2018
L23-023-01	RF Signal Generator	Rohde & Schwarz	SMF100A	101553	20Hz to 26.5GHz	8/23/2017	8/23/2018

Appendix A

A. RADIATED RF SPURIOUS EMISSIONS – 30 MHz TO 10 GHz

Purpose:

This test performed to determine if the EUT meets the radiated RF emission requirements of the FCC Part 15C section 236g and RSS 210 Issue 9, Annex G over the frequency range from 30MHz to 10GHz. A Quasi-Peak and Average detectors were used for the measurements.

Requirements:

As stated in FCC 15C section 236g and in RSS 210.9, spurious emissions must meet the limits specified in section 8.4 of ETSI EN 300 422-1 V1.4.2 (2011-08)

Measurement Uncertainty:

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

Values of Expanded Measurement Uncertainty (95% Confidence)

Measurement Type	U_{lab}	U_{ETSI}
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.12 dB	6.00 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 13 GHz)	4.56 dB	6.00 dB

U_{lab} = Determined for Shure EMC Laboratory

U_{ETSI} = From ETSI EN 300 422-1 Table 6

Since U_{lab} is less than or equal to U_{ETSI}:

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit; Non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

Test Setup and Instrumentation:

Photographs of the test setup are shown in Figure 1 and Figure 2. The test instrumentation can be determined from Table 10-1.

EUT Operation:

The EUT was powered up and the frequency of the transmitter was selected using the front panel controls. The EUT was checked for proper operation after it was setup on the table. For radiated spurious emissions the testing was conducted with the EUT set to the low, middle, and high frequencies in the Low Band, and low and high frequencies in the High band within the operating frequency range, and at 20mW RF output.

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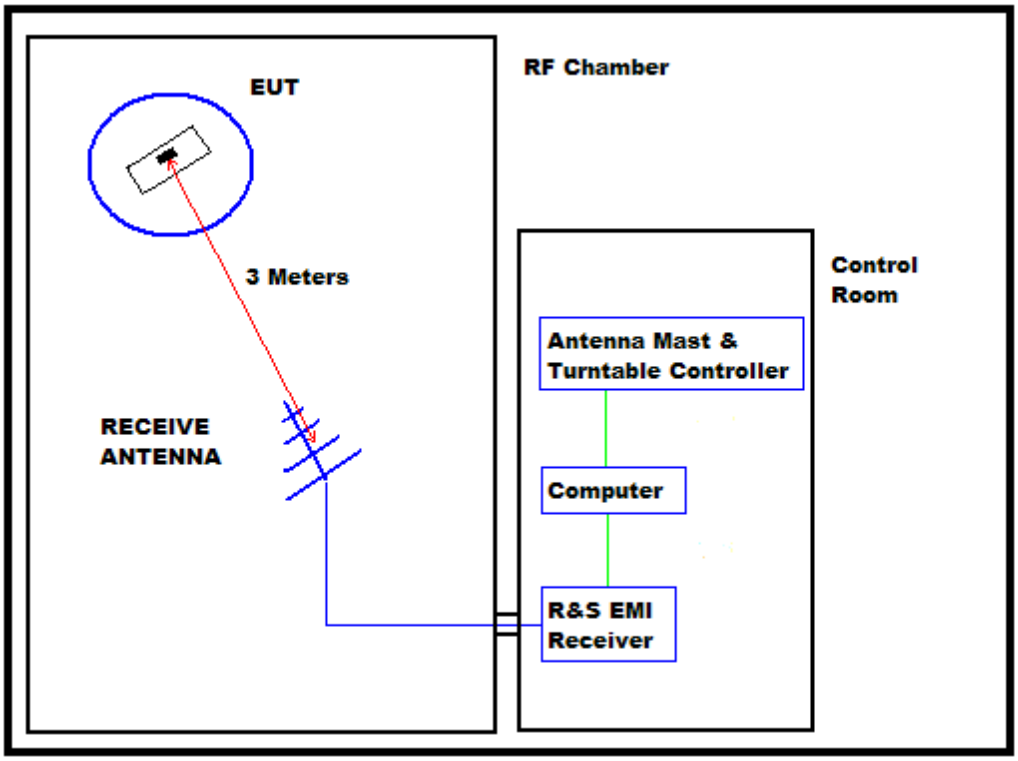
Specific Test Procedures:

All tests were performed in a 28ft. x 20ft. x 18.5ft. 3m semi-anechoic 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 C63.4-2003 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All power lines and signal lines entering the enclosure pass through filters on the enclosure wall. The power line filters prevent extraneous signals from entering the enclosure on these leads.



BLOCK DIAGRAM OF SHIELDED ENCLOSURE

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 BiConiLog measuring antenna was positioned at a 3 meter distance from the EUT.

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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 BiConiLog antenna over the frequency range of 30 MHz to 1 GHz, and a double ridged waveguide antenna over the frequency range of 1 GHz to 10 GHz.

To ensure that maximum emission levels were measured, the following steps were taken:

i. The EUT was rotated so that all of its sides were exposed to the receiving antenna.
ii. Since the measuring antennas are linearly polarized, both horizontal and vertical field components were measured.
iii. 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 EMI receiver. The signal level was recorded. The reading was corrected to compensate for cable loss and antenna gain.

Results:

The plots of the peak preliminary radiated voltage levels and maximized quasi-peak radiated voltage levels results are presented on page 12 thru page 41. The ERP measurements are shown on pages 42 thru page 46. All emissions measured from the EUT were within the ETSI EN 300 422-1 specification limits.

Appendix A

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 30MHz - 1GHz
EUT:	ULXD8 J50A
Serial Number:	# 1
Operating Frequency:	572.125MHz
Power Level / Mod Mode:	20mW
Name:	Alex Mishinger
Date Tested	Tested on January 25, 2018

EMI Auto Test Template: COMPLIANCE TEST FCC15C-EN300422 Transmitter 30MHz to 1GHz 79899 EU

Hardware Setup:	Electric Field Strength 79899 2017 02 27
Measurement Type:	Open-Area-Test-Site
Frequency Range:	30 MHz - 1 GHz
Graphics Level Range:	0 dBµV/m - 120 dBµV/m

Preview Measurements:

Antenna height:	100 - 400 cm , Step Size = 50 cm , Positioning Speed = 6
Polarization:	H + V
Turntable position:	0 - 360 deg , Continuously , Measuring Speed = 5
Graphics Display:	Show separate traces for horizontal and vertical polarization
Sweep Test Template:	Compliance Test EN300422 Transmitter 25MHz 1GHz 79899 PREVIEW

Adjustment:

Antenna height:	Range = 50 cm , Measuring Speed = 1
Turntable position:	Range = 90 deg , Measuring Speed = 5
Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 25 to 1000 MHz 79899 FINAL

Final Measurements:

Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 25 to 1000 MHz 79899 FINAL

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 26]					
25 MHz - 30 MHz	2.25 kHz	PK+ ; QPK	9 kHz	1 s	0 dB
30 MHz - 1 GHz	30 kHz	PK+ ; QPK	120 kHz	2 s	0 dB

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Hardware Setup: EMI radiated\Electric Field Strength 79899 2017 02 27 - [EMI radiated]

Subrange 1

Frequency Range:	25 MHz - 1 GHz
Receiver:	ESR 26 [ESR 26] @ GPIB0 (ADR 20), SN 1316.3003K26/101347, FW 3.36 SP2, CAL 5/28/2016
Signal Path:	Receiver-EMI to 1 GHz FW 1.0 Correction Table: Receiver-EMI Antenna 18GHz L23_041_38 8m
Antenna:	ETS 3142C 79899 SN 79899, CAL 12/5/2015 Correction Table (vertical): BiconiLog 3142C Hor-79899 2017 02 27 Correction Table (horizontal): BiconiLog 3142C Hor-79899 2017 02 27
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.21
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), SN 29799, FW REV 3.21

Appendix A

Full Spectrum

Critical Results

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment	Corr. (dB)
572.133000	102.71	53.00	-49.71	---	---	300.0	H	259.0	---	4:21:14 PM - 1/25/2018	---
102.717667	27.11	53.00	25.89	---	---	350.0	H	348.0	---	4:21:14 PM - 1/25/2018	---
712.621333	46.45	53.00	6.55	---	---	400.0	H	243.0	---	4:21:14 PM - 1/25/2018	---
223.127000	32.49	53.00	20.51	---	---	100.0	V	256.0	---	4:21:14 PM - 1/25/2018	---
49.044333	28.96	53.00	24.04	---	---	150.0	V	92.0	---	4:21:14 PM - 1/25/2018	---
30.452667	37.61	71.00	33.39	---	---	250.0	V	16.0	---	4:21:14 PM - 1/25/2018	---
853.982667	46.15	53.00	6.85	---	---	400.0	V	64.0	---	4:21:14 PM - 1/25/2018	---

Final Results

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
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Appendix A

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 1GHz - 10GHz
EUT:	ULXD8 J50A
Serial Number:	# 1
Operating Frequency:	572.125MHz
Power Level / Mod Mode:	20mW
Name:	Alex Mishinger
Date Tested	Tested on February 19, 2018

EMI Auto Test Template: COMPLIANCE TEST FCC15C-EN300422 Transmitter 1GHz to 10GHz 3117-PA 200363

Hardware Setup:	Electric Field Strength 3117-PA 200363 2017 10 17
Measurement Type:	Open-Area-Test-Site
Frequency Range:	1 GHz - 10 GHz
Graphics Level Range:	0 dBµV/m - 120 dBµV/m
Preview Measurements:	
Antenna height:	100 - 400 cm , Step Size = 50 cm , Positioning Speed = 6
Polarization:	H + V
Turntable position:	0 - 360 deg , Continuously , Measuring Speed = 5
Graphics Display:	Show separate traces for horizontal and vertical polarization
Sweep Test Template:	COMPLIANCE TEST EN300422 Transmitter 1-18 GHz 3117-PA 200363 PREVIEW
Adjustment:	
Antenna height:	Range = 50 cm , Measuring Speed = 1
Turntable position:	Range = 90 deg , Measuring Speed = 5
Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 1 to 18 GHz 3117-PA 200363 MAX
Final Measurements:	
Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 1 to 18 GHz 3117-PA 200363 FINAL

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 26]					
1 GHz - 18 GHz	250 kHz	AVG	1 MHz	1 s	0 dB

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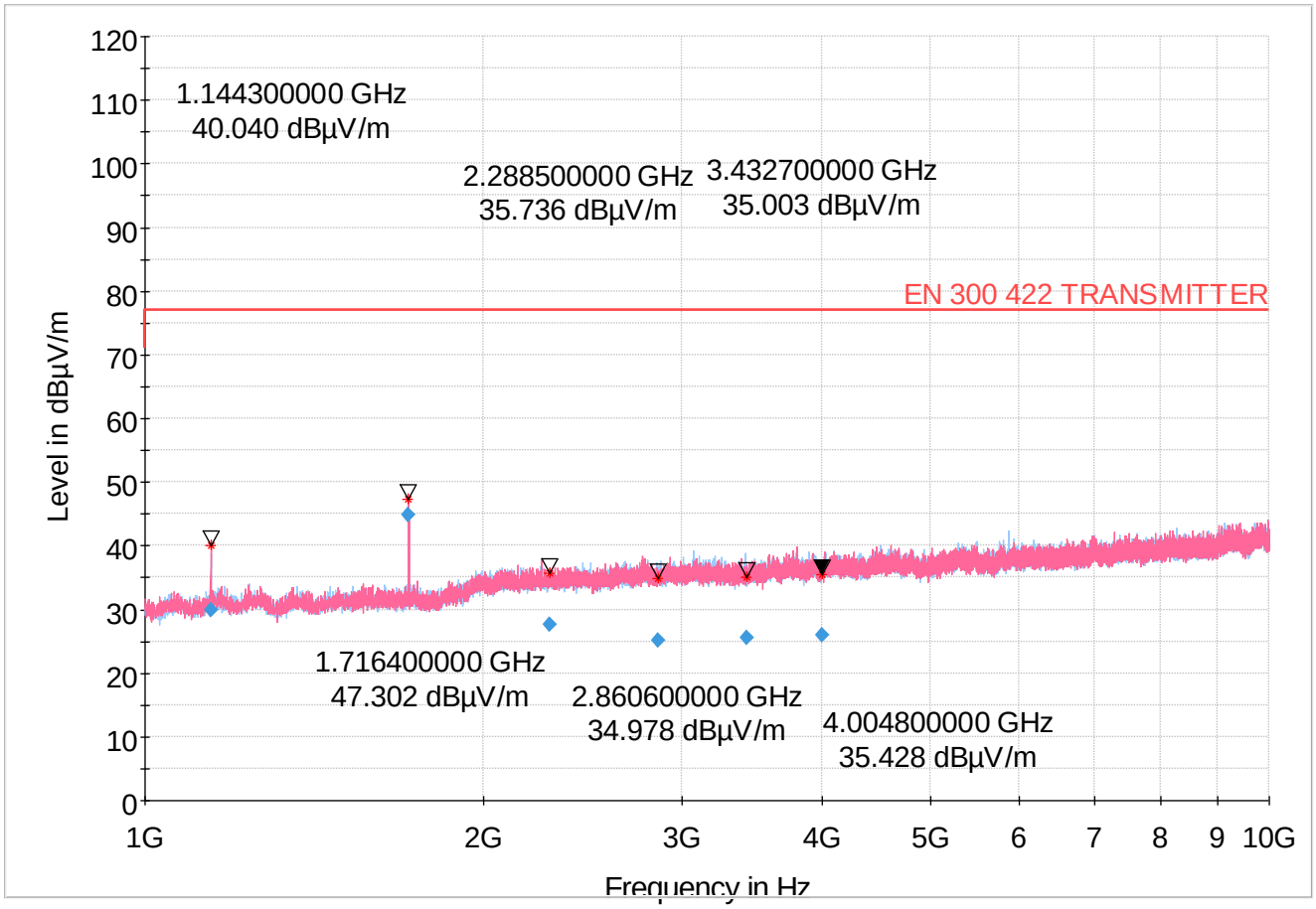
Hardware Setup: EMI radiated\Electric Field Strength 3117-PA 200363 2017 10 17 - [EMI radiated]

Subrange 1

Frequency Range:	1 GHz - 18 GHz
Receiver:	ESR 26 [ESR 26] @ GPIB0 (ADR 20), SN 1316.3003K26/101347, FW 2.26, CAL 5/28/2016
Signal Path:	Receiver-EMI to 18 GHz FW 1.0 Correction Table: Receiver-EMI Antenna TEMP 2016 11 23
Antenna:	EMI3117-PA 200385 SN 200385, CAL 10/16/2018 Correction Table (vertical): Horn ETS 3117-PA 200363 2017 10 16 Correction Table (horizontal): Horn ETS 3117-PA 200363 2017 10 16 Correction Table (vertical): L23_041_47 Cable Correction Table (horizontal): L23_041_47 Cable
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.21
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), SN 29799, FW REV 3.21

Appendix A

Full Spectrum



Critical Results

Frequency (MHz)	MaxPeak (dBµV/m)	DET 2 (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1144.300000	40.04	---	77.00	36.96	---	---	150.0	V	125.0	-15.9	3:38:05 PM - 2/19/2018
1716.400000	47.30	---	77.00	29.70	---	---	100.0	H	326.0	-15.0	3:35:09 PM - 2/19/2018
2288.500000	35.74	---	77.00	41.26	---	---	137.0	H	27.0	-12.9	3:36:54 PM - 2/19/2018
2860.600000	34.98	---	77.00	42.02	---	---	188.0	V	212.0	-11.6	3:39:20 PM - 2/19/2018
3432.700000	35.00	---	77.00	42.00	---	---	112.0	H	337.0	-10.8	3:34:07 PM - 2/19/2018
4004.800000	35.43	---	77.00	41.57	---	---	185.0	V	353.0	-8.7	3:40:30 PM - 2/19/2018

Final Results

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1144.300000	29.84	77.00	47.16	1000.0	1000.000	150.0	V	125.0	-15.9	3:38:14 PM - 2/19/2018
1716.400000	44.80	77.00	32.20	1000.0	1000.000	100.0	H	326.0	-15.0	3:35:20 PM - 2/19/2018
2288.500000	27.71	77.00	49.29	1000.0	1000.000	137.0	H	27.0	-12.9	3:37:04 PM - 2/19/2018
2860.600000	25.03	77.00	51.97	1000.0	1000.000	188.0	V	212.0	-11.6	3:39:30 PM - 2/19/2018
3432.700000	25.51	77.00	51.49	1000.0	1000.000	112.0	H	337.0	-10.8	3:34:16 PM - 2/19/2018
4004.800000	26.01	77.00	50.99	1000.0	1000.000	185.0	V	353.0	-8.7	3:40:42 PM - 2/19/2018

Appendix A

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 30MHz - 1GHz
EUT:	ULXD8 J50A
Serial Number:	# 1
Operating Frequency:	589.500MHz
Power Level / Mod Mode:	20mW
Name:	Alex Mishinger
Date Tested	Tested on November 27, 2017

EMI Auto Test Template: Bandsaw COMPLIANCE TEST FCC 15C 30MHz to 1GHz 34790 FCC

Hardware Setup:	Electric Field Strength 34790
Measurement Type:	Open-Area-Test-Site
Frequency Range:	30 MHz - 1 GHz
Graphics Level Range:	0 dBµV/m - 125 dBµV/m

Preview Measurements:

Graphics Display:	Show separate traces for horizontal and vertical polarization
Sweep Test Template:	Compliance Test FCC 30MHz 1GHz 34790 PREVIEW

Adjustment:

Template for Single Meas.:	COMPLIANCE TEST FCC 15B 30 to 1000 MHz 34790 MAX

Final Measurements:

Template for Single Meas.:	COMPLIANCE TEST FCC 15B 30 to 1000 MHz 34790 FINAL

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 26]					
25 MHz - 30 MHz	2.25 kHz	PK+ ; QPK	9 kHz	1 s	0 dB
30 MHz - 1 GHz	30 kHz	PK+ ; QPK	120 kHz	2 s	0 dB

Appendix A

Hardware Setup: EMI radiated\Electric Field Strength 34790 - [EMI radiated]

Subrange 1

Frequency Range:	25 MHz - 1 GHz
Receiver:	ESR 26 [ESR 26] @ GPIB0 (ADR 20), SN 1316.3003K26/101347, FW 2.26, CAL 5/28/2016
Signal Path:	Receiver-EMI to 1 GHz FW 1.0 Correction Table: Receiver-EMI Antenna 18GHz L23_041_38 8m
Antenna:	ETS 3142C 34790 SN 34790, CAL 6/3/2017 Correction Table (vertical): BiconiLog 3142C Hor-34790 2017 06 17 Correction Table (horizontal): BiconiLog 3142C Hor-34790 2017 06 17
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.21
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), SN 29799, FW REV 3.21

