SHURE

ELECTROMAGNETIC COMPATIBILITY LABORATORY
TEST REPORT

TEST REPORT TITLE: Electromagnetic Compatibility tests for a Shure AD2 Handheld Transmitter

TEST ITEM DESCRIPTION:

AD2 is a digital wireless handheld transmitter intended for use in mid-tier presentation, installed, and performance markets. The system operates in the UHF TV and STL bands (470 to 960 MHz) wherever permitted. Regionally dependent 2mW, 10mW, 20mW and 35mW output power modes are available. The AD2 transmitter is capable of operating with AA alkaline batteries or Shure rechargeable battery packs.

For: Shure Incorporated
5800 West Touhy Avenue
Niles, IL 60714

Project ID Number: SEL-023

Date Tested: October 19, 2016 – June 6, 2017

Test Personnel: Alex Stelmaszczyk, Alex Mishinger, Russell Smith
Tom Braxton, Craig Kozokar, Mudassar Khan

Test Specification: FCC "Code of Federal Regulations" Title 47 Part 74
ISED Canada RSS-210
ISED Canada RSS-Gen
EN 300 422-1

TEST REPORT BY:	SIGNATURE	SENIOR ENGINEER, GC POSITION	6-9-17 DATE
APPROVED BY:	SIGNATURE	Project Engineer, EMC POSITION	6/9/17 DATE

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REPORT REVISION HISTORY

Revision	Date	Description
0	3/31/2017	Initial Release
1	6/8/2017	Revised Throughout: Added Spurious Matching Data for FCC and ISED, Revised Spurious Limits Throughout, Added EU Spurious Test Data To Support ISED Certification, Updated Reference Documents, Minor Corrections Throughout

Report Title:

1. INTRODUCTION

1.1. Scope of Tests

This document presents the results of a series of electromagnetic compatibility (EMC) tests performed on the Shure AD2 handheld transmitter. The test items were manufactured and submitted for testing by Shure Incorporated located in Niles, IL. The data was taken following the measurement methods as described in the test specifications listed in the individual appendices of this document. Provided is the data for the test samples which also includes a summary of the measurements made and a description of the measurement setup. The EUT contained a transmitter that was designed to transmit in the following UHF and STL frequency bands using an integral, non-removable antenna:

Group	Band	Frequency (MHz)	Output Power (mW)
A	G55	470-636	2, 10, 35
B	K53	606-698	2, 10, 35
C	X55*	941-960	2, 10, 35
D	G57*	470-607 @ 35mW 614-616 @ 20mW	2, 10, 20, 35
E	K54*	606-607 @ 35mW 614-616 and 653-662 @ 20mW	2, 10, 20, 35

*US FCC only

1.2. Purpose

This series of tests was performed to determine if the test item would meet the conducted and radiated RF emission specifications of the FCC "Code of Federal Regulations" Title 47 Part 74, Subpart H, Section 74.861. The test series was also performed to determine if the test items meet the radiated and conducted RF emission specifications of ISED Canada RSS-210, Issue 9, Annex G. Testing was performed in accordance with ANSI C63.4-2014 and RSS-GEN.

1.3. Deviations, Additions and Exclusions

Additional test data was taken to represent the bands G57 and K54 at 615MHz at an output power level 20mW for the US only per the requirements of the 2017 FCC 600MHz Incentive Auction.

G57 is the same hardware as G55. It has been software adjusted to operate at 20mw from 614MHz to 616MHz in addition to the frequency range represented by the testing for G55. The original G55 frequency range of 470MHz to 636MHz has also been software limited to 616MHz for G57.

K54 is the same hardware as K53. It has been software adjusted to operate at 20mw from 614MHz to 616MHz and 653MHz to 662MHz in addition to the frequency range represented by the testing for K53. The original K53 frequency range of 606MHz to 698MHz has also been software limited to 662MHz for K54.

Additional test data was also taken on the bands G56 and K55 per EN 300 422 specifications for the purpose of representing the bands G55 and K53 for Canadian certification. G55 and G56 share the same hardware as do K53 and K55. The only difference between the two “band family” versions is software limited tuning range.

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 ISED 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 1) were performed on the EUT in accordance with FCC "Code of Federal Regulations” Title 47 Part 74 and ISED Canada RSS-210 specifications:

Table 1: Summary of tests performed

Test Spec (STD)	Description	Tested Range	Described in Appendix	Test Results
FCC Part 74 (74.861) RSS-210, Table G1	**Conducted RF Power Output**	**470 – 960MHz**	**A**	PASS
FCC Part 74 (74.861) RSS-210, G3.5	**Modulation Characteristics**	**470 – 960MHz**	**B**	N/A
FCC Part 74 (74.861) RSS-210, A1 (6.3)	**Frequency Stability**	**470 – 960MHz -30 deg C to 50C**	**C**	PASS
FCC Part 74 (74.861) RSS-210, G3.2	**Occupied Bandwidth & Necessary Bandwidth**	**470 – 960MHz**	**D**	PASS
FCC Part 74 (74.861) RSS-210, G3.4	**Spurious Emissions**	**30MHz – 10GHz**	**E**	PASS

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, dated 1 October 2010
- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 2, dated 1 October 2010
- European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2 (2011-08).
- European Telecommunications Institute Standard ETSI EN 300 422-1 v2.1.1 (2016-09).
- RSS-210, "Spectrum Management and Telecommunications Radio Standards Specification Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment” Issue 9, August 2016

- RSS-Gen, “Spectrum Management and Telecommunications Radio Standards Specification General Requirements and Information for the Certification of Radiocommunication Equipment”, Issue 3, December 2010

- 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"

- TIA-603-C-2004, “Land Mobile FM or PM Communications Equipment Measurement and Performance Standard”

3. EUT SET-UP AND OPERATION

3.1. General Description

The EUT is a wireless handheld transmitter, model no. AD2. The EUT arrangement in which the testing was conducted can be found in the individual appendices.