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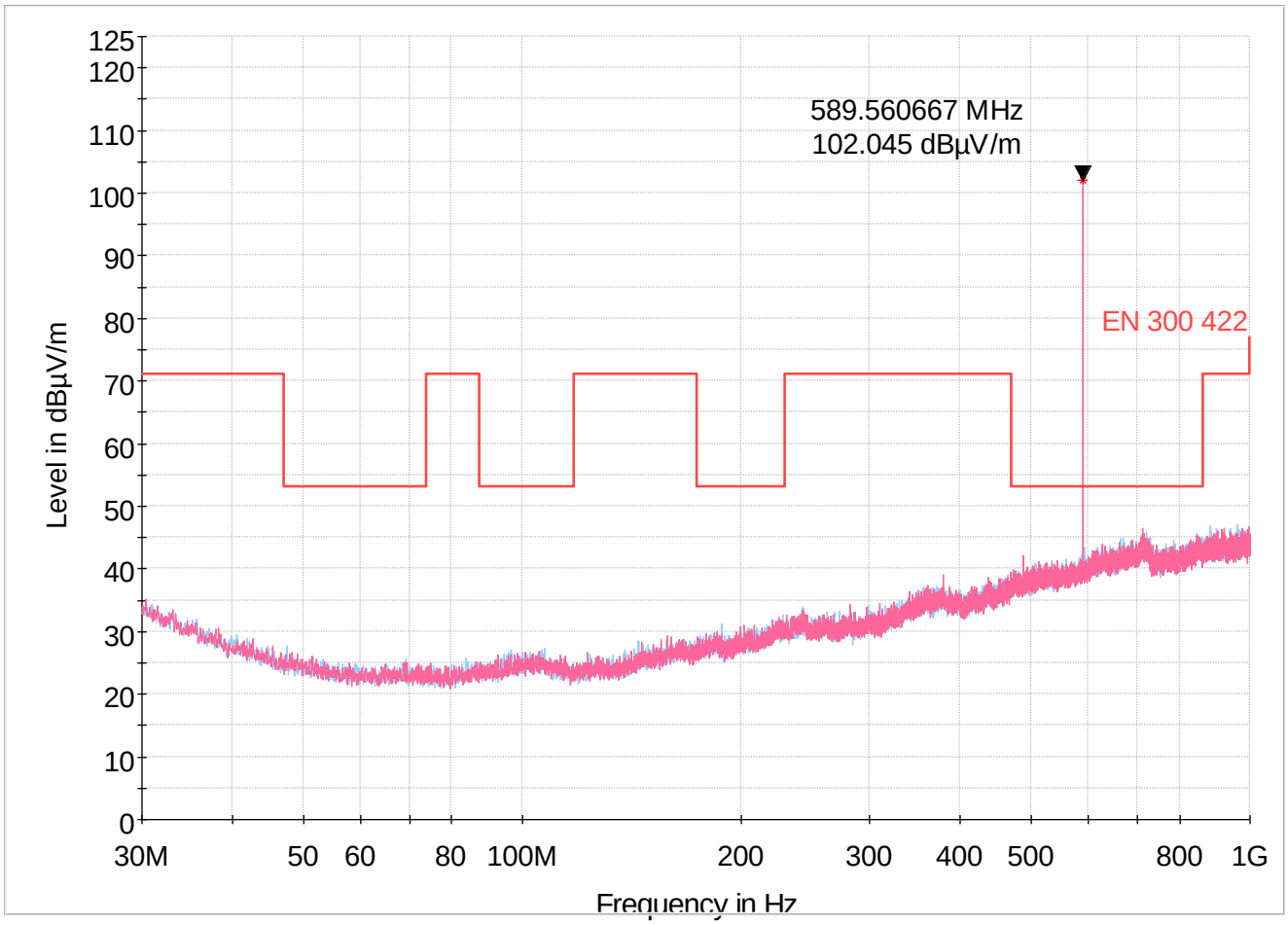

Critical Results

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
589.560667	102.04	53.00	-49.04	---	---	150.0	H	127.0	21.2	2:14:26 PM - 11/27/2017

Final Results

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
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Appendix A

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 1GHz - 10GHz
EUT:	ULXD8 J50A
Serial Number:	# 1
Operating Frequency:	589.500MHz
Power Level / Mod Mode:	20mW
Name:	Alex Mishinger
Date Tested	Tested on February 19, 2018

EMI Auto Test Template: COMPLIANCE TEST FCC15C-EN300422 Transmitter 1GHz to 10GHz 3117-PA 200363

Hardware Setup:	Electric Field Strength 3117-PA 200363 2017 10 17
Measurement Type:	Open-Area-Test-Site
Frequency Range:	1 GHz - 10 GHz
Graphics Level Range:	0 dBµV/m - 120 dBµV/m

Preview Measurements:

Antenna height:	100 - 400 cm , Step Size = 50 cm , Positioning Speed = 6
Polarization:	H + V
Turntable position:	0 - 360 deg , Continuously , Measuring Speed = 5
Graphics Display:	Show separate traces for horizontal and vertical polarization
Sweep Test Template:	COMPLIANCE TEST EN300422 Transmitter 1-18 GHz 3117-PA 200363 PREVIEW

Adjustment:

Antenna height:	Range = 50 cm , Measuring Speed = 1
Turntable position:	Range = 90 deg , Measuring Speed = 5
Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 1 to 18 GHz 3117-PA 200363 MAX

Final Measurements:

Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 1 to 18 GHz 3117-PA 200363 FINAL

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 26]					
1 GHz - 18 GHz	250 kHz	AVG	1 MHz	1 s	0 dB

Appendix A

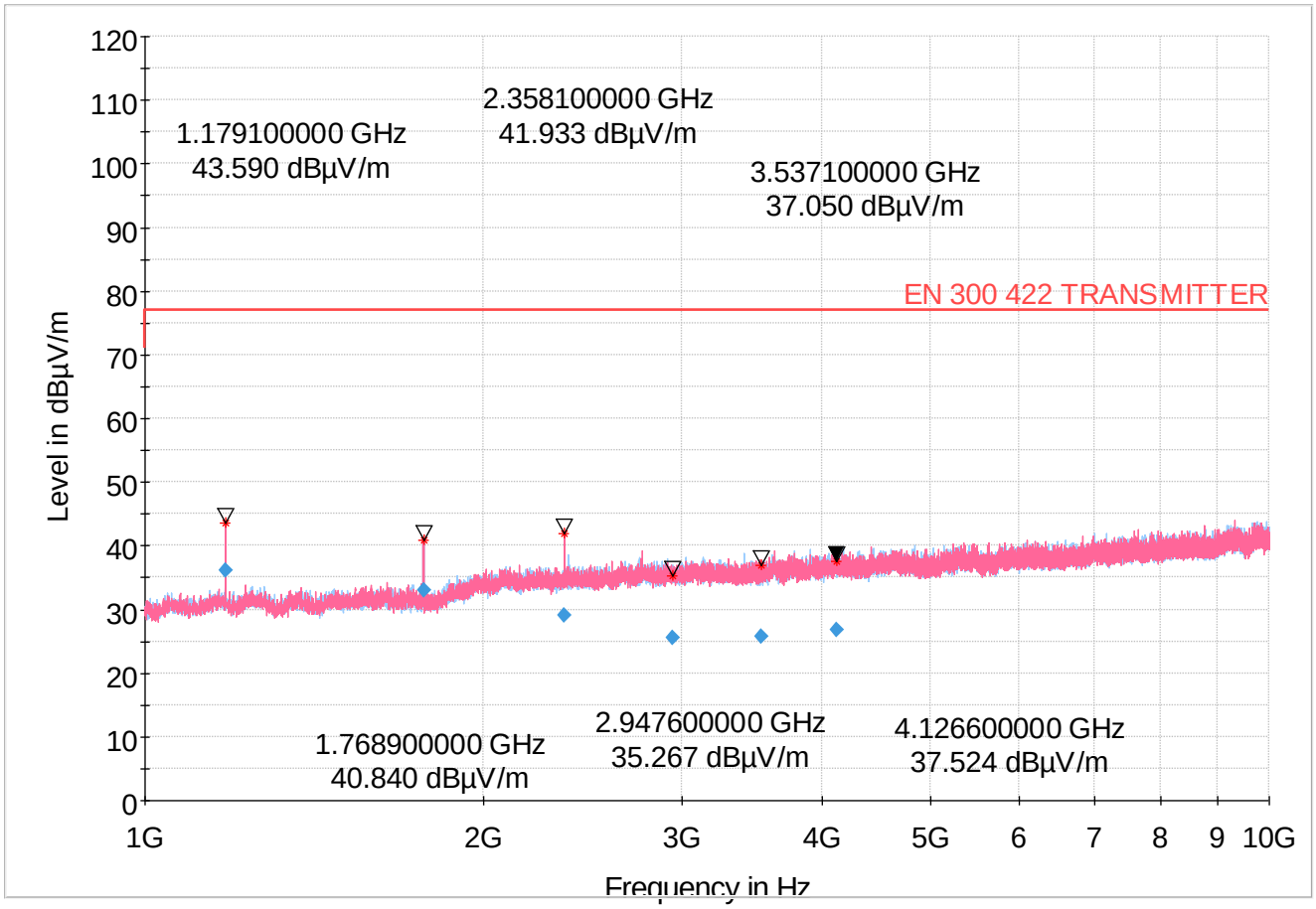
Hardware Setup: EMI radiated\Electric Field Strength 3117-PA 200363 2017 10 17 - [EMI radiated]

Subrange 1

Frequency Range:	1 GHz - 18 GHz
Receiver:	ESR 26 [ESR 26] @ GPIB0 (ADR 20), SN 1316.3003K26/101347, FW 2.26, CAL 5/28/2016
Signal Path:	Receiver-EMI to 18 GHz FW 1.0 Correction Table: Receiver-EMI Antenna TEMP 2016 11 23
Antenna:	EMI3117-PA 200385 SN 200385, CAL 10/16/2018 Correction Table (vertical): Horn ETS 3117-PA 200363 2017 10 16 Correction Table (horizontal): Horn ETS 3117-PA 200363 2017 10 16 Correction Table (vertical): L23_041_47 Cable Correction Table (horizontal): L23_041_47 Cable
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.21
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), SN 29799, FW REV 3.21

Appendix A

Full Spectrum



Critical Results

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment	Corr. (dB)
1179.100000	43.59	77.00	33.41	---	---	287.0	H	98.0	---	4:07:40 PM - 2/19/2018	---
1768.900000	40.84	77.00	36.16	---	---	117.0	H	308.0	---	4:05:57 PM - 2/19/2018	---
2358.100000	41.93	77.00	35.07	---	---	252.0	V	165.0	---	4:10:00 PM - 2/19/2018	---
2947.600000	35.27	77.00	41.73	---	---	352.0	H	139.0	---	4:08:44 PM - 2/19/2018	---
3537.100000	37.05	77.00	39.95	---	---	330.0	V	277.0	---	4:12:26 PM - 2/19/2018	---
4126.600000	37.52	77.00	39.48	---	---	333.0	V	84.0	---	4:11:18 PM - 2/19/2018	---

Final Results

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment	Corr. (dB)
1179.100000	36.03	77.00	40.97	1000.0	1000.000	287.0	H	98.0	-15.9	4:07:49 PM - 2/19/2018	---
1768.900000	33.03	77.00	43.97	1000.0	1000.000	117.0	H	308.0	-14.8	4:06:07 PM - 2/19/2018	---
2358.100000	29.06	77.00	47.94	1000.0	1000.000	252.0	V	165.0	-12.6	4:10:09 PM - 2/19/2018	---
2947.600000	25.52	77.00	51.48	1000.0	1000.000	352.0	H	140.0	-11.4	4:08:53 PM - 2/19/2018	---
3537.100000	25.66	77.00	51.34	1000.0	1000.000	330.0	V	277.0	-10.3	4:12:36 PM - 2/19/2018	---
4126.600000	26.75	77.00	50.25	1000.0	1000.000	333.0	V	84.0	-8.2	4:11:28 PM - 2/19/2018	---

Appendix A

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 30MHz - 1GHz
EUT:	ULXD8 J50A
Serial Number:	# 1
Operating Frequency:	606.875MHz
Power Level / Mod Mode:	20mW
Name:	Alex Mishinger
Date Tested	Tested on January 25, 2018

EMI Auto Test Template: COMPLIANCE TEST FCC15C-EN300422 Transmitter 30MHz to 1GHz 79899 EU

Hardware Setup:	Electric Field Strength 79899 2017 02 27
Measurement Type:	Open-Area-Test-Site
Frequency Range:	30 MHz - 1 GHz
Graphics Level Range:	0 dBµV/m - 120 dBµV/m

Preview Measurements:

Antenna height:	100 - 400 cm , Step Size = 50 cm , Positioning Speed = 6
Polarization:	H + V
Turntable position:	0 - 360 deg , Continuously , Measuring Speed = 5
Graphics Display:	Show separate traces for horizontal and vertical polarization
Sweep Test Template:	Compliance Test EN300422 Transmitter 25MHz 1GHz 79899 PREVIEW

Adjustment:

Antenna height:	Range = 50 cm , Measuring Speed = 1
Turntable position:	Range = 90 deg , Measuring Speed = 5
Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 25 to 1000 MHz 79899 FINAL

Final Measurements:

Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 25 to 1000 MHz 79899 FINAL

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 26]					
25 MHz - 30 MHz	2.25 kHz	PK+ ; QPK	9 kHz	1 s	0 dB
30 MHz - 1 GHz	30 kHz	PK+ ; QPK	120 kHz	2 s	0 dB

Appendix A

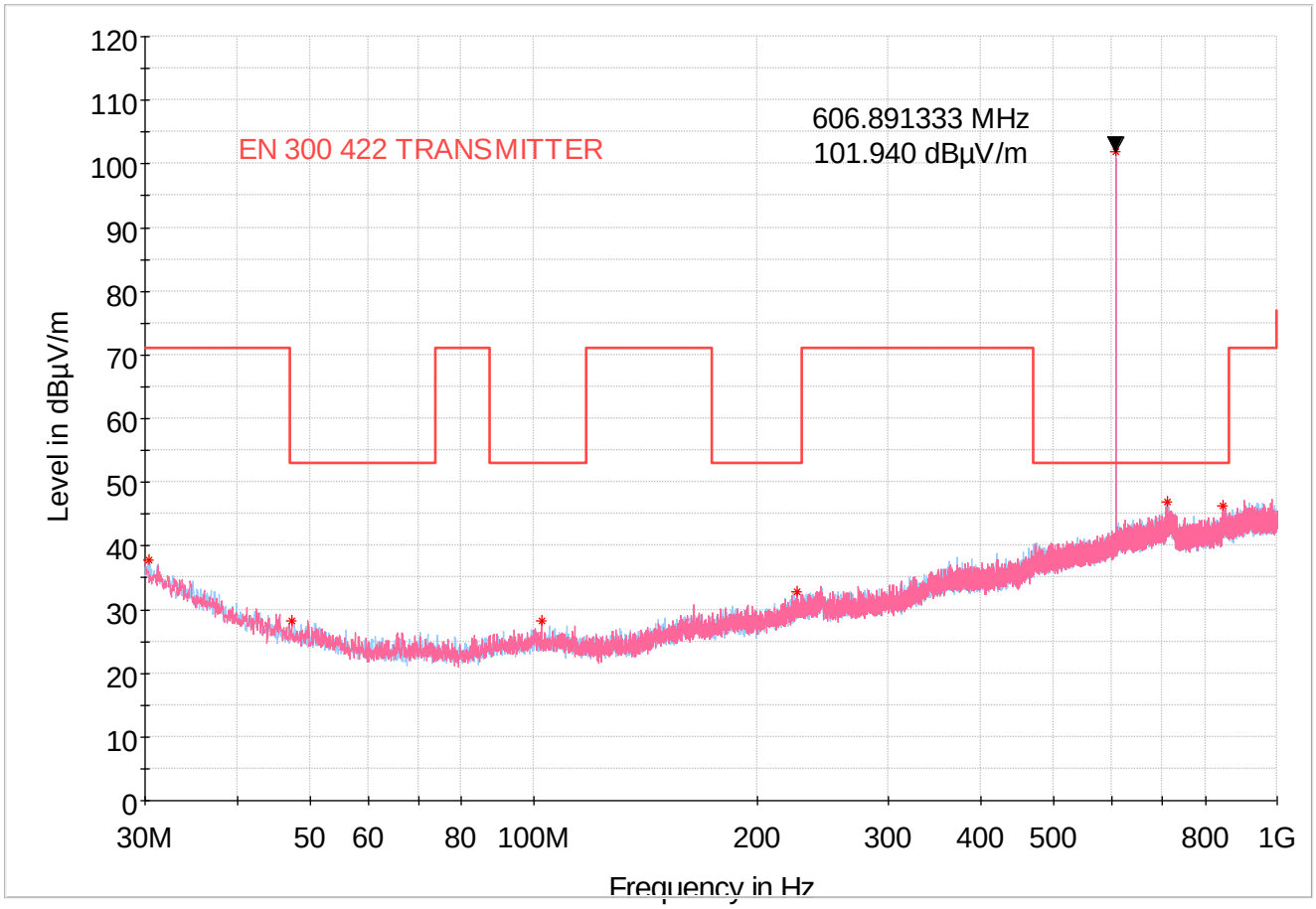
Hardware Setup: EMI radiated\Electric Field Strength 79899 2017 02 27 - [EMI radiated]

Subrange 1

Frequency Range:	25 MHz - 1 GHz
Receiver:	ESR 26 [ESR 26] @ GPIB0 (ADR 20), SN 1316.3003K26/101347, FW 3.36 SP2, CAL 5/28/2016
Signal Path:	Receiver-EMI to 1 GHz FW 1.0 Correction Table: Receiver-EMI Antenna 18GHz L23_041_38 8m
Antenna:	ETS 3142C 79899 SN 79899, CAL 12/5/2015 Correction Table (vertical): BiconiLog 3142C Hor-79899 2017 02 27 Correction Table (horizontal): BiconiLog 3142C Hor-79899 2017 02 27
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.21
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), SN 29799, FW REV 3.21

Appendix A

Full Spectrum



Critical Results

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment	Corr. (dB)
606.891333	101.94	53.00	-48.94	---	---	250.0	H	299.0	---	4:45:21 PM - 1/25/2018	---
30.323333	37.74	71.00	33.26	---	---	300.0	H	63.0	---	4:45:21 PM - 1/25/2018	---
844.929333	46.22	53.00	6.78	---	---	300.0	H	140.0	---	4:45:21 PM - 1/25/2018	---
226.069333	32.87	53.00	20.13	---	---	100.0	V	65.0	---	4:45:21 PM - 1/25/2018	---
102.362000	28.14	53.00	24.86	---	---	100.0	V	250.0	---	4:45:21 PM - 1/25/2018	---
47.266000	28.24	53.00	24.76	---	---	150.0	V	5.0	---	4:45:21 PM - 1/25/2018	---
710.810667	47.02	53.00	5.98	---	---	250.0	V	348.0	---	4:45:21 PM - 1/25/2018	---

Final Results

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment	Corr. (dB)
---	---	---	---	---	---	---		---	---		---

Appendix A

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 1GHz - 10GHz
EUT:	ULXD8 J50A
Serial Number:	# 1
Operating Frequency:	606.875MHz
Power Level / Mod Mode:	20mW
Name:	Alex Mishinger
Date Tested	Tested on February 19, 2018

EMI Auto Test Template: COMPLIANCE TEST FCC15C-EN300422 Transmitter 1GHz to 10GHz 3117-PA 200363

Hardware Setup:	Electric Field Strength 3117-PA 200363 2017 10 17
Measurement Type:	Open-Area-Test-Site
Frequency Range:	1 GHz - 10 GHz
Graphics Level Range:	0 dBµV/m - 120 dBµV/m

Preview Measurements:

Antenna height:	100 - 400 cm , Step Size = 50 cm , Positioning Speed = 6
Polarization:	H + V
Turntable position:	0 - 360 deg , Continuously , Measuring Speed = 5
Graphics Display:	Show separate traces for horizontal and vertical polarization
Sweep Test Template:	COMPLIANCE TEST EN300422 Transmitter 1-18 GHz 3117-PA 200363 PREVIEW

Adjustment:

Antenna height:	Range = 50 cm , Measuring Speed = 1
Turntable position:	Range = 90 deg , Measuring Speed = 5
Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 1 to 18 GHz 3117-PA 200363 MAX

Final Measurements:

Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 1 to 18 GHz 3117-PA 200363 FINAL

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 26]					
1 GHz - 18 GHz	250 kHz	AVG	1 MHz	1 s	0 dB

Appendix A

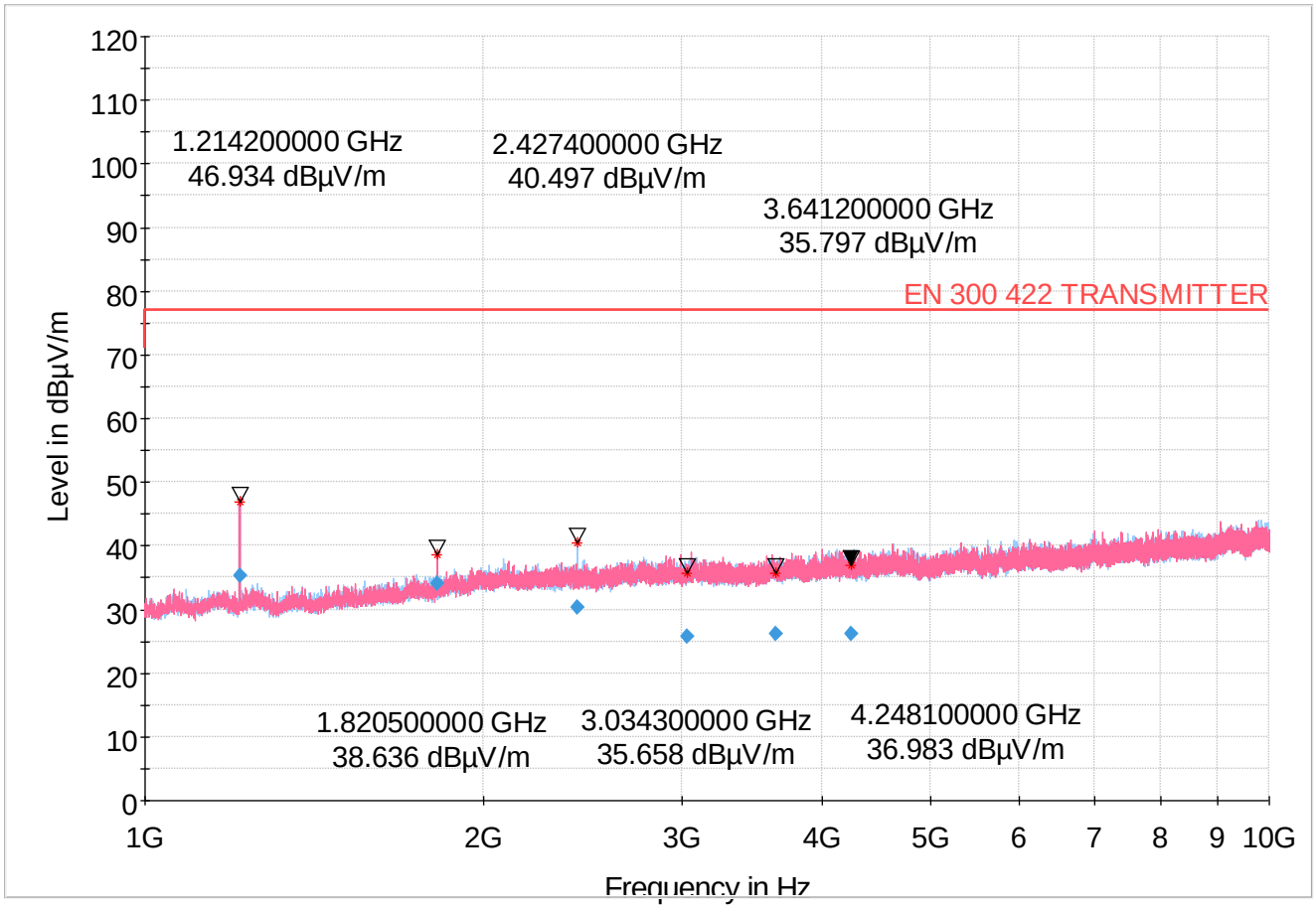
Hardware Setup: EMI radiated\Electric Field Strength 3117-PA 200363 2017 10 17 - [EMI radiated]

Subrange 1

Frequency Range:	1 GHz - 18 GHz
Receiver:	ESR 26 [ESR 26] @ GPIB0 (ADR 20), SN 1316.3003K26/101347, FW 2.26, CAL 5/28/2016
Signal Path:	Receiver-EMI to 18 GHz FW 1.0 Correction Table: Receiver-EMI Antenna TEMP 2016 11 23
Antenna:	EMI3117-PA 200385 SN 200385, CAL 10/16/2018 Correction Table (vertical): Horn ETS 3117-PA 200363 2017 10 16 Correction Table (horizontal): Horn ETS 3117-PA 200363 2017 10 16 Correction Table (vertical): L23_041_47 Cable Correction Table (horizontal): L23_041_47 Cable
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.21
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), SN 29799, FW REV 3.21

Appendix A

Full Spectrum



Critical Results

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/ m)	Comment	Corr. (dB)
1214.200000	46.93	77.00	30.07	---	---	212.0	H	83.0	---	4:40:05 PM - 2/19/2018	---
1820.500000	38.64	77.00	38.36	---	---	125.0	V	172.0	---	4:42:55 PM - 2/19/2018	---
2427.400000	40.50	77.00	36.50	---	---	199.0	H	-5.0	---	4:38:52 PM - 2/19/2018	---
3034.300000	35.66	77.00	41.34	---	---	138.0	H	349.0	---	4:37:10 PM - 2/19/2018	---
3641.200000	35.80	77.00	41.20	---	---	335.0	H	308.0	---	4:41:22 PM - 2/19/2018	---
4248.100000	36.98	77.00	40.02	---	---	187.0	V	164.0	---	4:44:07 PM - 2/19/2018	---

Final Results

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment	Corr. (dB)
1214.200000	35.32	77.00	41.68	1000.0	1000.000	212.0	H	83.0	-15.9	4:40:13 PM - 2/19/2018	---
1820.500000	34.06	77.00	42.94	1000.0	1000.000	125.0	V	172.0	-14.5	4:43:01 PM - 2/19/2018	---
2427.400000	30.33	77.00	46.67	1000.0	1000.000	199.0	H	-5.0	-12.6	4:39:01 PM - 2/19/2018	---
3034.300000	25.73	77.00	51.27	1000.0	1000.000	138.0	H	349.0	-11.2	4:37:20 PM - 2/19/2018	---
3641.200000	26.11	77.00	50.89	1000.0	1000.000	335.0	H	308.0	-9.6	4:41:33 PM - 2/19/2018	---
4248.100000	26.21	77.00	50.79	1000.0	1000.000	187.0	V	164.0	-8.1	4:44:18 PM - 2/19/2018	---

Appendix A

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 30MHz - 1GHz
EUT	ULXD8 J50A
Serial Number	# 1
Operating Conditions:	614.125MHz, 20mW Tested on November 27, 2017
Operator Name:	Alex Mishinger

EMI Auto Test Template: Bandsaw COMPLIANCE TEST FCC 15C 30MHz to 1GHz 34790 FCC

Hardware Setup:	Electric Field Strength 34790
Measurement Type:	Open-Area-Test-Site
Frequency Range:	30 MHz - 1 GHz
Graphics Level Range:	0 dBµV/m - 125 dBµV/m

Preview Measurements:

Graphics Display:	Show separate traces for horizontal and vertical polarization
Sweep Test Template:	Compliance Test FCC 30MHz 1GHz 34790 PREVIEW

Adjustment:

Template for Single Meas.:	COMPLIANCE TEST FCC 15B 30 to 1000 MHz 34790 MAX

Final Measurements:

Template for Single Meas.:	COMPLIANCE TEST FCC 15B 30 to 1000 MHz 34790 FINAL

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 26]					
25 MHz - 30 MHz	2.25 kHz	PK+ ; QPK	9 kHz	1 s	0 dB
30 MHz - 1 GHz	30 kHz	PK+ ; QPK	120 kHz	2 s	0 dB

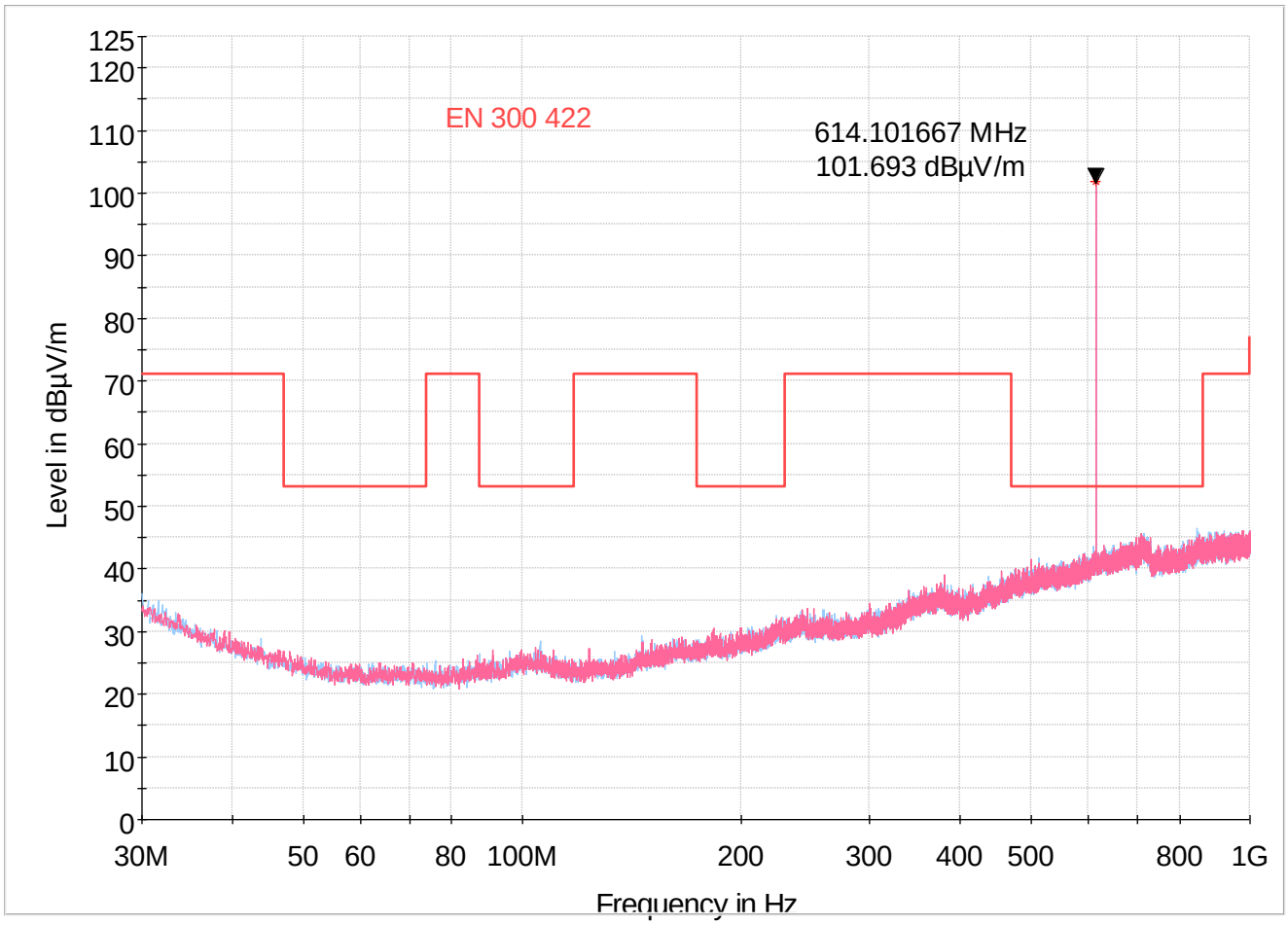
Appendix A

Hardware Setup: EMI radiated\Electric Field Strength 34790 - [EMI radiated]

Subrange 1

Frequency Range:	25 MHz - 1 GHz
Receiver:	ESR 26 [ESR 26] @ GPIB0 (ADR 20), SN 1316.3003K26/101347, FW 2.26, CAL 5/28/2016
Signal Path:	Receiver-EMI to 1 GHz FW 1.0 Correction Table: Receiver-EMI Antenna 18GHz L23_041_38 8m
Antenna:	ETS 3142C 34790 SN 34790, CAL 6/3/2017 Correction Table (vertical): BiconiLog 3142C Hor-34790 2017 06 17 Correction Table (horizontal): BiconiLog 3142C Hor-34790 2017 06 17
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.21
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), SN 29799, FW REV 3.21

Appendix A



Critical Results

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
614.134000	101.85	53.00	-48.85	---	---	200.0	H	311.0	22.0	3:04:09 PM - 11/27/2017

Final Results

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
---	---	---	---	---	---	---		---	---	

Appendix A

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC15C Radiated Emissions 1GHz - 10GHz EU
EUT:	ULXD8 J50A
Serial Number:	# 1
Operating Frequency:	614.125MHz
Power Level / Mod Mode:	20mW
Name:	Alex Mishinger
Comments:	Tested on February 16, 2018

EMI Auto Test Template: COMPLIANCE TEST FCC 15C 1GHz to 10GHz 3117-PA 200363 FCC

Hardware Setup:	Electric Field Strength 3117-PA 200363 2017 10 17
Measurement Type:	Open-Area-Test-Site
Frequency Range:	1 GHz - 10 GHz
Graphics Level Range:	0 dBµV/m - 120 dBµV/m

Preview Measurements:

Antenna height:	100 - 400 cm , Step Size = 50 cm , Positioning Speed = 6
Polarization:	H + V
Turntable position:	0 - 360 deg , Continuously , Measuring Speed = 5
Graphics Display:	Show separate traces for horizontal and vertical polarization
Sweep Test Template:	COMPLIANCE TEST EN300422 Transmitter 1-18 GHz 3117-PA 200363 PREVIEW

Adjustment:

Antenna height:	Range = 50 cm , Measuring Speed = 1
Turntable position:	Range = 90 deg , Measuring Speed = 5
Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 1 to 18 GHz 3117-PA 200363 MAX

Final Measurements:

Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 1 to 18 GHz 3117-PA 200363 FINAL

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 26]					
1 GHz - 18 GHz	250 kHz	AVG	1 MHz	1 s	0 dB

Appendix A

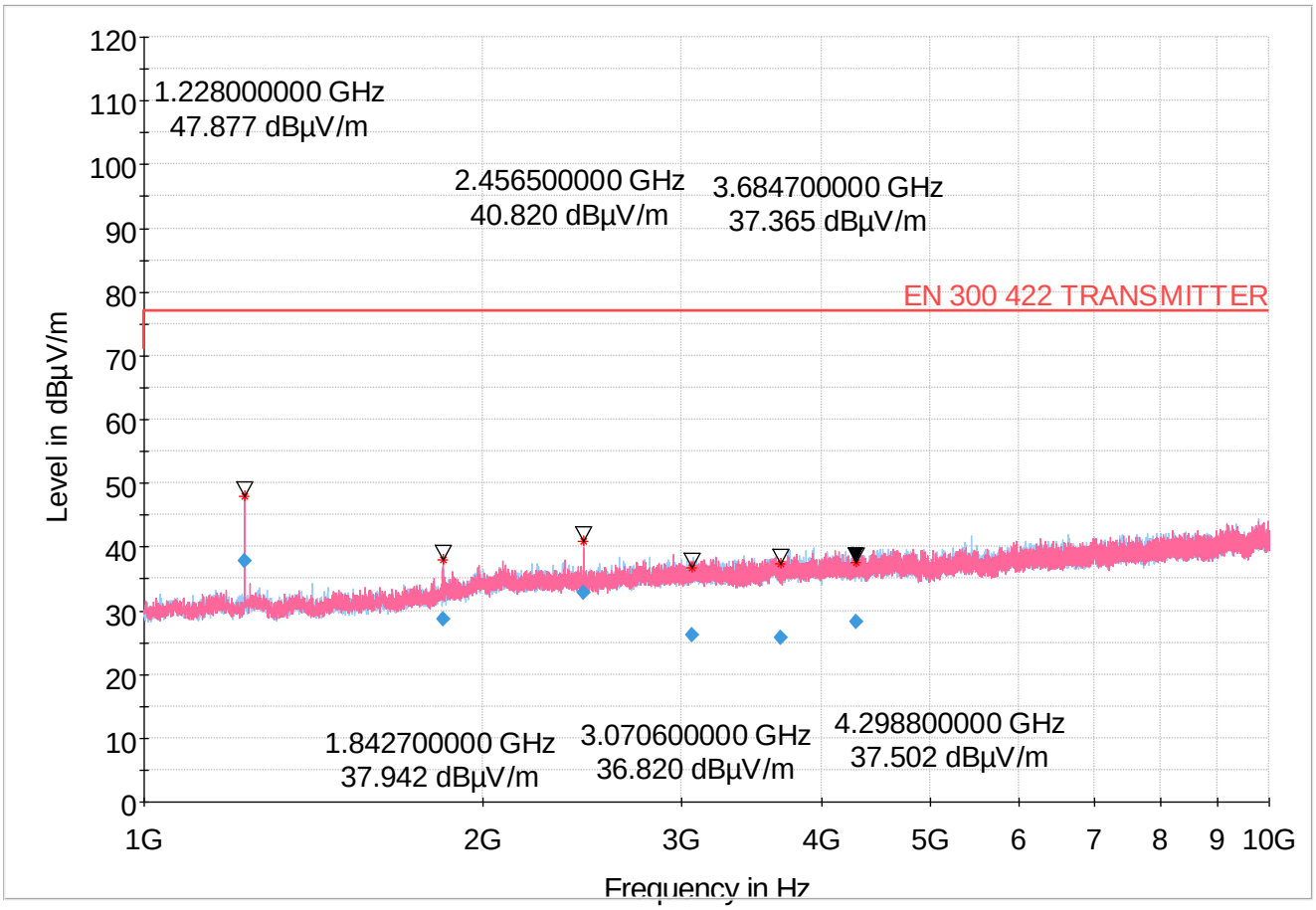
Hardware Setup: EMI radiated\Electric Field Strength 3117-PA 200363 - [EMI radiated]

Subrange 1

Frequency Range:	1 GHz - 18 GHz
Receiver:	ESR 26 [ESR 26] @ GPIB0 (ADR 20), SN 1316.3003K26/101347, FW 2.26, CAL 5/28/2016
Signal Path:	Receiver-EMI to 18 GHz FW 1.0 Correction Table: Receiver-EMI Antenna TEMP 2016 11 23
Antenna:	EMI3117-PA 200385 SN 200385, CAL 10/16/2018 Correction Table (vertical): Horn ETS 3117-PA 200363 2017 10 16 Correction Table (horizontal): Horn ETS 3117-PA 200363 2017 10 16 Correction Table (vertical): L23_041_47 Cable Correction Table (horizontal): L23_041_47 Cable
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.21
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), SN 29799, FW REV 3.21

Appendix A

Full Spectrum



Critical Frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment	Corr. (dB)
1228.000000	47.88	77.00	29.12	---	---	266.0	V	213.0	---	5:07:02 PM - 2/16/2018	---
1842.700000	37.94	77.00	39.06	---	---	103.0	V	3.0	---	5:04:50 PM - 2/16/2018	---
2456.500000	40.82	77.00	36.18	---	---	114.0	H	-2.0	---	5:01:32 PM - 2/16/2018	---
3070.600000	36.82	77.00	40.18	---	---	229.0	H	354.0	---	5:03:10 PM - 2/16/2018	---
3684.700000	37.37	77.00	39.63	---	---	232.0	V	256.0	---	5:08:13 PM - 2/16/2018	---
4298.800000	37.50	77.00	39.50	---	---	111.0	V	86.0	---	5:05:45 PM - 2/16/2018	---