3.2. Test Samples

The following product samples were tested:

Model	Band	Frequency (MHz)	Serial #	Sample #
AD2	G55	470-636	TU162040050	10 (Conducted)
AD2	G55	470-636	TU162030005	55 (Radiated)
AD2	K53	606-698	TU162080143	116 (Conducted)
AD2	K53	606-698	TU162080102	134 (Radiated)
AD2	X55	941-960	TU162090245	201 (Conducted)
AD2	X55	941-960	TU162090145	242 (Radiated)
AD2	G57*	470 -616	TU163360199	43 (Conducted)
AD2	G57*	470 -616	TU163360199	43 (Radiated)
AD2	K54*	606 - 662	TU163370212	66 (Conducted)
AD2	K54*	606 - 662	TU163370263	65 (Radiated)
AD2	G56**	470 - 636	TU162040097	64 (Conducted)
AD2	G56**	470 - 636	TU162040046	102 (Radiated)
AD2	K55***	606 - 694	TU162050094	150 (Conducted)
AD2	K55***	606 - 694	TU162080110	146 (Radiated)

*US FCC only
**Representing G55 Hardware for Canada
***Representing K53 Hardware for Canada

3.3. Test Setup

3.3.1. Power Input

The EUT was powered with 3VDC from 2 internal “AA” batteries or 3.7VDC from a rechargeable battery. The input power source is noted in the individual appendices.

3.3.2. Signal Input /Output Leads

The microphone port of the EUT was terminated with a Shure SM58 microphone capsule for all radiated emissions tests.

3.3.3. Test Frequency Range

Per CFR Title 47, Section 2, part 1057 and RSS-210, Annex G, section G3.4 (sections 8.3 and 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08)) for spurious radiated emissions measurements, the frequency spectrum shall be investigated up to at least the tenth harmonic of the highest fundamental frequency. The highest fundamental frequency internally generated by the EUT is 960MHz. Therefore, radiated emissions measurements were performed up to 10GHz.

3.3.4. Grounding Considerations

The EUT was not grounded during testing.

3.4. Operational Mode

3.4.1. Frequency and Power Output:

All emissions tests were performed separately in the following transmit frequency and output power modes:

G55

Tx @ 470.125MHz, 2mW; Tx @ 470.125MHz, 35mW (Low)
Tx @ 553.000MHz, 2mW; Tx @ 553.000MHz, 35mW (Mid)
Tx @ 635.875MHz, 2mW; Tx @ 635.875MHz, 35mW (High)

K53

Tx @ 606.125MHz, 2mW; Tx @ 606.125MHz, 35mW (Low)
Tx @ 652.000MHz, 2mW; Tx @ 652.000MHz, 35mW (Mid)
Tx @ 697.875MHz, 2mW; Tx @ 697.875MHz, 35mW (High)

X55*

Tx @ 941.625MHz, 2mW; Tx @ 941.625MHz, 35mW (Low)
Tx @ 950.500MHz, 2mW; Tx @ 950.500MHz, 35mW (Mid)
Tx @ 959.725MHz, 2mW; Tx @ 959.725MHz, 35mW (High)

G57*

Tx @ 615.000MHz, 2mW; Tx @ 615.000MHz, 20mW (Mid)

K54*

Tx @ 615.000MHz, 2mW; Tx @ 615.000MHz, 20mW (Mid)

G56**

Tx @ 470.125MHz, 2mW; Tx @ 470.125MHz, 35mW (Low)
Tx @ 553.000MHz, 2mW; Tx @ 553.000MHz, 35mW (Mid)
Tx @ 635.875MHz, 2mW; Tx @ 635.875MHz, 35mW (High)

K55**

Tx @ 606.125MHz, 2mW; Tx @ 606.125MHz, 35mW (Low)
Tx @ 652.000MHz, 2mW; Tx @ 652.000MHz, 35mW (Mid)
Tx @ 693.875MHz, 2mW; Tx @ 693.875MHz, 35mW (High)

*US FCC only
**Canada ISED only

4. TEST INSTRUMENTATION

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

5. TEST PROCEDURES

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 the individual test appendices. In general, it was found that the Shure Incorporated AD2 met the radiated and conducted RF emission specifications of the FCC "Code of Federal Regulations" Title 47, Part 74, Subpart H, Section 74.861. It was also found that the AD2 met the radiated and conducted RF emissions specifications of ISED Canada RSS-210, Issue 9, Annex G.

8. CONCLUSIONS

It was determined that the Shure Incorporated AD2 did fully comply with the radiated and conducted RF emissions requirements of both the FCC "Code of Federal Regulations" Title 47 Part 74, Subpart H, Section 74.861 and ISED Canada RSS-210, Issue 9, Annex G.

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 to claim product endorsement by NVLAP or any agency of the US Government.

10. EQUIPMENT LIST

Table 10-1: Test Equipment

L# or ID	Description	Manufacturer	Model #	Serial #	Range	Cal Date	Due Date
L23-011-01	3 meter RF Chamber	ETS Lindgren	FACT-3	AJ640	25MHz - 18GHz	8/8/2016	8/8/2017
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
L23-020-04	Antenna Positioner	ETS Lindgren	2171B	118617	N/A	N/A	N/A
L23-011-15	BiConiLog Antenna	ETS Lindgren	3142C	34790	25MHz-3GHz	6/3/2016	6/3/2017
L23-011-54	EMI Test Receiver	Rohde & Schwarz	ESR26	101347	9kHz - 26.5GHz	5/19/2016	5/19/2017
L23-011-31	EMI/EMS Test Software	Rohde & Schwarz	EMC32	V.9.21 0S200319	20Hz - 40GHz	N/A	N/A
L23-022-01	Spectrum Analyzer	Rohde & Schwarz	FSU 1166.1660. K26	201043	20Hz – 26.5GHz	7/13/2016	7/13/2017
L23-040-03	20dB Attenuator	Mini Circuits	BW-N20W5+	0952	DC-18GHz	5/20/2016	5/20/2017
L23-031-01	Power Meter	AR	PM2003	0335363	10kHz – 40GHz	12/20/2016	12/06/2017
L23-032-01	Power Head	AR	PH2008	336213	100 kHz - 18GHz -40 to +33 dBm	12/20/2016	12/06/2017
L19-06-01	Temp. Chamber	ESPEC	SU-24	91004211	-40C - +130C	4/12/2016	4/12/2017
L23-034-08	Type K/J Thermometer	Extech	TM100 & TP870	13018733, TE701576	-50C – +538C	10/21/2016	10/21/2017
L23-24-01	Frequency Counter / Timer	Agilent	53220A	MY50006485	N/A	06/06/2016	06/06/2017
L23-026-01	Tunable Notch Filter	Trilithic	3VNF500/1000-50-AA	200908026	500 – 1000MHz	3/1/2016	3/1/2017
L23-027-01	Tunable Notch Filter	Trilithic	3VNF300/600-50-AA	201004053	300 – 600MHz	3/3/2016	3/3/2017
L23-027-02	Tunable Notch Filter	Trilithic	3VNF300/600-50-AA	201004054	300 – 600MHz	12/15/2015	12/15/2016
L23-011-57	High Pass Filter	K&L	11SH10-940/X10000-O/O	3	940 – 10000MHz	NEW	7/20/2017
L23-011-38	High Pass Filter	K&L	11SH10-1340/X10000-O/O	1	1340 – 10000MHz	4/22/2016	4/22/2017
L23-011-55	Waveguide Horn Antenna with Pre-Amp	ETS Lindgren	3117-PA	206583	1GHz-18GHz	3/24/2016	3/24/2017
L23-011-36D	Tuned Dipole Antenna	ETS Lindgren	312D-DB-4	123695	400-1000MHz	5/5/2016	5/5/2017

L# or ID	Description	Manufacturer	Model #	Serial #	Range	Cal Date	Due Date
L23-011-41	Waveguide Horn Antenna	ETS Lindgren	3117	123511	1GHz -18GHz	3/7/2017	3/7/2018
L23-022-02	Spectrum Analyzer	Rohde & Schwarz	FSW26	103788	2Hz – 26.5GHz	3/28/2017	3/28/2018
L23-011-16	Waveguide Horn Antenna	ETS Lindgren	3115	29851	1GHz -18GHz	12/8/2016	12/8/2017
RENT	RF Signal Generator	Agilent	E4428C	94730	250kHz – 6GHz	1/5/2017	1/5/2019

A. RF POWER OUTPUT MEASUREMENTS

A.1. PURPOSE:

This test was performed to determine if the EUT meets the RF power output requirements of FCC Part 74 over the EUT operating frequency ranges of 470 to 608MHz, 614 to 806MHz and 941 to 960MHz as well as the RSS-210, Issue 9, Annex G specifications.

A.2. REQUIREMENTS:

As stated in paragraph 74.861(e)(1)(ii), for low power auxiliary stations operating in the bands allocated for TV broadcasting, the power of the measured unmodulated carrier power at the output of the transmitter power amplifier (antenna input power) may not exceed 250 milliwatts in the 470-608 and 614-806MHz bands. Per the requirements set out in section G3.1, Table 1 of ISED Canada RSS-210, Issue 9, Annex G, the RF power output shall not exceed 250mW average power.

A.3. 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}
RF Power Output	***0.354 dB***

U_{lab} = Determined for Shure EMC Laboratory

- 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.

A.4. TEST SETUP AND INSTRUMENTATION:

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

A.5. EUT OPERATION:

The EUT was powered up and the transmit frequency and power output level of the transmitter was selected using the front panel controls. The EUT was powered at 3.7VDC by a Shure SB900 rechargeable battery. The EUT was checked for proper operation after it was setup for the test. Testing was conducted with the EUT set to transmit at output power levels of 2mW, 10mW, 20mW and 35mW at low, mid and high frequencies for each band.

A.6. TEST PROCEDURES:

a. The EUT was connected to an RF power meter through a calibrated power head.

b. The frequency of the power meter was set to the operating frequency of the EUT.

c. The RF power meter was allowed to stabilize and then the output power measurement was recorded.