Final Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment	Corr. (dB)
1228.000000	37.81	77.00	39.19	1000.0	1000.000	266.0	V	213.0	-15.8	5:07:10 PM - 2/16/2018	---
1842.700000	28.66	77.00	48.34	1000.0	1000.000	103.0	V	3.0	-14.4	5:04:59 PM - 2/16/2018	---
2456.500000	32.78	77.00	44.22	1000.0	1000.000	114.0	H	-2.0	-12.5	5:01:40 PM - 2/16/2018	---
3070.600000	26.08	77.00	50.92	1000.0	1000.000	229.0	H	354.0	-11.1	5:03:20 PM - 2/16/2018	---
3684.700000	25.76	77.00	51.24	1000.0	1000.000	232.0	V	256.0	-9.5	5:08:23 PM - 2/16/2018	---
4298.800000	28.16	77.00	48.84	1000.0	1000.000	111.0	V	86.0	-8.3	5:05:54 PM - 2/16/2018	---

Appendix A

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 30MHz - 1GHz
EUT:	ULXD8 J50A
Serial Number:	# 1
Operating Frequency:	615.875MHz
Power Level / Mod Mode:	20mW
Name:	Alex Mishinger
Comments:	Tested on January 25, 2018

EMI Auto Test Template: COMPLIANCE TEST FCC15C-EN300422 Transmitter 25MHz to 1GHz 79899 EU

Hardware Setup:	Electric Field Strength 79899 2017 02 27
Measurement Type:	Open-Area-Test-Site
Frequency Range:	25 MHz - 1 GHz
Graphics Level Range:	0 dBµV/m - 120 dBµV/m

Preview Measurements:

Antenna height:	100 - 400 cm , Step Size = 50 cm , Positioning Speed = 6
Polarization:	H + V
Turntable position:	0 - 360 deg , Continuously , Measuring Speed = 5
Graphics Display:	Show separate traces for horizontal and vertical polarization
Sweep Test Template:	Compliance Test EN300422 Transmitter 25MHz 1GHz 79899 PREVIEW

Adjustment:

Antenna height:	Range = 50 cm , Measuring Speed = 1
Turntable position:	Range = 90 deg , Measuring Speed = 5
Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 25 to 1000 MHz 79899 FINAL

Final Measurements:

Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 25 to 1000 MHz 79899 FINAL

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
25 MHz - 30 MHz	2.25 kHz	PK+	9 kHz	1 s	0 dB
30 MHz - 1 GHz	30 kHz	PK+	120 kHz	1 s	0 dB

Receiver: [ESR 26]

Appendix A

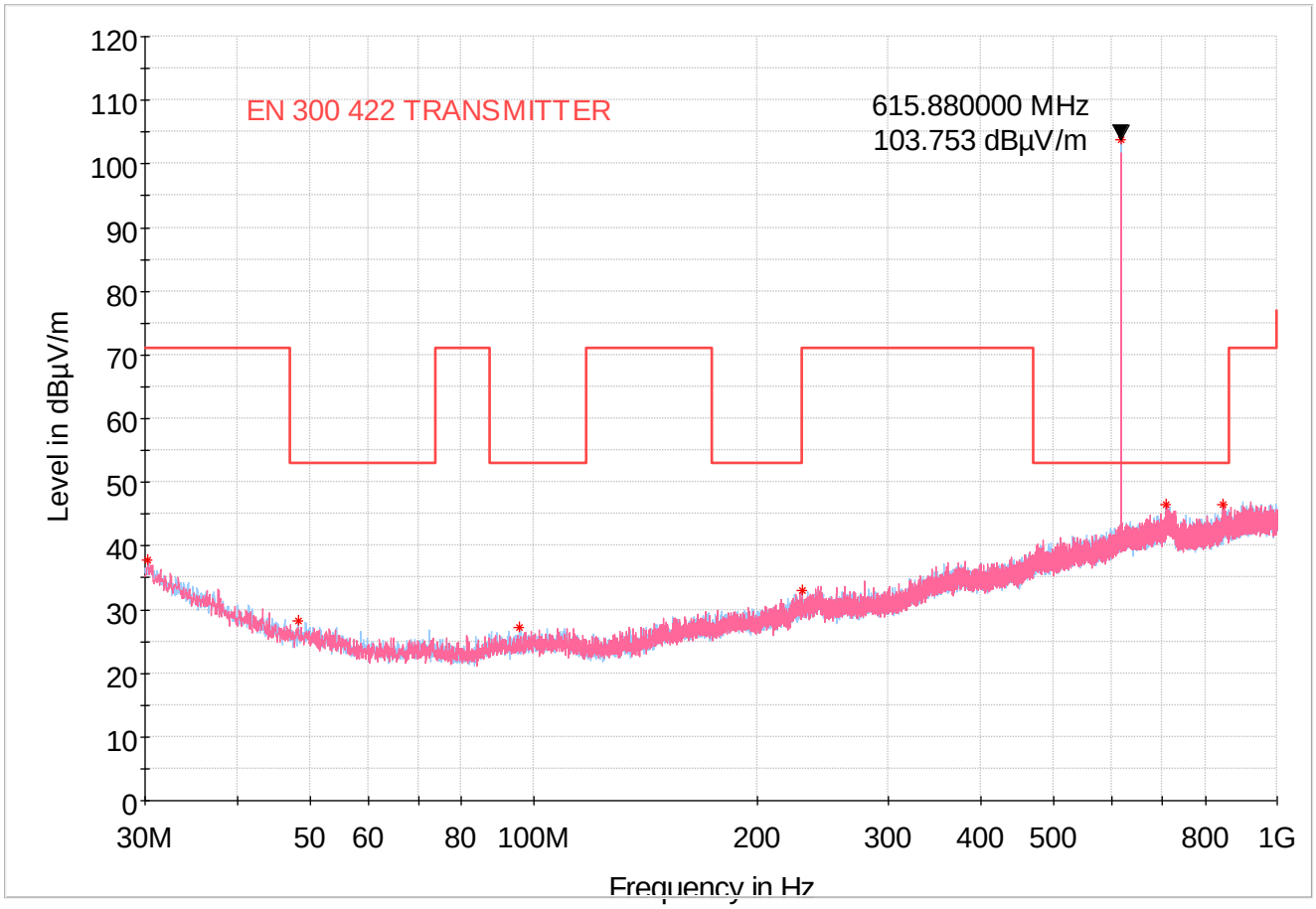
Hardware Setup: EMI radiated\Electric Field Strength 79899 2017 02 27 - [EMI radiated]

Subrange 1

Frequency Range:	25 MHz - 1 GHz
Receiver:	ESR 26 [ESR 26] @ GPIB0 (ADR 20), SN 1316.3003K26/101347, FW 3.36 SP2, CAL 5/28/2016
Signal Path:	Receiver-EMI to 1 GHz FW 1.0 Correction Table: Receiver-EMI Antenna 18GHz L23_041_38 8m
Antenna:	ETS 3142C 79899 SN 79899, CAL 12/5/2015 Correction Table (vertical): BiconiLog 3142C Hor-79899 2017 02 27 Correction Table (horizontal): BiconiLog 3142C Hor-79899 2017 02 27
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.21
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), SN 29799, FW REV 3.21

Appendix A

Full Spectrum



Critical Frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/ m)	Comment	Corr. (dB)
709.355667	46.41	53.00	6.59	---	---	100.0	H	0.0	---	5:07:04 PM - 1/25/2018	---
615.880000	103.75	53.00	-50.75	---	---	250.0	H	294.0	---	5:07:04 PM - 1/25/2018	---
845.996333	46.53	53.00	6.47	---	---	300.0	H	0.0	---	5:07:04 PM - 1/25/2018	---
48.203667	28.24	53.00	24.76	---	---	300.0	H	113.0	---	5:07:04 PM - 1/25/2018	---
95.701333	27.20	53.00	25.80	---	---	350.0	H	280.0	---	5:07:04 PM - 1/25/2018	---
229.399667	33.11	53.00	19.89	---	---	150.0	V	169.0	---	5:07:04 PM - 1/25/2018	---
30.258667	37.69	71.00	33.31	---	---	350.0	V	287.0	---	5:07:04 PM - 1/25/2018	---

Final Frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment	Corr. (dB)
---	---	---	---	---	---	---		---	---		---

Appendix A

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC15C Radiated Emissions 1GHz - 10GHz
EUT:	ULXD8 J50A
Serial Number:	# 1
Operating Frequency:	615.875MHz
Power Level / Mod Mode:	20mW
Name:	Alex Mishinger
Comments:	Tested on February 16, 2018

EMI Auto Test Template: COMPLIANCE TEST EN300422 Transmitter 1GHz to 10GHz 3117-PA 200363 EU

Hardware Setup:	Electric Field Strength 3117-PA 200363 2017 10 17
Measurement Type:	Open-Area-Test-Site
Frequency Range:	1 GHz - 10 GHz
Graphics Level Range:	0 dBµV/m - 120 dBµV/m
Preview Measurements:	
Antenna height:	100 - 400 cm , Step Size = 50 cm , Positioning Speed = 6
Polarization:	H + V
Turntable position:	0 - 360 deg , Continuously , Measuring Speed = 5
Graphics Display:	Show separate traces for horizontal and vertical polarization
Sweep Test Template:	COMPLIANCE TEST EN300422 Transmitter 1-18 GHz 3117-PA 200363 PREVIEW
Adjustment:	
Antenna height:	Range = 50 cm , Measuring Speed = 1
Turntable position:	Range = 90 deg , Measuring Speed = 5
Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 1 to 18 GHz 3117-PA 200363 MAX
Final Measurements:	
Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 1 to 18 GHz 3117-PA 200363 FINAL

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 26]					
1 GHz - 18 GHz	250 kHz	AVG	1 MHz	1 s	0 dB

Appendix A

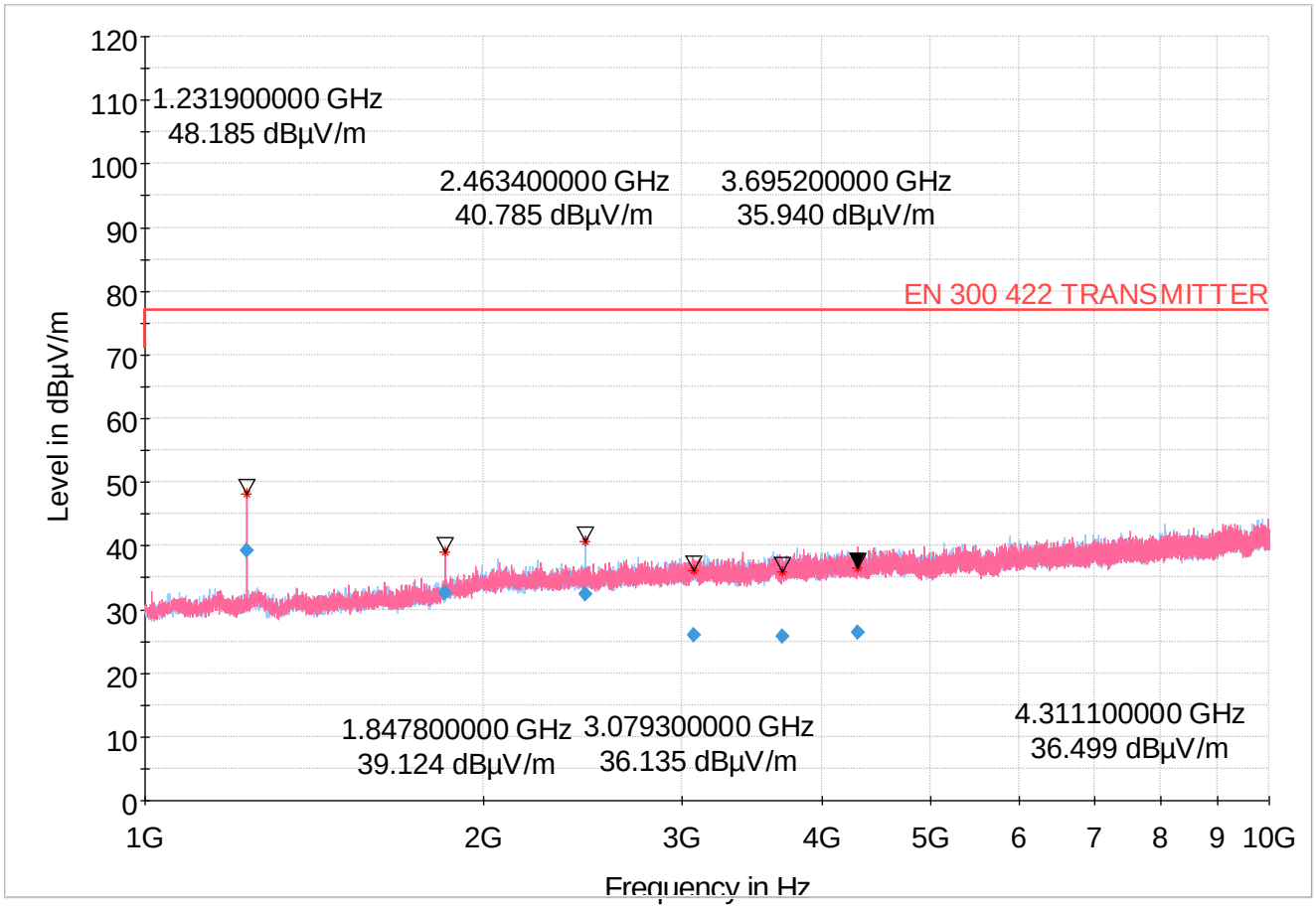
Hardware Setup: EMI radiated\Electric Field Strength 3117-PA 200363 - [EMI radiated]

Subrange 1

Frequency Range:	1 GHz - 18 GHz
Receiver:	ESR 26 [ESR 26] @ GPIB0 (ADR 20), SN 1316.3003K26/101347, FW 2.26, CAL 5/28/2016
Signal Path:	Receiver-EMI to 18 GHz FW 1.0 Correction Table: Receiver-EMI Antenna TEMP 2016 11 23
Antenna:	EMI3117-PA 200385 SN 200385, CAL 10/16/2018 Correction Table (vertical): Horn ETS 3117-PA 200363 2017 10 16 Correction Table (horizontal): Horn ETS 3117-PA 200363 2017 10 16 Correction Table (vertical): L23_041_47 Cable Correction Table (horizontal): L23_041_47 Cable
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.21
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), SN 29799, FW REV 3.21

Appendix A

Full Spectrum



Critical Frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment	Corr. (dB)
1231.900000	48.18	77.00	28.82	---	---	174.0	V	251.0	---	6:28:47 PM - 2/16/2018	---
1847.800000	39.12	77.00	37.88	---	---	314.0	V	0.0	---	6:30:18 PM - 2/16/2018	---
2463.400000	40.79	77.00	36.21	---	---	194.0	H	11.0	---	6:23:05 PM - 2/16/2018	---
3079.300000	36.13	77.00	40.87	---	---	289.0	H	180.0	---	6:24:29 PM - 2/16/2018	---
3695.200000	35.94	77.00	41.06	---	---	311.0	H	308.0	---	6:25:47 PM - 2/16/2018	---
4311.100000	36.50	77.00	40.50	---	---	111.0	V	41.0	---	6:27:20 PM - 2/16/2018	---

Final Frequencies

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment	Corr. (dB)
1231.900000	39.30	77.00	37.70	1000.0	1000.000	175.0	V	251.0	-15.8	6:28:54 PM - 2/16/2018	---
1847.800000	32.67	77.00	44.33	1000.0	1000.000	314.0	V	0.0	-14.4	6:30:26 PM - 2/16/2018	---
2463.400000	32.34	77.00	44.66	1000.0	1000.000	194.0	H	11.0	-12.5	6:23:14 PM - 2/16/2018	---
3079.300000	25.92	77.00	51.08	1000.0	1000.000	289.0	H	180.0	-11.1	6:24:39 PM - 2/16/2018	---
3695.200000	25.72	77.00	51.28	1000.0	1000.000	311.0	H	308.0	-9.5	6:25:55 PM - 2/16/2018	---
4311.100000	26.35	77.00	50.65	1000.0	1000.000	111.0	V	41.0	-8.3	6:27:29 PM - 2/16/2018	---

Appendix A

Date: February 27, 2018
EUT: ULXD8
Band: J50A
Serial Number: # 1
Specification: EN 300 422-1, Spurious Radiated Emissions
Comments: Test Distance is 3 meters
Mode: EUT set to Low 572.125 MHz
Tested By: Alex Mishinger, February 26 & 27, 2018

Frequency in MHz	Detector Used	Antenna Polarity	Measured Level in dBuV	Matched Sig. Gen. Reading in dBm	Antenna Gain in dB	Cable Loss in dB	ERP Total in dBm	ETSI Limit in dBm
1144.250	Average	H	29.84	-71.0	3.7	3.29	-70.6	-30
1144.250	Average	V	29.84	-71.0	3.7	3.29	-70.6	-30
1716.375	Average	H	44.80	-58.0	5.4	3.55	-56.2	-30
1716.275	Average	V	44.80	-58.0	5.4	3.55	-56.2	-30
2288.500	Average	H	27.71	-74.0	5.4	4.14	-72.7	-30
2288.500	Average	V	27.71	-74.0	5.4	4.14	-72.7	-30
2860.625	Average	H	25.03	-76.0	6.8	4.42	-73.6	-30
2860.625	Average	V	25.03	-76.0	6.8	4.42	-73.6	-30
3432.750	Average	H	25.51	-76.0	8.0	4.80	-72.8	-30
3432.750	Average	V	25.51	-76.0	8.0	4.80	-72.8	-30
4004.875	Average	H	25.01	-76.0	8.9	5.21	-72.3	-30
4004.875	Average	V	25.01	-76.0	8.9	5.21	-72.3	-30

Total (dBm) = Matched Signal. Generator Reading (dBm) + Antenna Gain (dB) – Cable Loss (dB)

Appendix A

Date: February 27, 2018
EUT: ULXD8
Band: J50A
Serial Number: # 1
Specification: EN 300 422-1, Spurious Radiated Emissions
Comments: Test Distance is 3 meters
Mode: EUT set to Middle 589.500 MHz
Tested By: Alex Mishinger, February 26 & 27, 2018

Frequency in MHz	Detector Used	Antenna Polarity	Measured Level in dBuV	Matched Sig. Gen. Reading in dBm	Antenna Gain in dB	Cable Loss in dB	ERP Total in dBm	ETSI Limit in dBm
1179.000	Average	H	36.03	-65.3	3.7	3.76	-65.4	-30
1179.000	Average	V	36.03	-65.3	3.7	3.76	-65.4	-30
1768.500	Average	H	33.03	-67.2	5.4	3.76	-65.6	-30
1768.500	Average	V	33.03	-67.2	5.4	3.76	-65.6	-30
2358.000	Average	H	29.06	-71.0	5.5	4.11	-69.6	-30
2358.000	Average	V	29.06	-71.0	5.5	4.11	-69.6	-30
2947.500	Average	H	25.52	-76.0	6.9	4.60	-73.7	-30
2947.500	Average	V	25.52	-76.0	6.9	4.60	-73.7	-30
3537.000	Average	H	25.66	-76.0	8.1	4.69	-72.6	-30
3537.000	Average	V	25.66	-76.0	8.1	4.69	-72.6	-30
4126.500	Average	H	26.75	-75.0	9.0	5.16	-71.2	-30
4126.500	Average	V	26.75	-75.0	9.0	5.16	-71.2	-30

Total (dBm) = Matched Signal. Generator Reading (dBm) + Antenna Gain (dB) – Cable Loss (dB)

Appendix A

Date: February 27, 2018
EUT: ULXD8
Band: J50A
Serial Number: # 1
Specification: EN 300 422-1, Spurious Radiated Emissions
Comments: Test Distance is 3 meters
Mode: EUT set to High 606.875 MHz
Tested By: Alex Mishinger, February 26 & 27, 2018

Frequency in MHz	Detector Used	Antenna Polarity	Measured Level in dBuV	Matched Sig. Gen. Reading in dBm	Antenna Gain in dB	Cable Loss in dB	ERP Total in dBm	ETSI Limit in dBm
1213.750	Average	H	35.32	-66.4	3.7	3.03	-65.7	-30
1213.750	Average	V	35.32	-66.4	3.7	3.03	-65.7	-30
1820.625	Average	H	34.06	-67.6	5.3	3.56	-65.9	-30
1820.625	Average	V	34.06	-67.6	5.3	3.56	-65.9	-30
2427.500	Average	H	30.33	-70.0	5.4	3.97	-68.6	-30
2427.500	Average	V	30.33	-70.0	5.4	3.97	-68.6	-30
3034.375	Average	H	25.73	-76.0	7.0	4.68	-73.7	-30
3034.375	Average	V	25.73	-76.0	7.0	4.68	-73.7	-30
3641.250	Average	H	26.11	-76.0	8.2	5.06	-72.9	-30
3641.250	Average	V	26.11	-76.0	8.2	5.06	-72.9	-30
4248.125	Average	H	26.21	-76.0	9.3	5.40	-72.1	-30
4248.125	Average	V	26.21	-76.0	9.3	5.40	-72.1	-30

Total (dBm) = Matched Signal. Generator Reading (dBm) + Antenna Gain (dB) – Cable Loss (dB)

Appendix A

Date: February 27, 2018
EUT: ULXD8
Band: J50A
Serial Number: # 1
Specification: EN 300 422-1, Spurious Radiated Emissions
Comments: Test Distance is 3 meters
Mode: EUT set to Low 614.125 MHz
Tested By: Craig Kozokar, February 26 & 27, 2018

Frequency in MHz	Detector Used	Antenna Polarity	Measured Level in dBuV	Matched Sig. Gen. Reading in dBm	Antenna Gain in dB	Cable Loss in dB	ERP Total in dBm	ETSI Limit in dBm
1228.250	Average	H	37.81	-66.8	3.8	2.86	-65.9	-30
1228.250	Average	V	37.81	-66.8	3.8	2.86	-65.9	-30
1842.375	Average	H	28.66	-74.5	5.3	3.63	-72.8	-30
1842,275	Average	V	28.66	-74.5	5.3	3.63	-72.8	-30
2456.500	Average	H	32.78	-71.0	6.0	4.18	-69.2	-30
2456.500	Average	V	32.78	-71.0	6.0	4.18	-69.2	-30
3070.625	Average	H	26.08	-76.0	7.0	4.34	-73.3	-30
3070.625	Average	V	26.08	-76.0	7.0	4.34	-73.3	-30
3684.750	Average	H	25.76	-76.0	8.2	4.99	-72.8	-30
3684.750	Average	V	25.76	-76.0	8.2	4.99	-72.8	-30
4298.875	Average	H	28.16	-75.0	9.3	5.23	-70.9	-30
4298.875	Average	V	28.16	-75.0	9.3	5.23	-70.9	-30

Total (dBm) = Matched Signal. Generator Reading (dBm) + Antenna Gain (dB) – Cable Loss (dB)

Appendix A

Date: February 27, 2018
EUT: ULXD8
Band: J50A
Serial Number: # 1
Specification: EN 300 422-1, Spurious Radiated Emissions
Comments: Test Distance is 3 meters
Mode: EUT set to HIGH 615.875 MHz
Tested By: Craig Kozokar, February 26 & 27, 2018

Frequency in MHz	Detector Used	Antenna Polarity	Measured Level in dBuV	Matched Sig. Gen. Reading in dBm	Antenna Gain in dB	Cable Loss in dB	ERP Total in dBm	ETSI Limit in dBm
1231.750	Average	H	39.30	-65.6	3.8	3.79	-65.6	-30
1231.750	Average	V	39.30	-65.6	3.8	3.79	-65.6	-30
1847.625	Average	H	32.67	-71.0	5.3	3.53	-69.2	-30
1847.625	Average	V	32.67	-71.0	5.3	3.53	-69.2	-30
2463.500	Average	H	32.34	-71.1	6.0	4.23	-69.3	-30
2463.500	Average	V	32.34	-71.1	6.0	4.23	-69.3	-30
3079.375	Average	H	25.92	-76.0	7.0	4.37	-73.4	-30
3079.375	Average	V	25.92	-76.0	7.0	4.37	-73.4	-30
3695.250	Average	H	25.72	-76.0	8.2	5.00	-72.8	-30
3695.250	Average	V	25.72	-76.0	8.2	5.00	-72.8	-30
4311.125	Average	H	26.35	-76.0	9.3	5.55	-72.3	-30
4311.125	Average	V	26.35	-76.0	9.3	5.55	-72.3	-30

Total (dBm) = Matched Signal. Generator Reading (dBm) + Antenna Gain (dB) – Cable Loss (dB)

Appendix B

B. Maximum Radiated Power

Purpose:

This test performed to determine if the EUT meets the Maximum Radiated Power requirements of the FCC Part15C, Section 15.236 and RSS 210 Issue 9, Annex G.

Requirements:

As stated in FCC 15C Section 15.236 (6)(2), the maximum radiated power in the 600MHz guard band and the 600MHz duplex gap: 20mW EIRP.

The power output requirements for RSS 210 Issue 9, Annex G are listed below in table G1.

Table G1 — Specification for Low-Power Radio Apparatus

Frequency Bands (MHz)	Transmit e.i.r.p. (mW)	Authorized Bandwidth (kHz)	Frequency Stability (ppm)
54-72 76-88 174-216	50	200	± 50
470-608 614-698[Note]	250	200	± 50

Measurement Uncertainty:

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

Values of Expanded Measurement Uncertainty (95% Confidence)

Measurement Type	U_{lab}
Conducted measurements (30 MHz – 1000 MHz)	1.24 dB

U_{lab} = Determined for Shure EMC Laboratory

Since U_{lab} is less than or equal to U_{ETSI}:

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit; Non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

Test Setup and Instrumentation:

Photographs of the test setup are shown in Figure 1. The test instrumentation can be determined from Table 10-1.

EUT Operation:

The EUT was powered up and the frequency of the transmitter was selected using the front panel controls. For rated output power, the testing was conducted with the EUT set to the low, middle, and high frequency in the low band, and low and high frequencies in the high band, within the operating frequency range, and at 20mW RF output.

Appendix B

Specific Test Procedures:

The output of the EUT was connected to a spectrum analyzer through 20dB of attenuation. The EUT was set to transmit on the low, middle, and high frequencies in the low band and low and high frequencies in the high band. The channel power was measured.

The spectrum analyzer was set to:

RBW 10kHz
VBW 100kHz
Channel BW 200kHz
Span 1MHz
Detector Average
State Average

Results:

The EIRP for all frequencies measured meets the FCC15C 15.236 requirements as well as the RSS 210.9 requirements.

Appendix B

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	Maximum Rated Output
Operating Conditions:	Low Frequency, 572.125MHz, 20mW
Operator Name:	Craig Kozokar
Comment:	FCC Part15C, Section 15.236, RSS 210.9
Date Tested:	Tested on March 13, 2018

Power Meter Measurement in dBm	Measured Antenna Gain in dBi	Cable Loss in dB	EIRP in dBm	EIRP Limit in dBm	Margin In dB
+10.73	-5.7	0.50	5.53	13.00	7.47

EIRP (dBm) = Measurement (dBm) + Measured Antenna Gain (dB) + Cable Loss (dB)

Measured ULXD8 J50A antenna gain is -5.7dBi

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	Maximum Rated Output
Operating Conditions:	Middle Frequency, 589.500MHz, 20mW
Operator Name:	Craig Kozokar
Comment:	FCC Part15C, Section 15.236, RSS 210.9
Date Tested:	Tested on March 13, 2018

Power Meter Measurement in dBm	Measured Antenna Gain in dBi	Cable Loss in dB	EIRP in dBm	EIRP Limit in dBm	Margin In dB
+10.63	-5.7	0.50	5.43	13.00	7.57

EIRP (dBm) = Measurement (dBm) + Measured Antenna Gain (dB) + Cable Loss (dB)

Measured ULXD8 J50A antenna gain is -5.7dBi

Appendix B

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	Maximum Rated Output
Operating Conditions:	High Frequency, 606.875MHz, 20mW
Operator Name:	Craig Kozokar
Comment:	FCC Part15C, Section 15.236, RSS 210.9
Date Tested:	Tested on March 13, 2018

Power Meter Measurement in dBm	Measured Antenna Gain in dBi	Cable Loss in dB	EIRP in dBm	EIRP Limit in dBm	Margin In dB
+10.53	-5.7	0.50	5.33	13.00	7.67

EIRP (dBm) = Measurement (dBm) + Measured Antenna Gain (dB) + Cable Loss (dB)

Measured ULXD8 J50A antenna gain is -5.7dBi

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	Maximum Rated Output
Operating Conditions:	Low Frequency, 614.125MHz, 20mW
Operator Name:	Craig Kozokar
Comment:	FCC Part15C, Section 15.236, RSS 210.9
Date Tested:	Tested on March 13, 2018

Power Meter Measurement in dBm	Measured Antenna Gain in dBi	Cable Loss in dB	EIRP in dBm	EIRP Limit in dBm	Margin In dB
+10.43	-5.7	0.50	5.23	13.00	7.77

EIRP (dBm) = Measurement (dBm) + Measured Antenna Gain (dB) + Cable Loss (dB)

Measured ULXD8 J50A antenna gain is -5.7dBi

Appendix B

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	Maximum Rated Output
Operating Conditions:	High Frequency, 615.875MHz, 20mW
Operator Name:	Craig Kozokar
Comment:	FCC Part15C, Section 15.236, RSS 210.9
Date Tested:	Tested on March 13, 2018

Power Meter Measurement in dBm	Measured Antenna Gain in dBi	Cable Loss in dB	EIRP in dBm	EIRP Limit in dBm	Margin In dB
+10.43	-5.7	0.50	5.23	13.00	7.77

EIRP (dBm) = Measurement (dBm) + Measured Antenna Gain (dB) + Cable Loss (dB)

Measured ULXD8 J50A antenna gain is -5.7dBi

Appendix C

C. NECESSARY BANDWIDTH MEASUREMENTS

C.1 PURPOSE

This test was performed to determine if the EUT meets the necessary bandwidth requirements of EN 300 422-1, section 8.3.3., with the EUT operating at 572.125MHz, 589.500MHz, 606.875MHz, 614.125MHz and 615.875MHz.

C.2 REQUIREMENTS

As stated in EN 300 422-1, section 8.3.3, the emission mask given in section 8.3.3.2 shall not be exceeded.

C.3 TEST SETUP AND INSTRUMENTATION

A photograph of the test setup is shown in Figure B-1. The test instrumentation can be determined from Table 10-1.

C.4 MEASUREMENT UNCERTAINTY

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

Values of Expanded Measurement Uncertainty (95% Confidence):

Measurement Type	U_{LAB}
Necessary Bandwidth	**±0.130 %**

U_{lab} = Determined for Shure EMC Laboratory

Since U_{LAB} is less than or equal to U_{ETSI}:

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

C.5 EUT OPERATION

The EUT was powered up and the transmit frequency and power output of the EUT were selected. The EUT was checked for proper operation after it was setup for the test. Testing was conducted with the EUT set to transmit at 572.125MHz, 589.500MHz, 606.875MHz, 614.125MHz, and 615.875MHz, at an output power level of 20mW. The transmitter was modulated per EN300422-1 V1.4.2 (2011-08), clause 7.1.2.

C.6 TEST PROCEDURE

The test procedure followed is shown in EN300422-1 V1.4.2 (2011-08), section 8.3.3.1.

Appendix C

C.7 RESULTS

The necessary bandwidth data is presented on pages 54 and 68. Data is shown on the figures for each transmitter. The figure shows the maximum relative level within the emission mask with modulation. As shown by the test data, the necessary bandwidth of the EUT meets the requirements of EN 300 422-1, section 8.3.3.

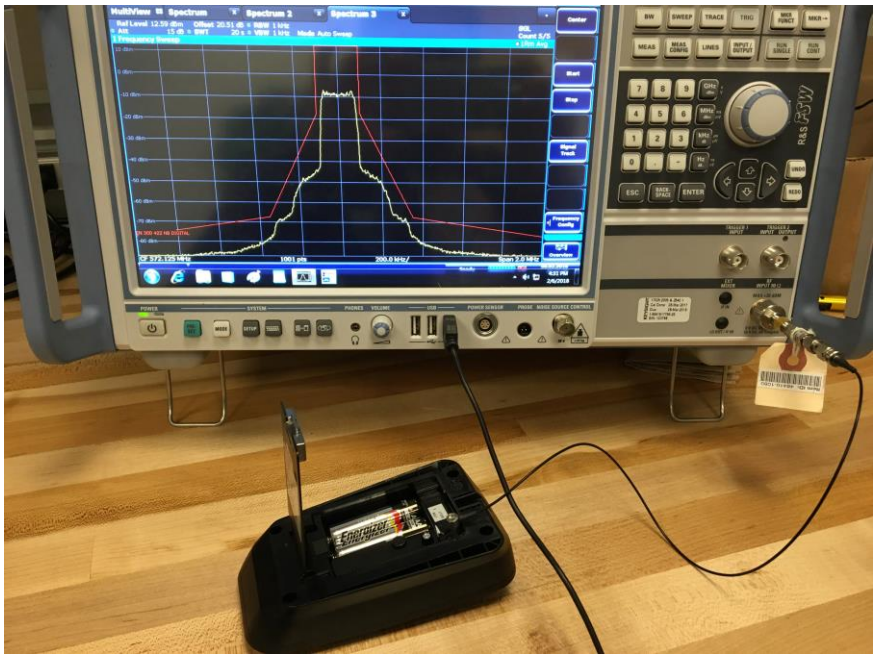
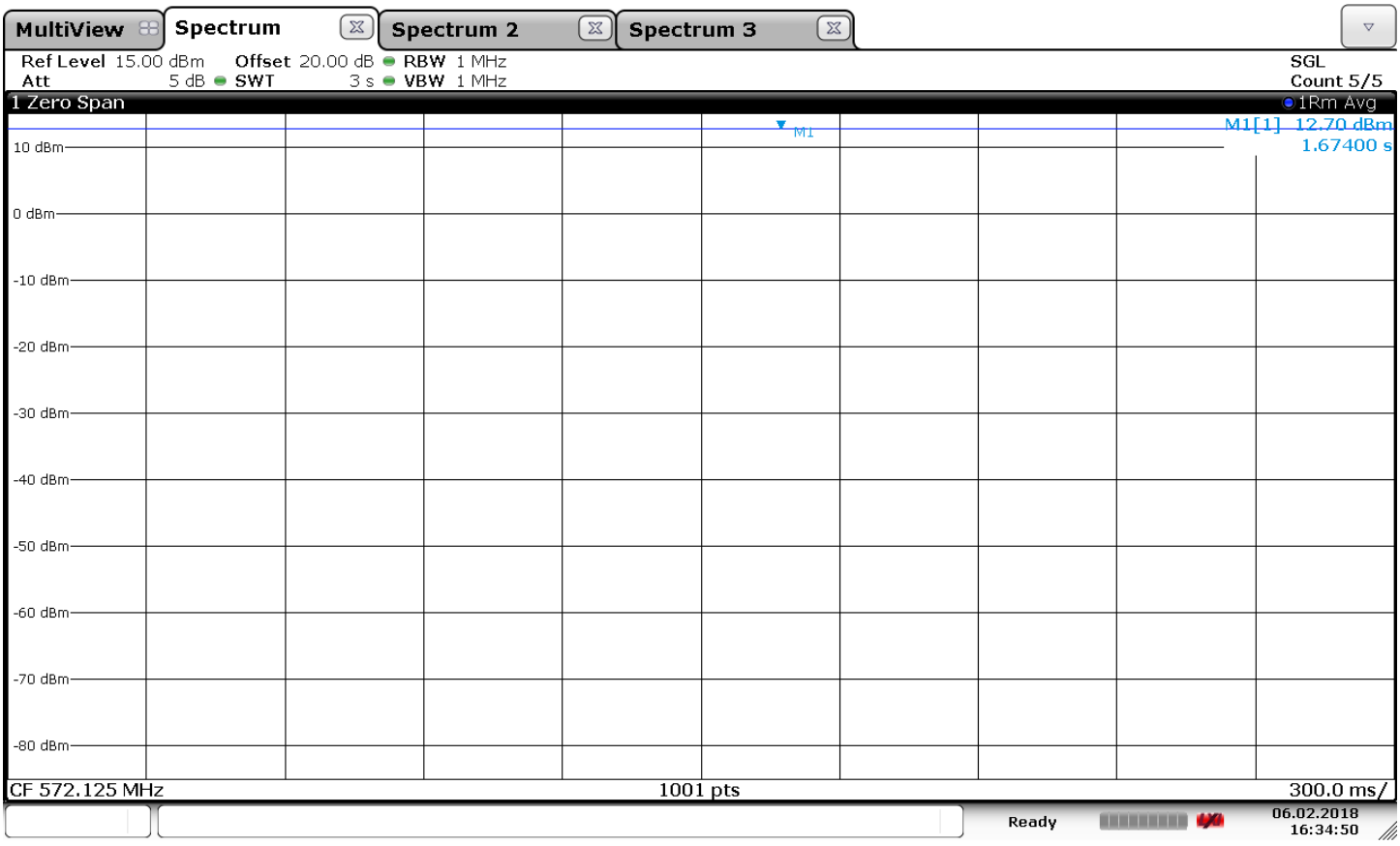


Figure B-1 - Test Setup for Necessary Bandwidth

Appendix C

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	#1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	Low Frequency, 572.125MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 1; Carrier Power
Date Tested:	Tested on February 6, 2018