A.7. RESULTS:

The output power measurement data is presented below on pages 13 - 14. As shown by the test data, the power output of the EUT is within the requirements of Part 74.861 and RSS-210.

Figure A-1 - Test Setup for RF Power Output

Test Information

EUT Name:	AD2 Bands G55, K53, X55, X55*
Serial Number:	TU162040050 (G55), TU162080143 (K53), TU162090245 (X55)
Test Description:	FCC pt.74 and RSS-210 RF Power Output – Antenna Conducted
Operating Conditions:	Low, Mid and High Frequencies at 2mW, 10mW and 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	PM2003 Power Meter and PH2008 Power Head
Test Date:	January 4, 2017 & February 7, 2017

EUT Name:	AD2 Bands G57*, K54*
Serial Number:	TU163360199 (G57), TU163370212 (K54)
Test Description:	**FCC pt.74 Only** – Antenna Conducted
Operating Conditions:	615MHz (Mid Frequency) at 2mW, 10mW and 20mW
Operator Name:	Alex Stelmaszczyk
Comment:	PM2003 Power Meter and PH2008 Power Head
Test Date:	March 10 & 21, 2017

*US FCC only

Appendix A

Appendix A

Frequency (MHz)	Nominal Power (mW)	Measured Power (dBm)	Measured Power (mW)	Limit (mW)
470.125	2	**2.66**	1.85	250
470.125	10	**10.18**	10.42	250
470.125	35	**15.56**	35.97	250
553.000	2	**2.58**	1.81	250
553.000	10	**9.87**	9.71	250
553.000	35	**15.6**	36.31	250
635.875	2	**2.25**	1.68	250
635.875	10	**10**	10.00	250
635.875	35	**15.67**	36.90	250
615.000	2	**3.01**	2.00	250
615.000	10	**10.47**	11.14	250
615.000	20	**14.4**	27.54	250
Frequency (MHz)	Nominal Power (mW)	Measured Power (dBm)	Measured Power (mW)	Limit (mW)
606.125	2	**2.97**	1.98	250
606.125	10	**10.52**	11.27	250
606.125	35	**16.18**	41.50	250
652.000	2	**2.89**	1.95	250
652.000	10	**10.48**	11.17	250
652.000	35	**16.28**	42.46	250
697.875	2	**3.08**	2.03	250
697.875	10	**10.54**	11.32	250
697.875	35	**16.49**	44.57	250
615.000	2	**3.07**	2.03	250
615.000	10	**10.66**	11.64	250
615.000	20	**14.3**	26.92	250
Frequency (MHz)	Nominal Power (mW)	Measured Power (dBm)	Measured Power (mW)	Limit (mW)
941.625	2	**2.57**	1.81	250
941.625	10	**10.01**	10.02	250
941.625	35	**16.51**	44.77	250
950.500	2	**2.77**	1.89	250
950.500	10	**10.29**	10.69	250
950.500	35	**16.54**	45.08	250
959.725	2	**2.74**	1.88	250
959.725	10	**10.2**	10.47	250
959.725	35	**16.18**	41.50	250

B. MODULATION CHARACTERISTICS

B.1**. REQUIREMENTS:**

As stated in paragraph 74.861(e)(3) and Annex G, section G3.5 of RSS-210, Amendment 1 for low power auxiliary stations operating in the bands allocated for TV broadcasting, any form of modulation may be used.

B.2 TEST PROCEDURES:

Since the EUT employs digital modulation, no modulation characteristics tests were performed.

C. FREQUENCY STABILITY

C.1. PURPOSE:

This test was performed to determine if the EUT meets the frequency stability requirements of the FCC Part 74.861(e)(4) and the Annex G, section G3.1 of RSS-210, Table G1 specifications over the EUTs operating frequency range.

C.2. REQUIREMENTS:

As stated in paragraph 74.861(e)(4) and section G3.1 of RSS-210, A1, Table G1, for low power auxiliary stations operating in the UHF bands, the frequency tolerance of the transmitter shall be 0.005 percent. 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}
Frequency Error (Stability)	**56.47 Hz**

U_{lab} = Determined for Shure EMC Laboratory

- 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.4. TEST SETUP AND INSTRUMENTATION:

The EUT was heated and cooled in an ESPEC temperature chamber over a temperature range of -30C to +50C. The temperature around the EUT was measured and monitored by a K-Type thermocouple connected to an Extech Type K/J Thermometer. The EUTs frequency was measured with an Agilent Universal Frequency Counter/Timer set to measure frequency to 7 decimal places. The operational frequency of the transmitter under test was set to a low, mid or high frequency within its operating range. Photographs of the test setup are shown as Figure C-1. The test instrumentation can be determined from Table 10-1.

Appendix C

C.5. EUT OPERATION:

The antenna port of the EUT was connected to the 50 Ohm input of the frequency counter/timer. The EUT was set at its lowest power output setting (2mW) as representative of the worst case operational condition for this test.

C.6. TEST PROCEDURES:

a. The temperature chamber was set to -30C with the EUT inside and powered off.

b. The EUT was allowed to soak for ~15 minutes after the temperature chamber reached the set temperature.

c. The EUT was then powered on and allowed to stabilize for ~ 1 minute.

d. The measured frequency of the transmitter was recorded with the Universal Frequency Counter/Timer.

e. Steps a. through d. were repeated at -20C through +50C in ten degree increments for representative low, mid and high frequencies within each EUTs operational band.

C.7 RESULTS:

The frequency stability measurements are presented in table C-1 on pages 18 - 22. As shown by the test data, the test frequency deviation was within the 0.005 percent limit set out in the FCC Part 74.861 and the RSS-210 Annex G specifications.

Appendix C

Figure C-1 - Test Setup for Frequency Stability

Test Information

EUT Name:	AD2 Band G55 #10
Serial Number:	TU162040050
Test Description:	FCC Part 74.861 and RSS-210 Frequency Stability
Operating Conditions:	Low, Mid and High Frequencies at 2mW, -30C to +50C
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer and ESPEC Temp Chamber
Test Date:	December 12 - 19, 2016

Temp °C	Nominal Frequency (MHz)	Measured Frequency (MHz)	Deviation (%)	Frequency Stability (%)	Deviation (Hz)	Frequency Stability (Hz)	Pass Or Fail
-30	470.125	**470.1253411**	0.0000726	0.005	341	23506.25	PASS
-20	470.125	**470.1256901**	0.0001468	0.005	690	23506.25	PASS
-10	470.125	**470.1256852**	0.0001457	0.005	685	23506.25	PASS
0	470.125	**470.1251751**	0.0000372	0.005	175	23506.25	PASS
10	470.125	**470.1251091**	0.0000232	0.005	109	23506.25	PASS
20	470.125	**470.1252737**	0.0000582	0.005	274	23506.25	PASS
30	470.125	**470.1252241**	0.0000477	0.005	224	23506.25	PASS
40	470.125	**470.1252920**	0.0000621	0.005	292	23506.25	PASS
50	470.125	**470.1253748**	0.0000797	0.005	375	23506.25	PASS
-30	553.000	**553.0004581**	0.0000828	0.005	458	27650	PASS
-20	553.000	**553.0008181**	0.0001479	0.005	818	27650	PASS
-10	553.000	**553.0008040**	0.0001454	0.005	804	27650	PASS
0	553.000	**553.0002057**	0.0000372	0.005	206	27650	PASS
10	553.000	**553.0001500**	0.0000271	0.005	150	27650	PASS
20	553.000	**553.0003219**	0.0000582	0.005	322	27650	PASS
30	553.000	**553.0002638**	0.0000477	0.005	264	27650	PASS
40	553.000	**553.0003390**	0.0000613	0.005	339	27650	PASS
50	553.000	**553.0004341**	0.0000785	0.005	434	27650	PASS
-30	635.875	**635.8755916**	0.0000930	0.005	592	31793.75	PASS
-20	635.875	**635.8759427**	0.0001482	0.005	943	31793.75	PASS
-10	635.875	**635.8759237**	0.0001453	0.005	924	31793.75	PASS
0	635.875	**635.8752344**	0.0000369	0.005	234	31793.75	PASS
10	635.875	**635.8752153**	0.0000339	0.005	215	31793.75	PASS
20	635.875	**635.8753681**	0.0000579	0.005	368	31793.75	PASS
30	635.875	**635.8753032**	0.0000477	0.005	303	31793.75	PASS
40	635.875	**635.8753824**	0.0000601	0.005	382	31793.75	PASS
50	635.875	**635.8754958**	0.0000780	0.005	496	31793.75	PASS

Test Information

EUT Name:	AD2 Band K53 #116
Serial Number:	TU162080143
Test Description:	FCC Part 74.861 and RSS-210 Frequency Stability
Operating Conditions:	Low, Mid and High Frequencies at 2mW, -30C to +50C
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer and ESPEC Temp Chamber
Test Date:	December 12 - 19, 2016

Temp °C	Nominal Frequency (MHz)	Measured Frequency (MHz)	Deviation (%)	Frequency Stability (%)	Deviation (Hz)	Frequency Stability (Hz)	Pass Or Fail
-30	606.125	**606.1256878**	0.0001135	0.005	688	30306.25	PASS
-20	606.125	**606.1258888**	0.0001466	0.005	889	30306.25	PASS
-10	606.125	**606.1257260**	0.0001198	0.005	726	30306.25	PASS
0	606.125	**606.1249639**	-0.0000060	0.005	-36	30306.25	PASS
10	606.125	**606.1249980**	-0.0000003	0.005	-2	30306.25	PASS
20	606.125	**606.1253235**	0.0000534	0.005	324	30306.25	PASS
30	606.125	**606.1253588**	0.0000592	0.005	359	30306.25	PASS
40	606.125	**606.1253529**	0.0000582	0.005	353	30306.25	PASS
50	606.125	**606.1253321**	0.0000548	0.005	332	30306.25	PASS
-30	652.000	**652.0007983**	0.0001224	0.005	798	32600	PASS
-20	652.000	**652.0009618**	0.0001475	0.005	962	32600	PASS
-10	652.000	**652.0007602**	0.0001166	0.005	760	32600	PASS
0	652.000	**651.9999607**	-0.0000060	0.005	-39	32600	PASS
10	652.000	**652.0000229**	0.0000035	0.005	23	32600	PASS
20	652.000	**652.0003340**	0.0000512	0.005	334	32600	PASS
30	652.000	**652.0003969**	0.0000609	0.005	397	32600	PASS
40	652.000	**652.0003799**	0.0000583	0.005	380	32600	PASS
50	652.000	**652.0003418**	0.0000524	0.005	342	32600	PASS
-30	697.875	**697.8758799**	0.0001261	0.005	880	34893.75	PASS
-20	697.875	**697.8760412**	0.0001492	0.005	1041	34893.75	PASS
-10	697.875	**697.8757969**	0.0001142	0.005	797	34893.75	PASS
0	697.875	**697.8749544**	-0.0000065	0.005	-46	34893.75	PASS
10	697.875	**697.8750521**	0.0000075	0.005	52	34893.75	PASS
20	697.875	**697.8753372**	0.0000483	0.005	337	34893.75	PASS
30	697.875	**697.8754339**	0.0000622	0.005	434	34893.75	PASS
40	697.875	**697.8754056**	0.0000581	0.005	406	34893.75	PASS
50	697.875	**697.8753440**	0.0000493	0.005	344	34893.75	PASS