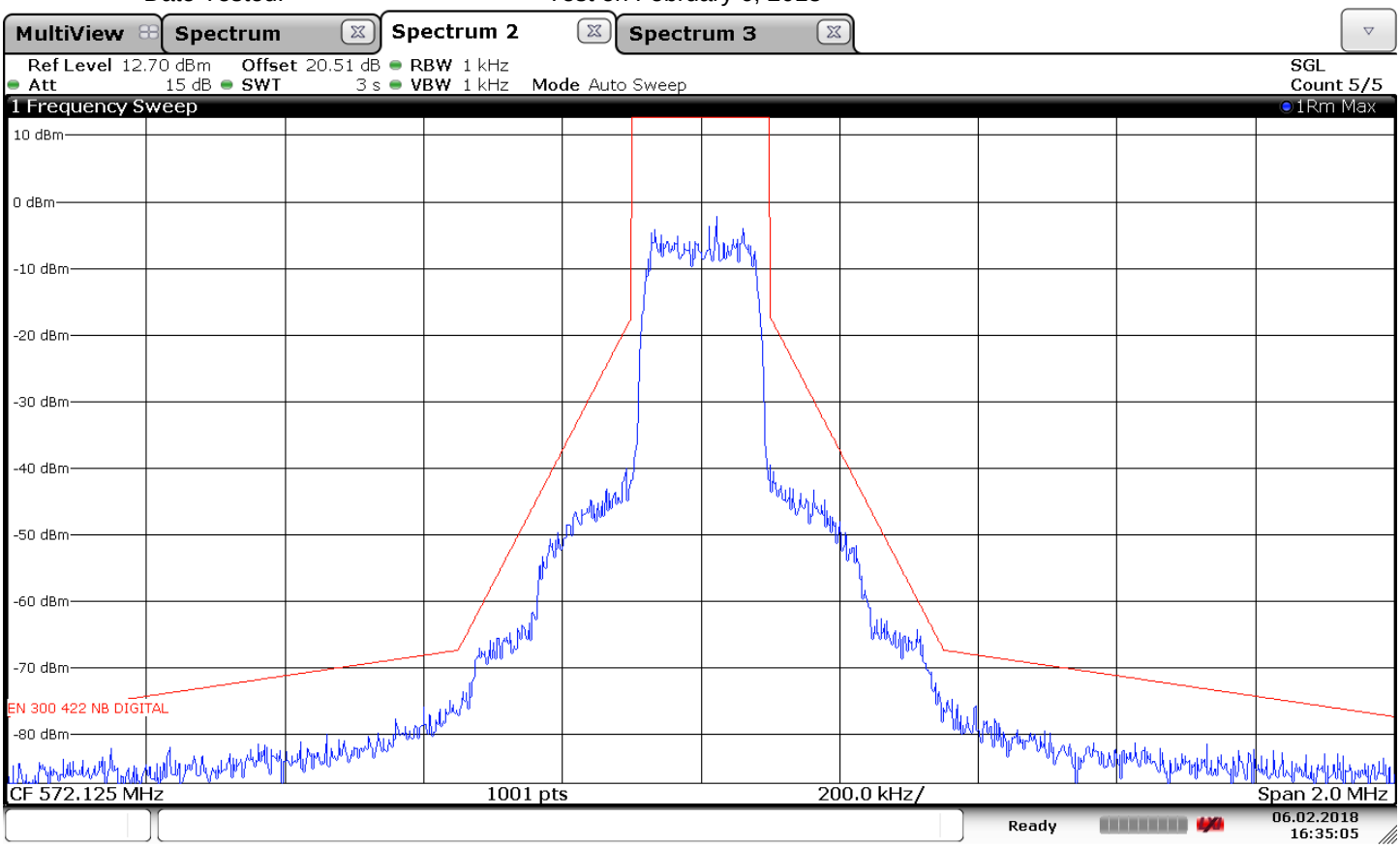


16:34:50 06.02.2018

Appendix C

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	#1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	Low Frequency, 572.125MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 2;Maximum Relative Level
Date Tested:	Test on February 6, 2018

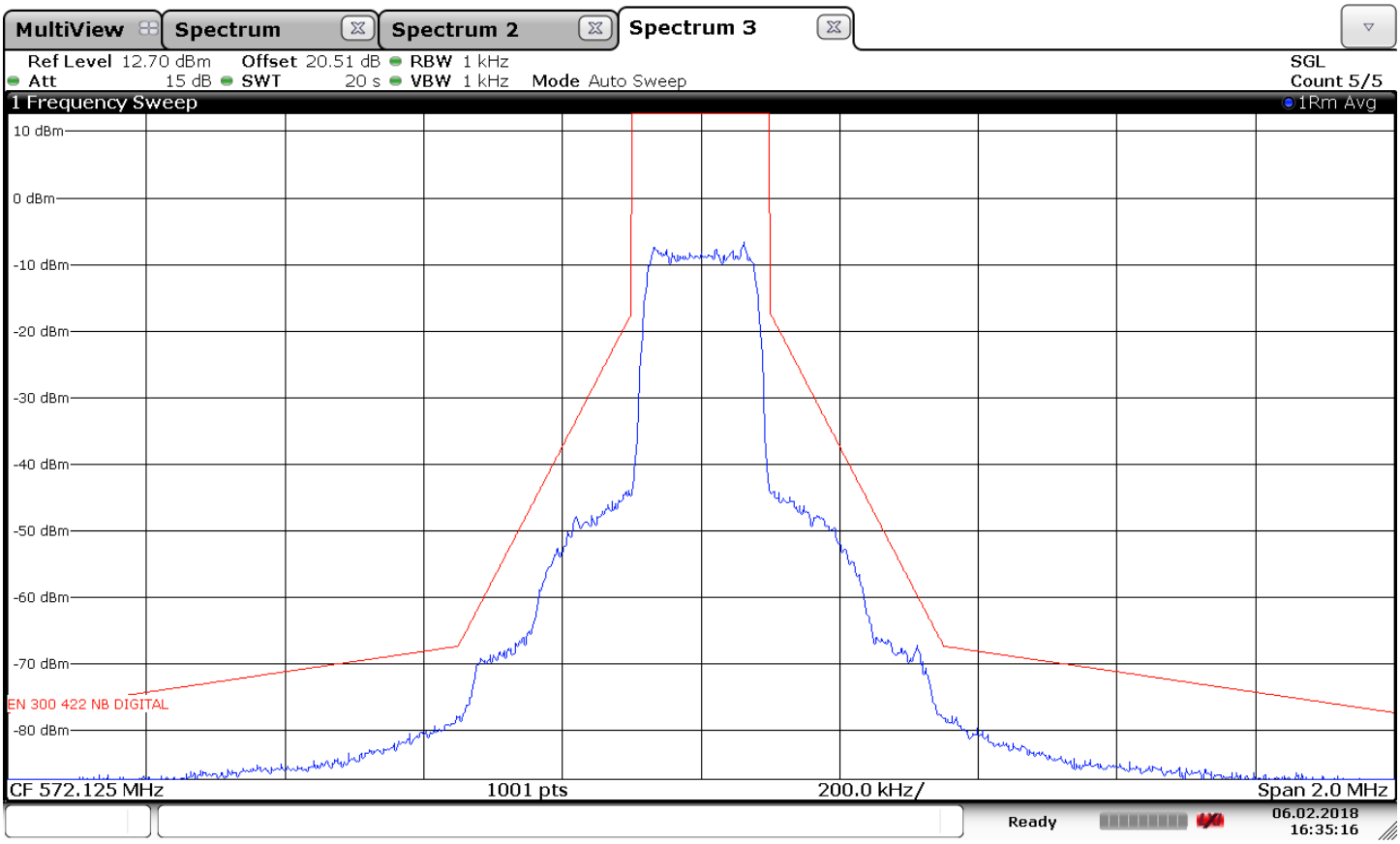


16:35:05 06.02.2018

Appendix C

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	#1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	Low Frequency, 572.125MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 3;Lower and upper frequency transmitter Wide band noise floor
Date Tested:	Test on February 6, 2018

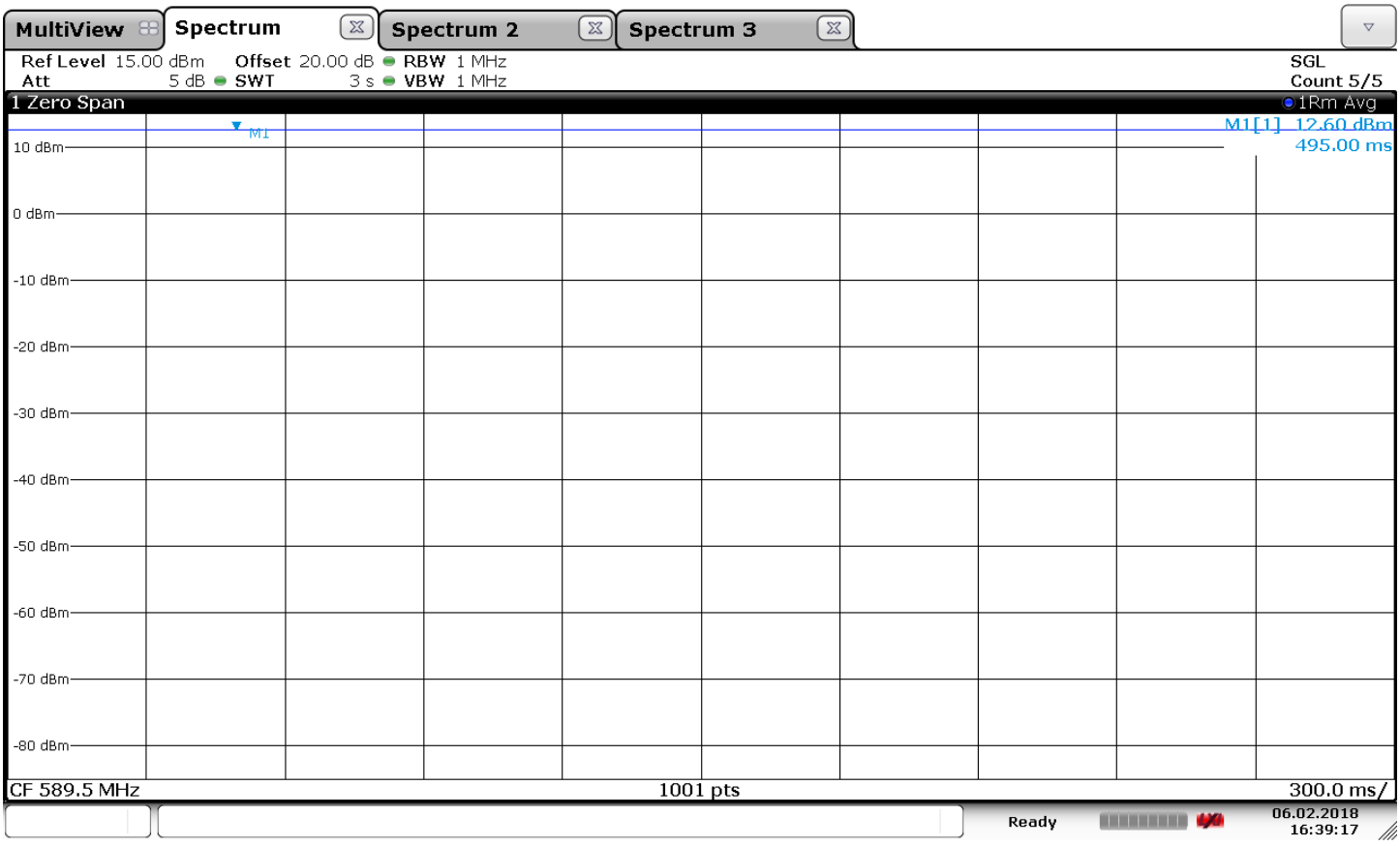


16:35:17 06.02.2018

Appendix C

Test Information

EUT Name:	ULXD6 J50A
Serial Number:	# 1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	Middle Frequency, 589.500MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 1; Carrier Power
Date Tested:	Tested on February 6, 2018

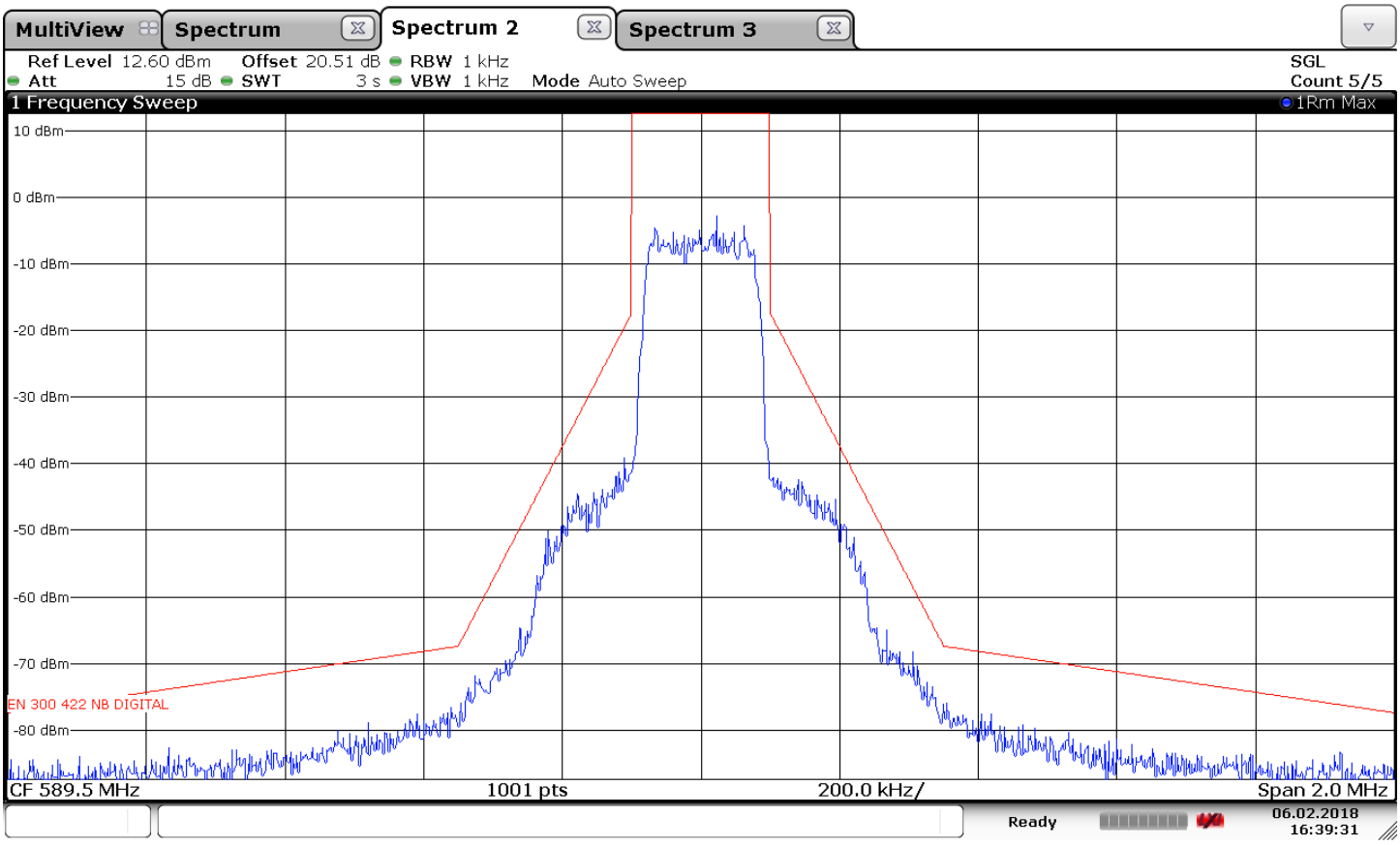


16:39:18 06.02.2018

Appendix C

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	Middle Frequency, 589.500MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 2;Maximum Relative Level
Date Tested:	Test on February 6, 2018

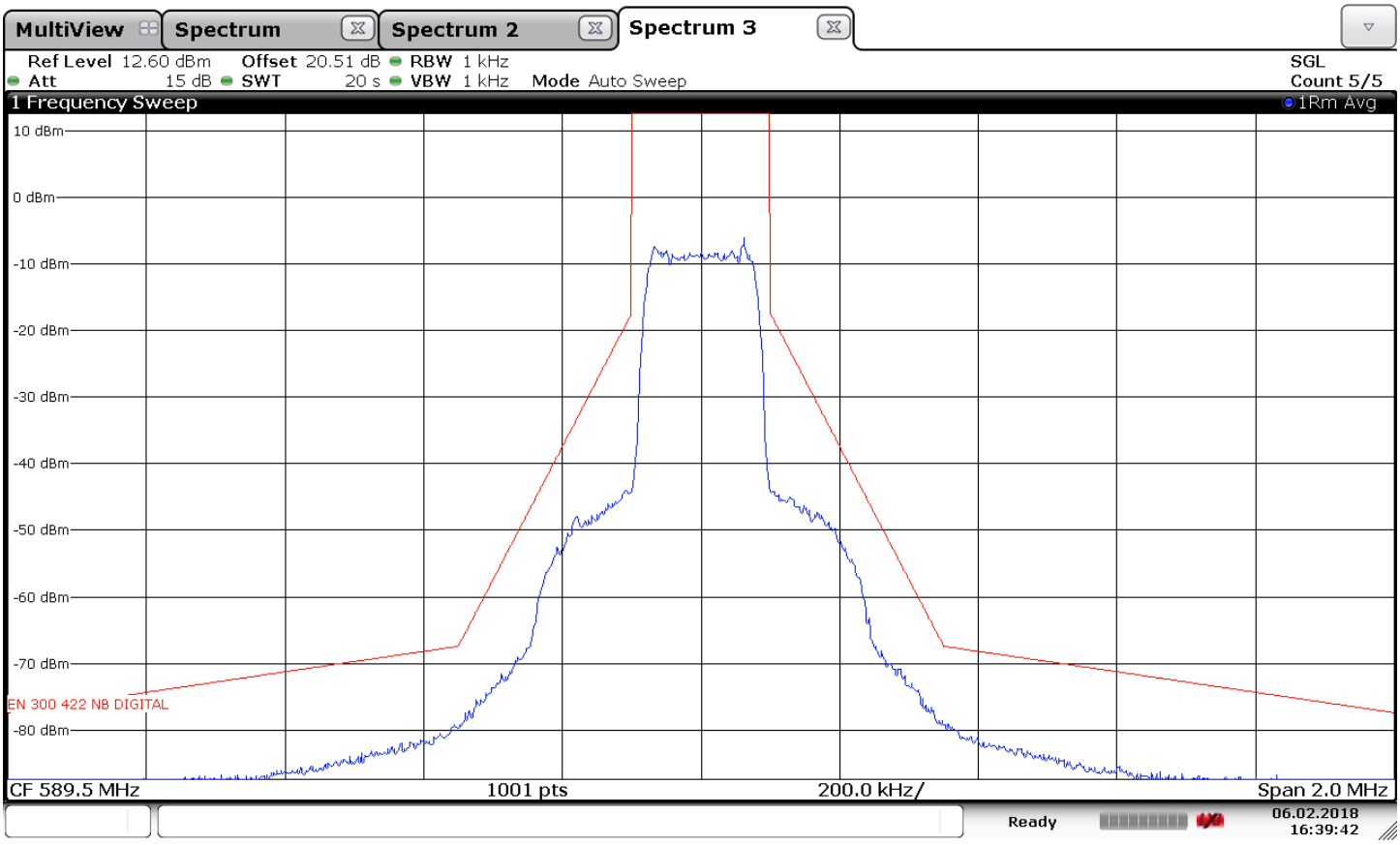


16:39:32 06.02.2018

Appendix C

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	Middle Frequency, 589.500MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 3;Lower and upper frequency transmitter Wide band noise floor
Date Tested:	Test on February 6, 2018