Test Information

EUT Name:	AD2 Band X55 #201
Serial Number:	TU162090245
Test Description:	FCC Part 74.861 Frequency Stability
Operating Conditions:	Low, Mid and High Frequencies at 2mW, -30C to +50C
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer and ESPEC Temp Chamber
Test Date:	December 12 – 19 2016 & February 13 - 15, 2017

Temp °C	Nominal Frequency (MHz)	Measured Frequency (MHz)	Deviation (%)	Frequency Stability (%)	Deviation (Hz)	Frequency Stability (Hz)	Pass Or Fail
-30	941.625	**941.6256331**	0.0000672	0.005	633	47081.25	PASS
-20	941.625	**941.6259575**	0.0001017	0.005	957	47081.25	PASS
-10	941.625	**941.6254741**	0.0000504	0.005	474	47081.25	PASS
0	941.625	**941.6261478**	0.0001219	0.005	1148	47081.25	PASS
10	941.625	**941.6260131**	0.0001076	0.005	1013	47081.25	PASS
20	941.625	**941.6260621**	0.0001128	0.005	1062	47081.25	PASS
30	941.625	**941.6260797**	0.0001147	0.005	1080	47081.25	PASS
40	941.625	**941.6259068**	0.0000963	0.005	907	47081.25	PASS
50	941.625	**941.6258266**	0.0000878	0.005	827	47081.25	PASS
-30	950.500	**950.5009232**	0.0000971	0.005	923	47525	PASS
-20	950.500	**950.5013043**	0.0001372	0.005	1304	47525	PASS
-10	950.500	**950.5013092**	0.0001377	0.005	1309	47525	PASS
0	950.500	**950.4999581**	-0.0000044	0.005	-42	47525	PASS
10	950.500	**950.5001831**	0.0000193	0.005	183	47525	PASS
20	950.500	**950.5004479**	0.0000471	0.005	448	47525	PASS
30	950.500	**950.5004512**	0.0000475	0.005	451	47525	PASS
40	950.500	**950.5004892**	0.0000515	0.005	489	47525	PASS
50	950.500	**950.5007207**	0.0000758	0.005	721	47525	PASS
-30	959.725	**959.7256329**	0.0000659	0.005	633	47986.25	PASS
-20	959.725	**959.7259755**	0.0001016	0.005	975	47986.25	PASS
-10	959.725	**959.7263836**	0.0001442	0.005	1384	47986.25	PASS
0	959.725	**959.7262234**	0.0001275	0.005	1223	47986.25	PASS
10	959.725	**959.7260357**	0.0001079	0.005	1036	47986.25	PASS
20	959.725	**959.7260898**	0.0001136	0.005	1090	47986.25	PASS
30	959.725	**959.7261021**	0.0001148	0.005	1102	47986.25	PASS
40	959.725	**959.7259195**	0.0000958	0.005	920	47986.25	PASS
50	959.725	**959.7258542**	0.0000890	0.005	854	47986.25	PASS

Test Information

EUT Name:	AD2 Band G57* #43
Serial Number:	TU163360199
Test Description:	FCC Part 74.861 Frequency Stability
Operating Conditions:	615MHz (Mid Frequency) @ 2mW, -30C to +50C
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer and ESPEC Temp Chamber
Test Date:	March 10 and 21, 2017

*US FCC only

Temp °C	Nominal Frequency (MHz)	Measured Frequency (MHz)	Deviation (%)	Frequency Stability (%)	Deviation (Hz)	Frequency Stability (Hz)	Pass Or Fail
-30	615.000	**614.9998846**	-0.0000188	0.005	-115	30750	PASS
-20	615.000	**615.0001553**	0.0000252	0.005	155	30750	PASS
-10	615.000	**615.0001710**	0.0000278	0.005	171	30750	PASS
0	615.000	**614.9998656**	-0.0000218	0.005	-134	30750	PASS
10	615.000	**615.0000075**	0.0000012	0.005	7	30750	PASS
20	615.000	**615.0001290**	0.0000210	0.005	129	30750	PASS
30	615.000	**615.0000504**	0.0000082	0.005	50	30750	PASS
40	615.000	**615.0000902**	0.0000147	0.005	90	30750	PASS
50	615.000	**615.0001356**	0.0000220	0.005	136	30750	PASS

Appendix C

Test Information

EUT Name:	AD2 Band K54* #66
Serial Number:	TU163370212
Test Description:	FCC Part 74.861 Frequency Stability
Operating Conditions:	615MHz (Mid Frequency) @ 2mW, -30C to +50C
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer and ESPEC Temp Chamber
Test Date:	March 10 and 21, 2017

*US FCC only

Temp °C	Nominal Frequency (MHz)	Measured Frequency (MHz)	Deviation (%)	Frequency Stability (%)	Deviation (Hz)	Frequency Stability (Hz)	Pass Or Fail
-30	615.000	**615.0000121**	0.0000020	0.005	12	30750	PASS
-20	615.000	**615.0006683**	0.0001087	0.005	668	30750	PASS
-10	615.000	**615.0007347**	0.0001195	0.005	735	30750	PASS
0	615.000	**615.0006180**	0.0001005	0.005	618	30750	PASS
10	615.000	**615.0006329**	0.0001029	0.005	633	30750	PASS
20	615.000	**615.0007622**	0.0001239	0.005	762	30750	PASS
30	615.000	**615.0008309**	0.0001351	0.005	831	30750	PASS
40	615.000	**615.0007240**	0.0001177	0.005	724	30750	PASS
50	615.000	**615.0004766**	0.0000775	0.005	477	30750	PASS

D. OCCUPIED BANDWIDTH MEASUREMENTS

D.1. PURPOSE:

This test was performed to determine if the EUT meets the occupied bandwidth requirements of the FCC Part 74.861(e)(4) and the RSS-210, Annex G, section G3.2 specifications over the EUT's operating frequency range.

D.2. REQUIREMENTS:

As stated in 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+10log10 (mean output power in watts) dB.

Per the specifications set out in the RSS-210, Issue 9, Annex G, Section G3.2 and Table G1 specifications, the following technical requirements apply:

a) The authorized bandwidth shall not exceed 200kHz.

b) The power of unwanted emissions (measured with a resolution bandwidth of 1kHz) shall be contained within the mask prescribed for digital systems operating below 2GHz as described in section 8.3.2 of ETSI EN 300 422-1 v1.4.2 (2011-08).

D.3. TEST SETUP AND INSTRUMENTATION:

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

D.4. EUT OPERATION:

The EUT was powered up and the transmit frequency and power output level of the transmitter were selected using the front panel controls. The EUT was powered at 3VDC by 2 "AA" alkaline batteries. The EUT was checked for proper operation after it was setup for the test. Testing was conducted with the EUT set to transmit at a low, mid and high frequency within each band at an output power level of 35mW. Testing was

also performed at an output power level of 2mW in normal channel bandwidth mode and high density channel bandwidth mode to demonstrate compliance to the occupied bandwidth requirements stated in section D.2.

D.5. TEST PROCEDURES:

a) The EUT was connected to the 50 ohm input of a spectrum analyzer through 20dB of attenuation.

c) The bandwidth of the spectrum analyzer was set to 1MHz.

d) The peak output power was measured and used to set the reference level on the spectrum analyzer.

e) The EUT was then modulated with a typical digital modulation.

f) The bandwidth of the spectrum analyzer was set to 2kHz (1% of Authorized BW), or 1kHz for RSS-210.

D.6. RESULTS:

The occupied bandwidth measurement data is presented on pages 26 – 105. As shown by the test data, the occupied bandwidth of the EUT meets the requirements set out in FCC Part 74.861 and RSS-210.

The maximum ISED Canada 99% bandwidth measurement was 183kHz.