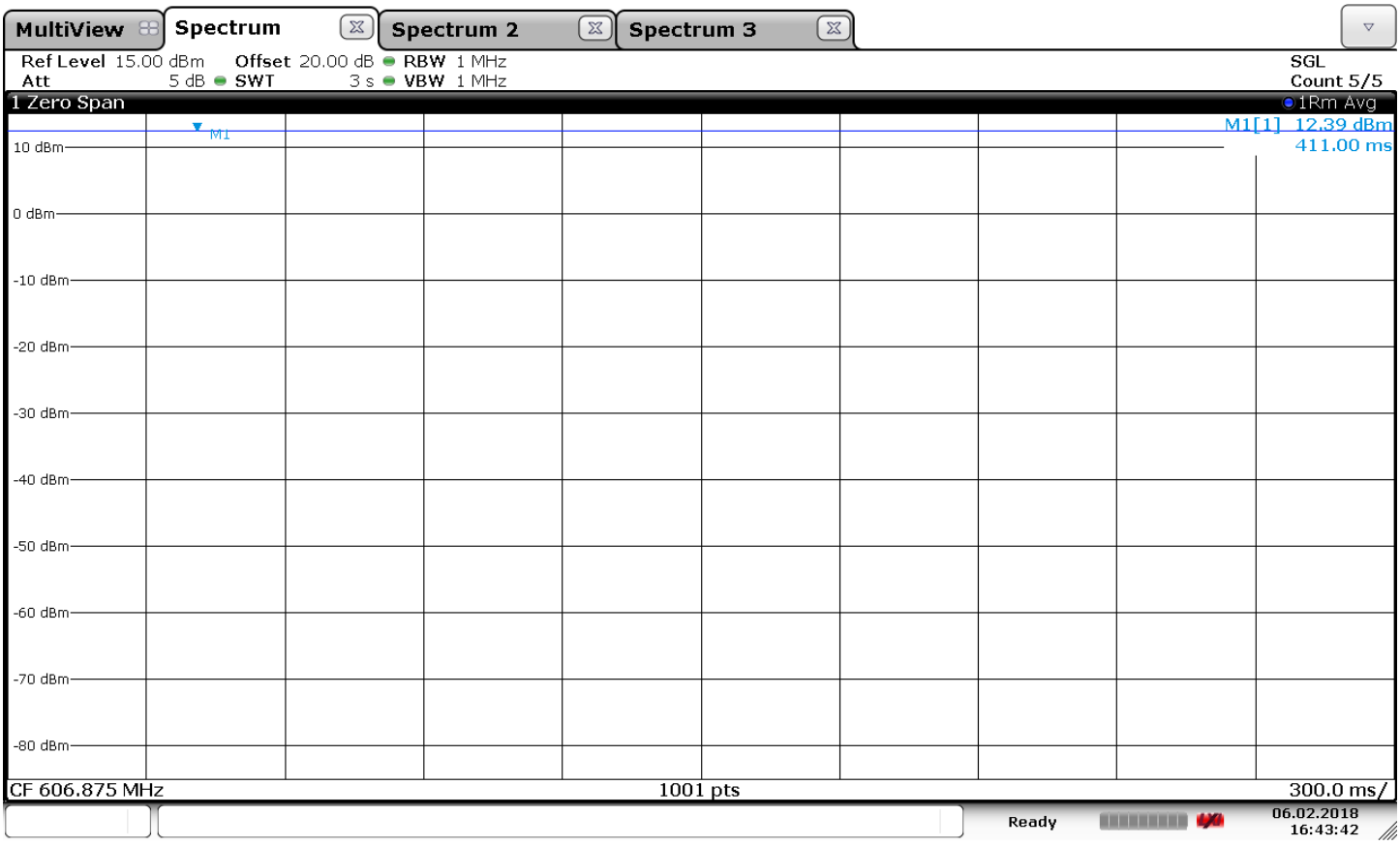


16:39:42 06.02.2018

Appendix C

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	High Frequency, 606.875MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 1; Carrier Power
Date Tested:	Tested on February 6, 2018

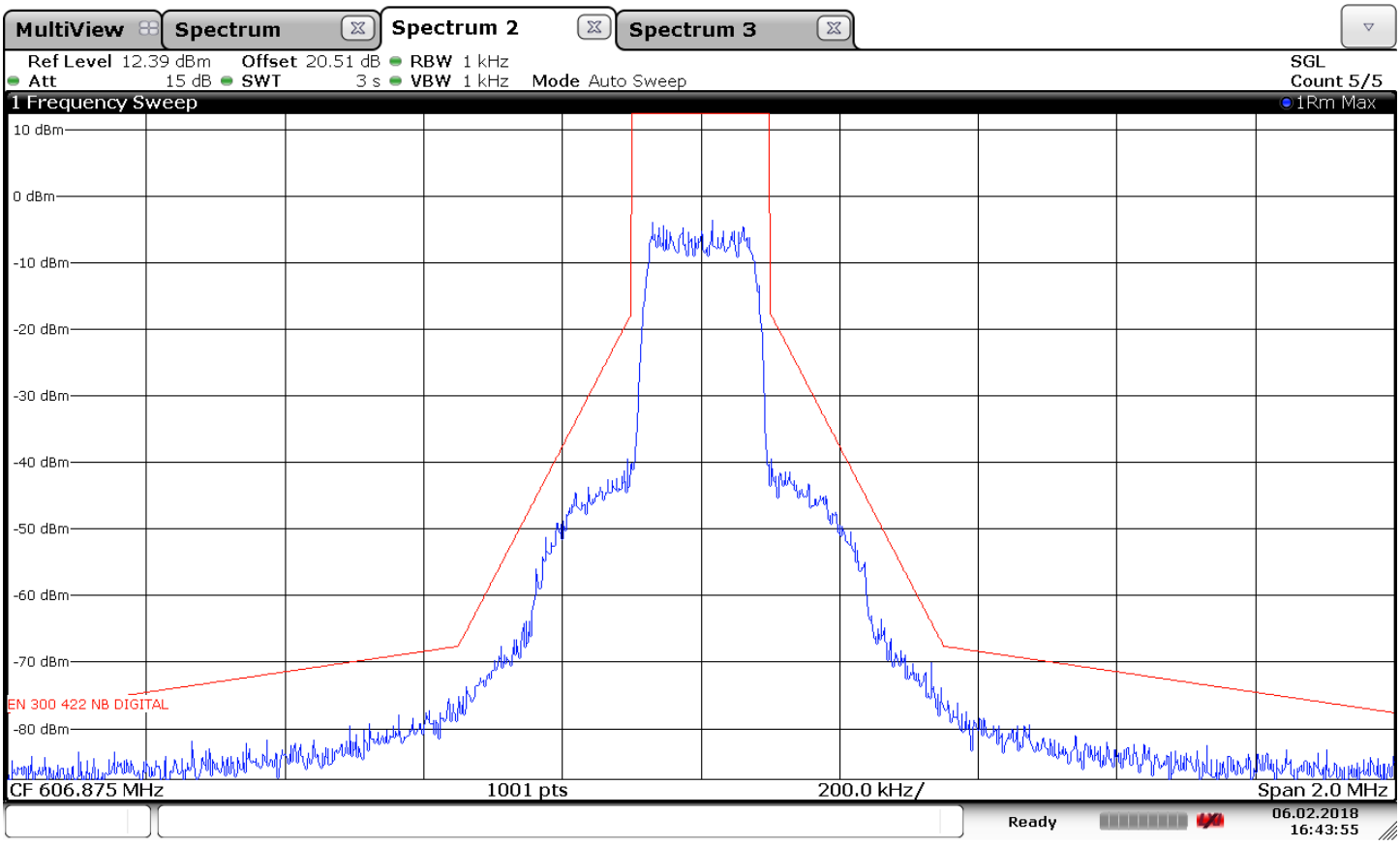


16:43:42 06.02.2018

Appendix C

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	#1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	High Frequency, 606.875MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 2;Maximum Relative Level
Date Tested:	Test on February 6, 2018

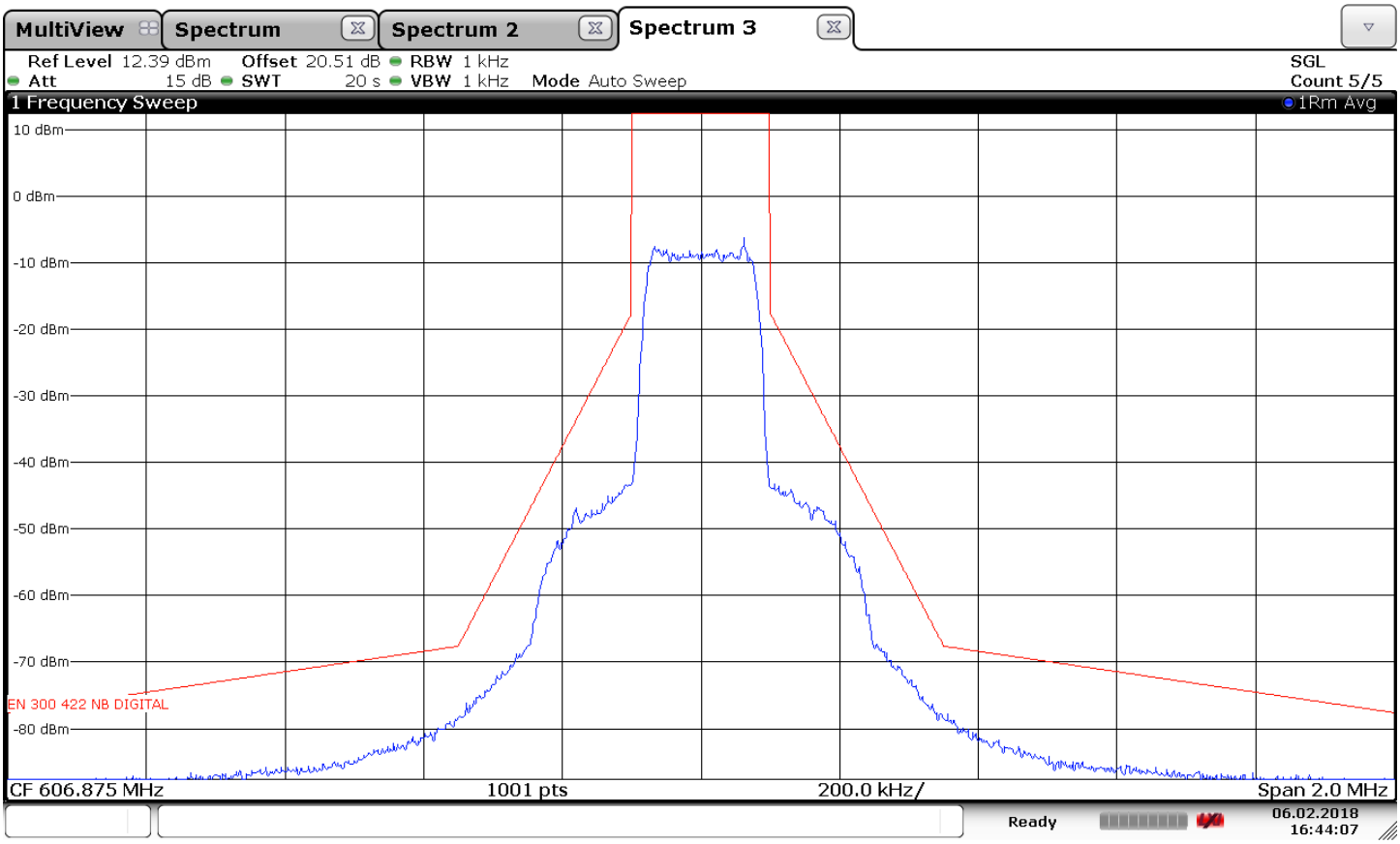


16:43:56 06.02.2018

Appendix C

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	High Frequency, 606.875MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 3;Lower and upper frequency transmitter Wide band noise floor
Date Tested:	Test on February 6, 2018

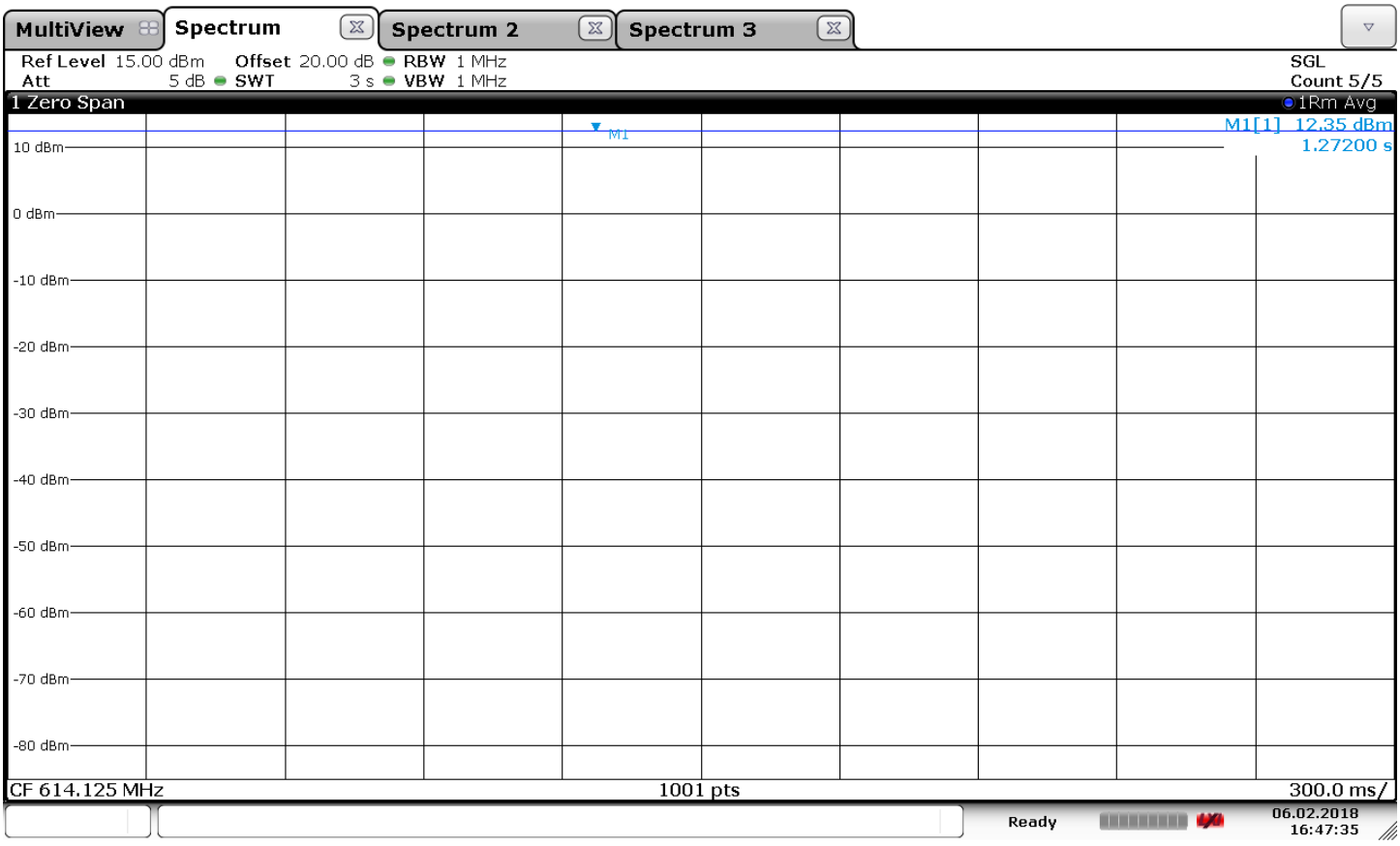


16:44:08 06.02.2018

Appendix C

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	Low Frequency, 614.125MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 1; Carrier Power
Date Tested:	Tested on February 6, 2018

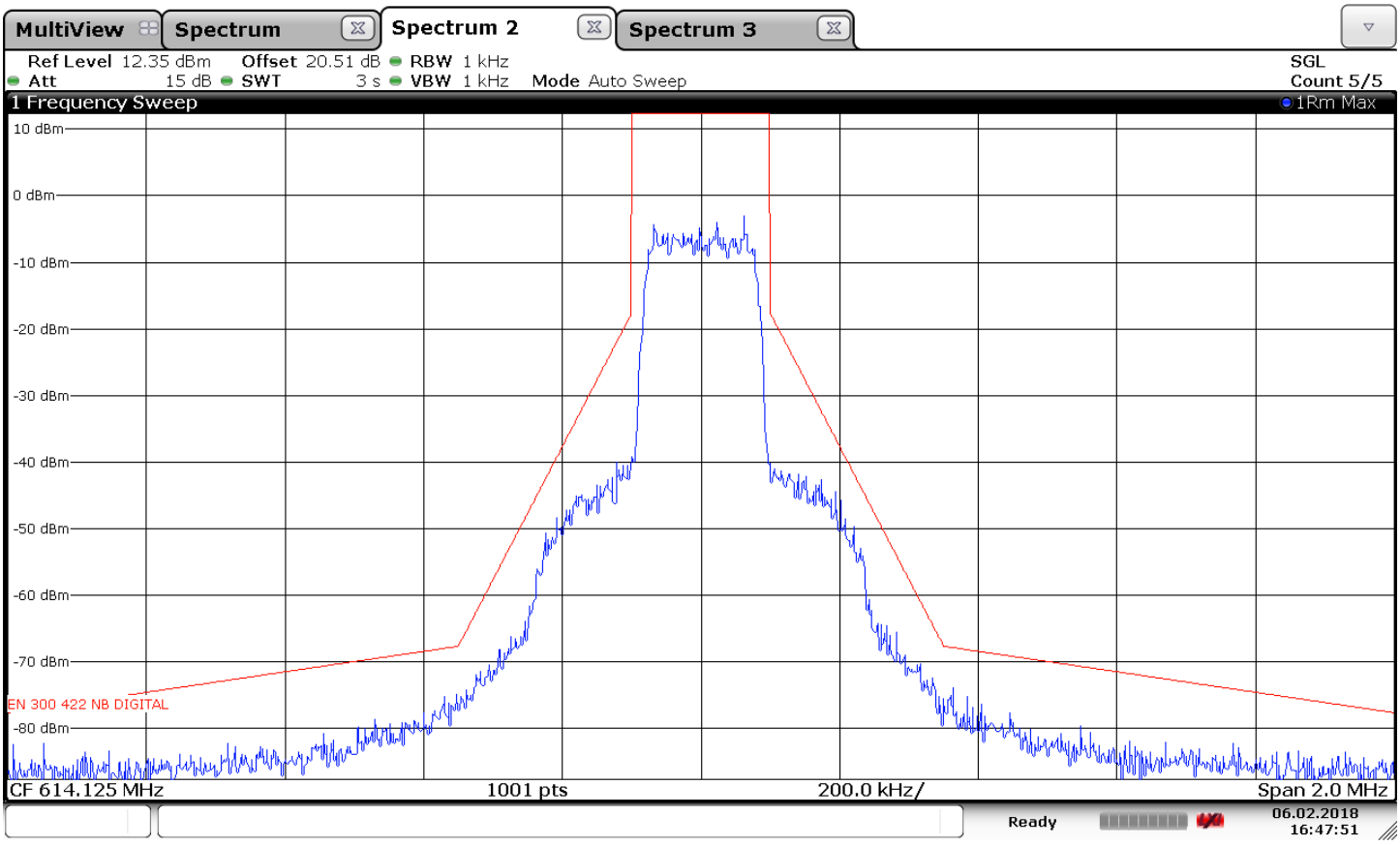


16:47:36 06.02.2018

Appendix C

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	Low Frequency, 614.125MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 2;Maximum Relative Level
Date Tested:	Test on February 6, 2018

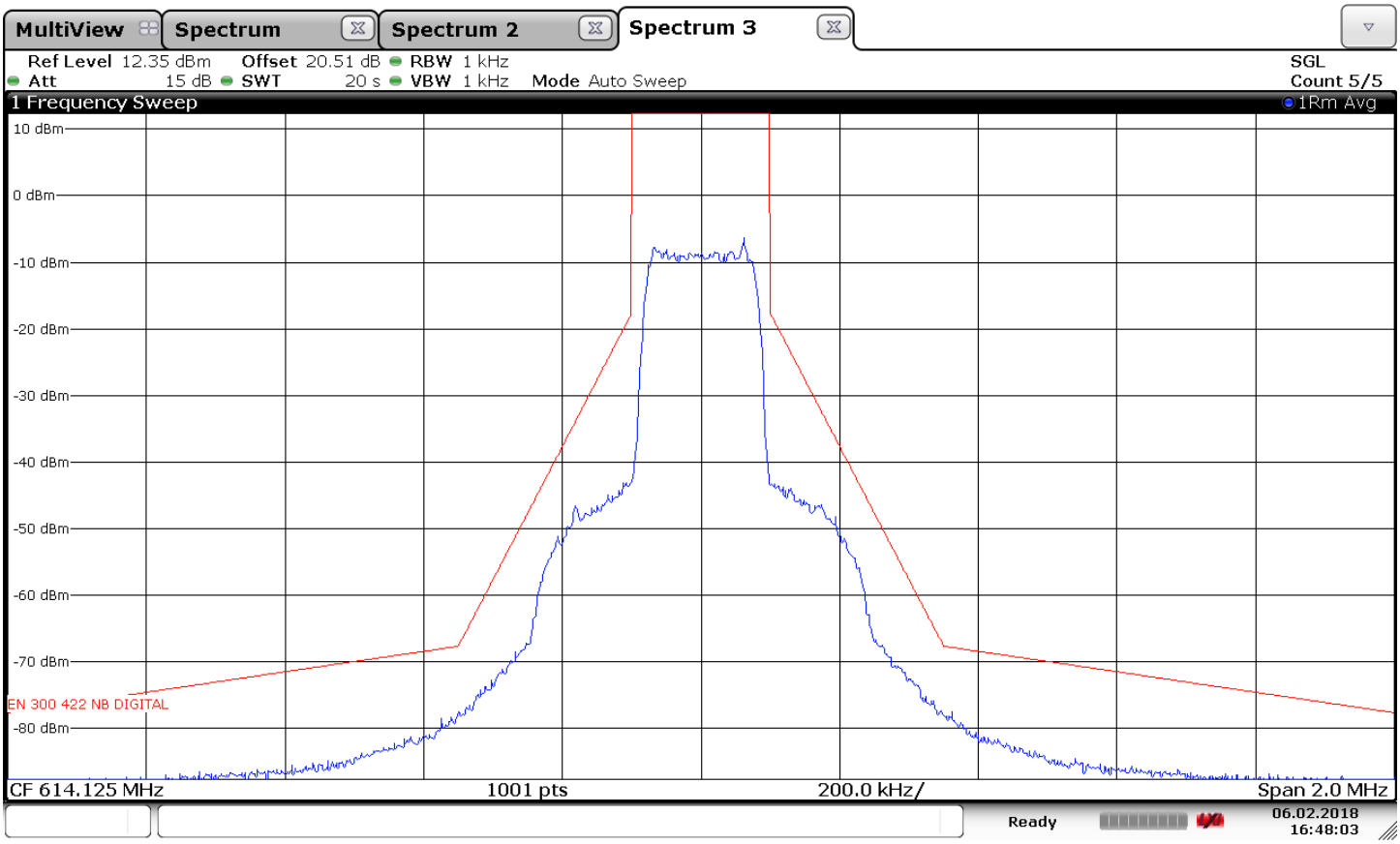


16:47:52 06.02.2018

Appendix C

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	Low Frequency, 614.125MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 3;Lower and upper frequency transmitter Wide band noise floor
Date Tested:	Test on February 6, 2018

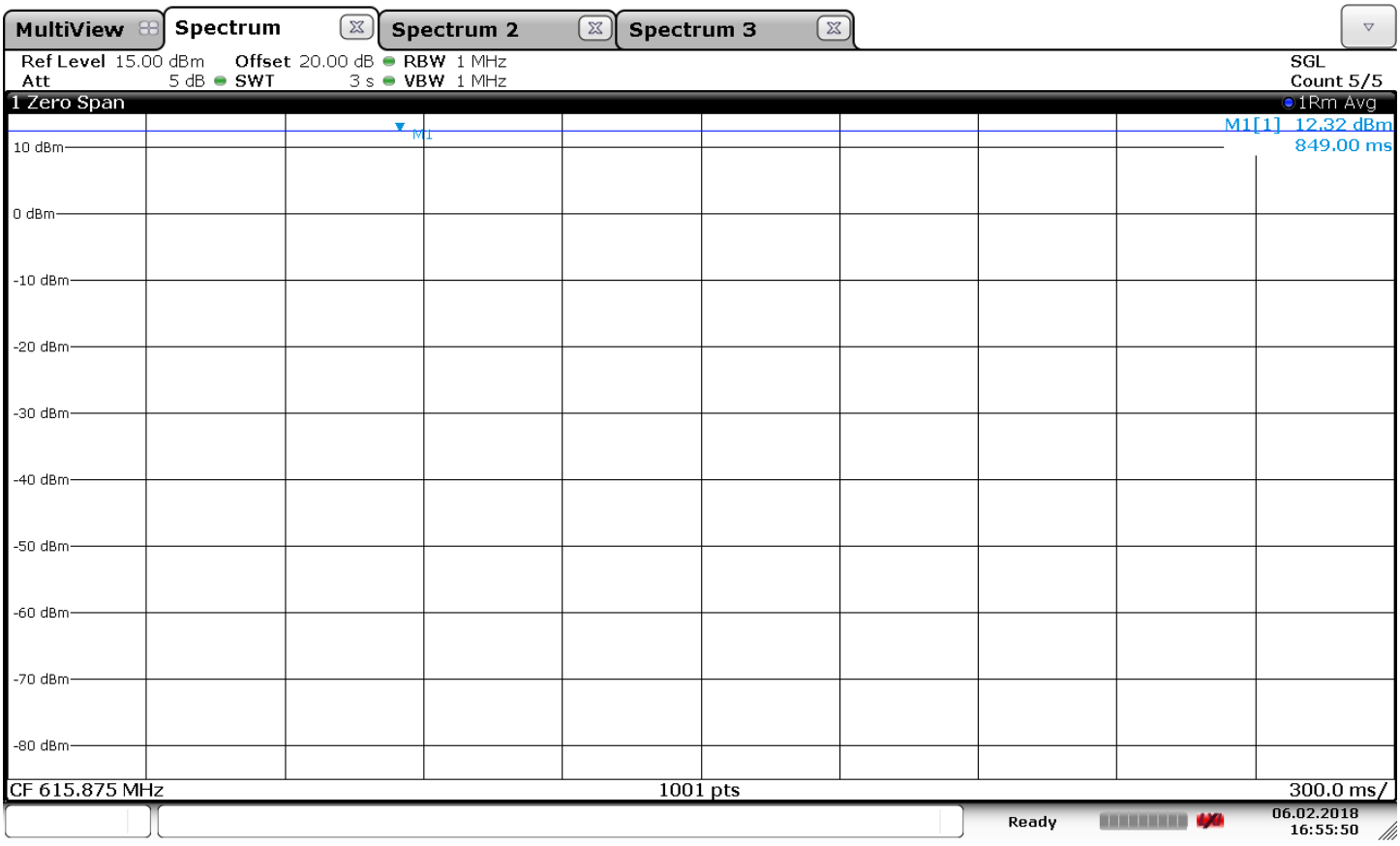


16:48:03 06.02.2018

Appendix C

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	High Frequency, 615.875MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 1; Carrier Power
Date Tested:	Tested on February 6, 2018

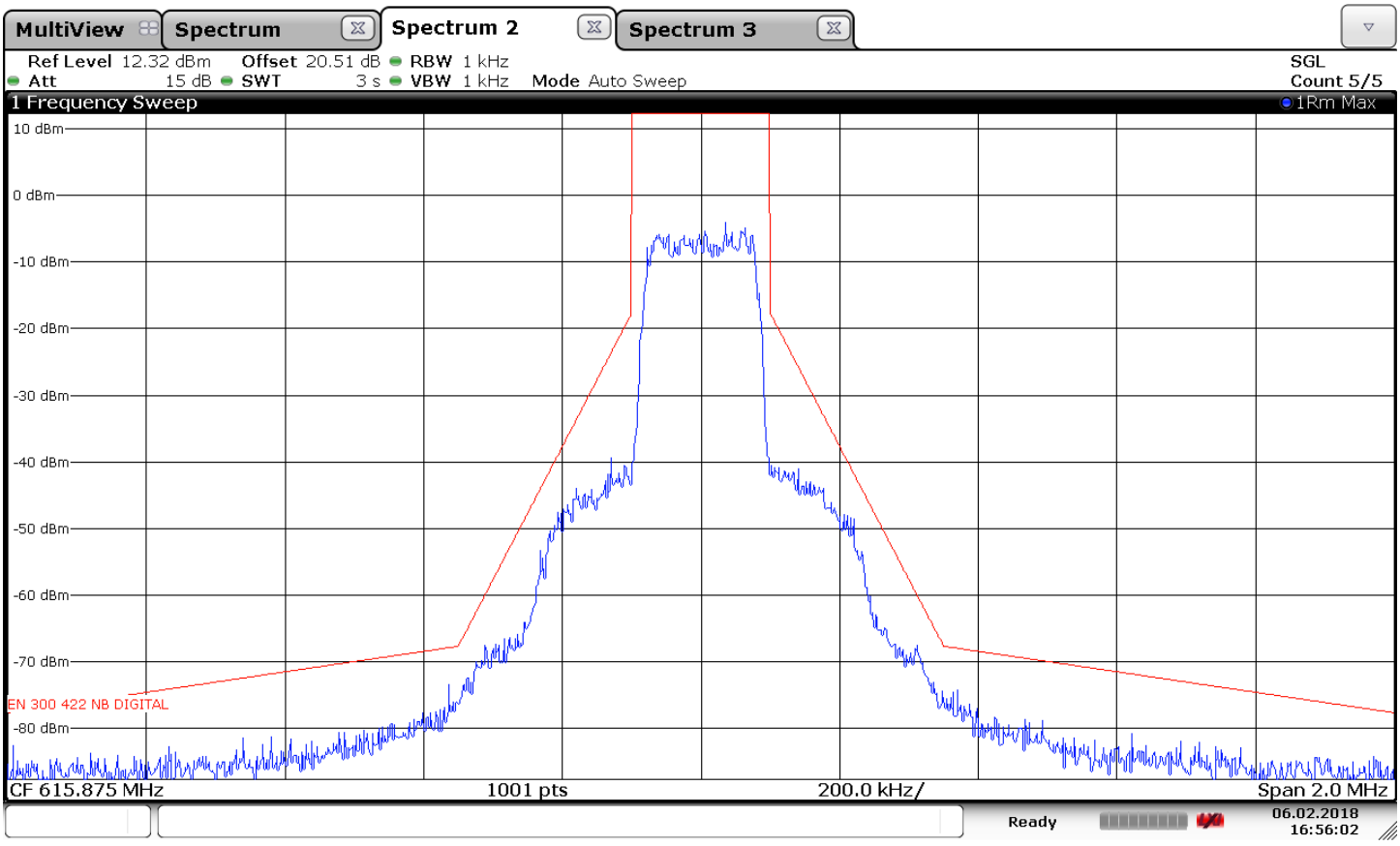


16:55:50 06.02.2018

Appendix B

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	High Frequency, 615.875MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 2;Maximum Relative Level
Date Tested:	Test on February 6, 2018

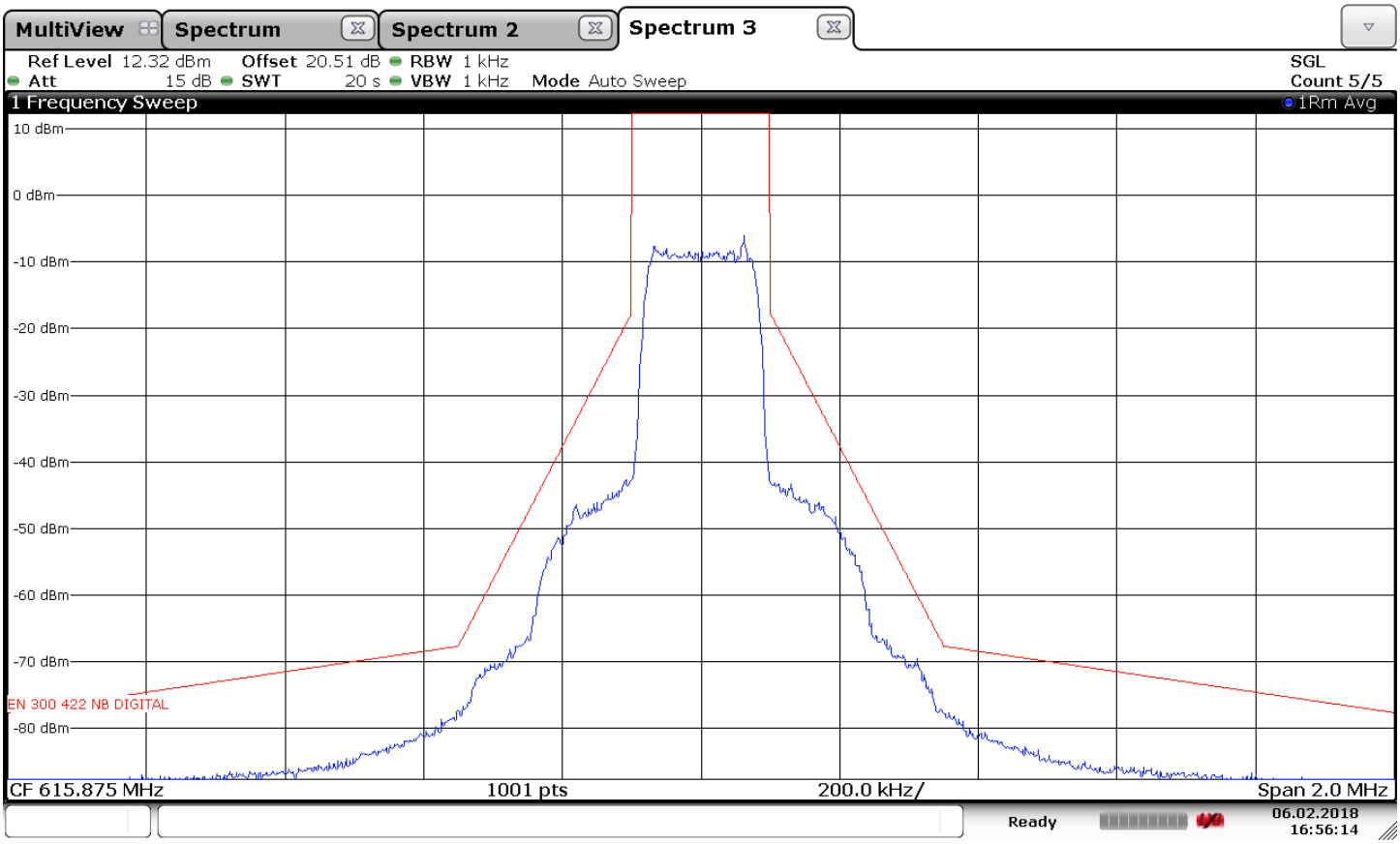


16:56:03 06.02.2018

Appendix C

Test Information

EUT Name:	ULXD8 J50A
Serial Number:	# 1
Test Description:	EN 300 422 Digital Necessary Bandwidth
Operating Conditions:	High Frequency, 615.875MHz, 20mW
Operator Name:	Juan Castrejon
Comment:	8.3.3.1: Step 3;Lower and upper frequency transmitter Wide band noise floor
Date Tested:	Test on February 6, 2018



16:56:15 06.02.2018

Appendix D

D. Test Setup Photos

1. Radiated Emissions test setup

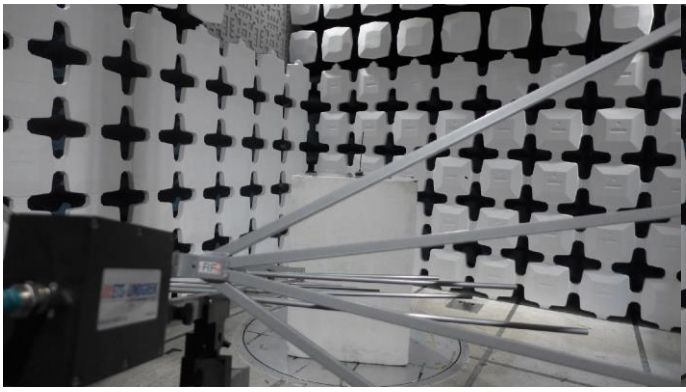


Figure 1: ULXD8 Transmitter Test Setup

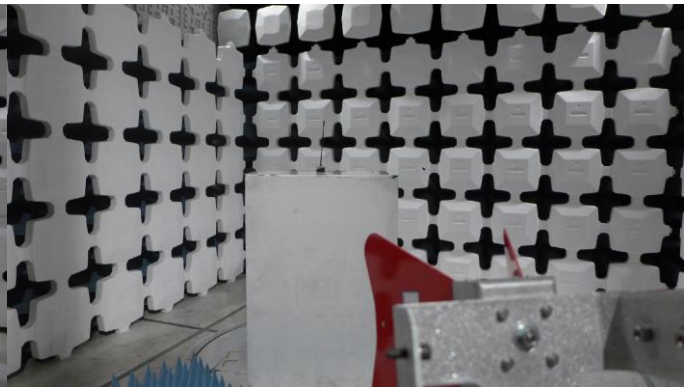


Figure 2: ULXD8 Transmitter Test Setup

2. Power Output test setup

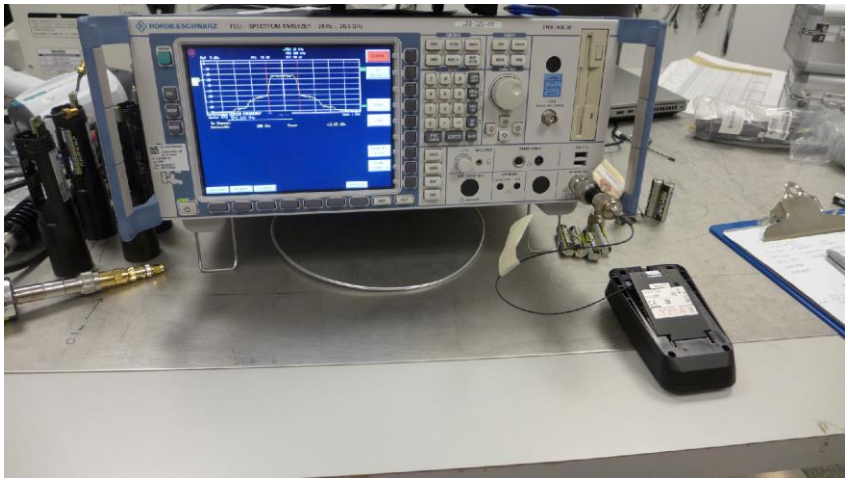


Figure 3: Test setup for Maximum Radiated Output

3. Necessary Bandwidth test setup

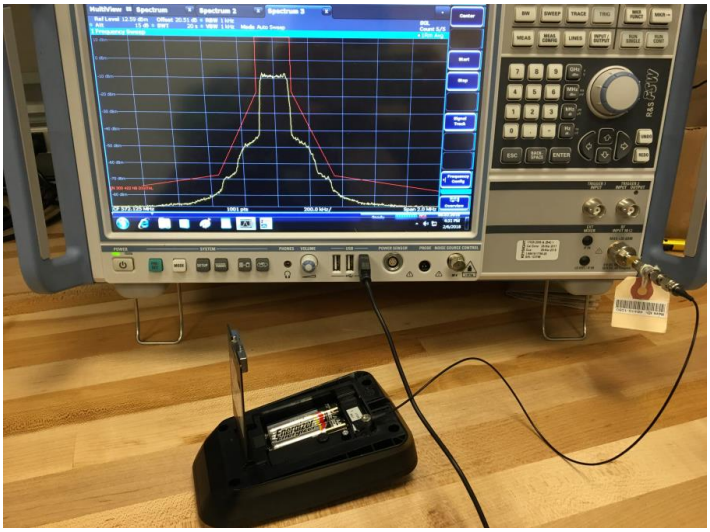


Figure 4: Test Setup for Necessary Bandwidth