Appendix D

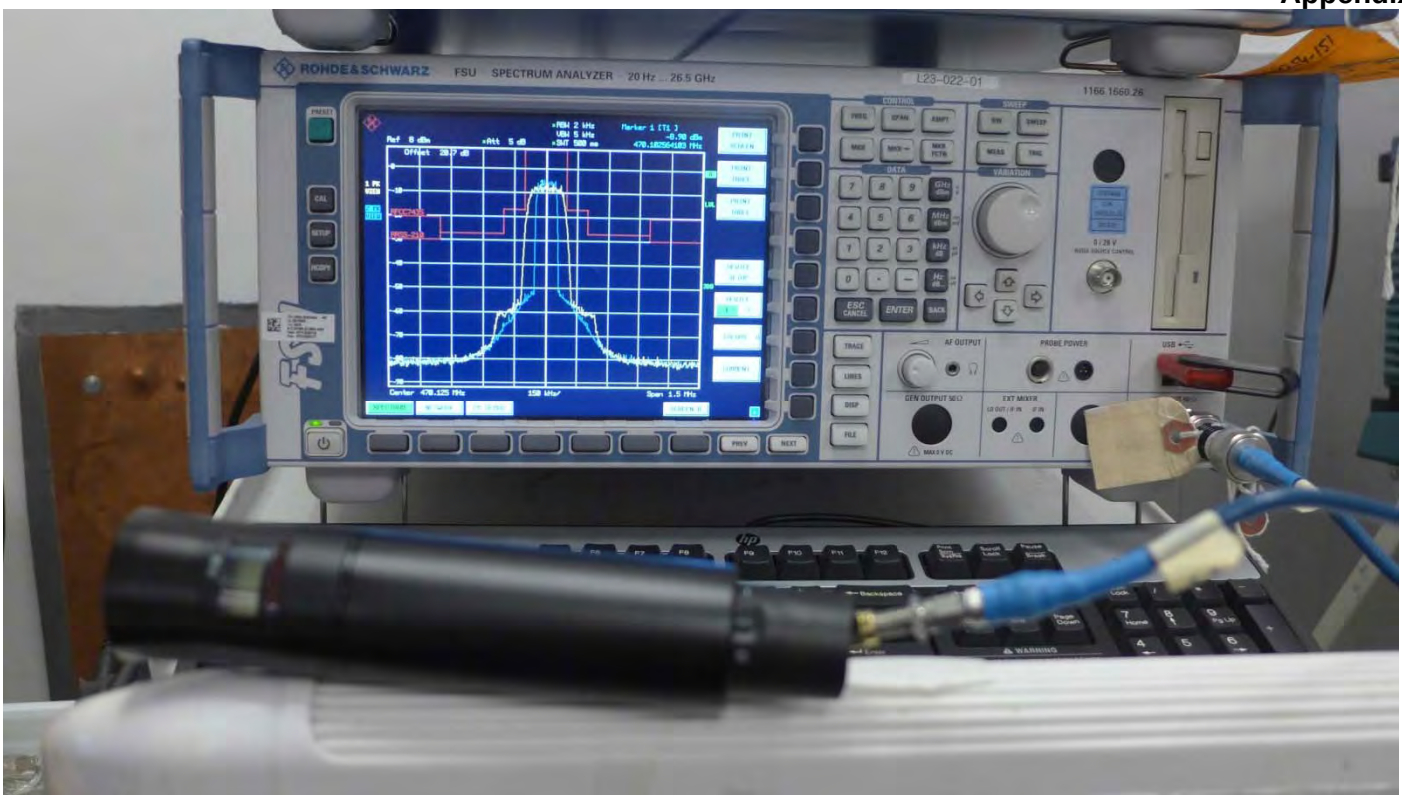
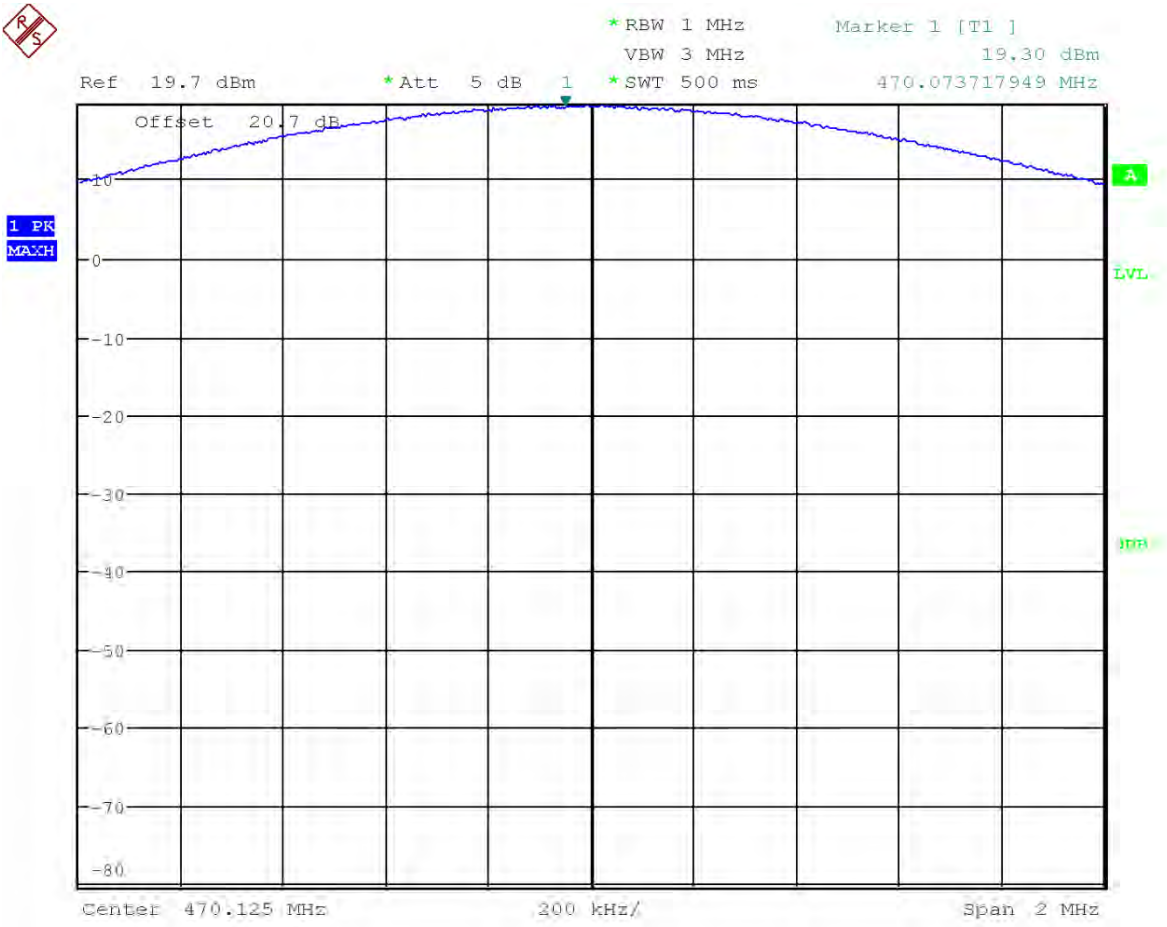


Figure D-1 - Test Setup for Occupied Bandwidth

Appendix D

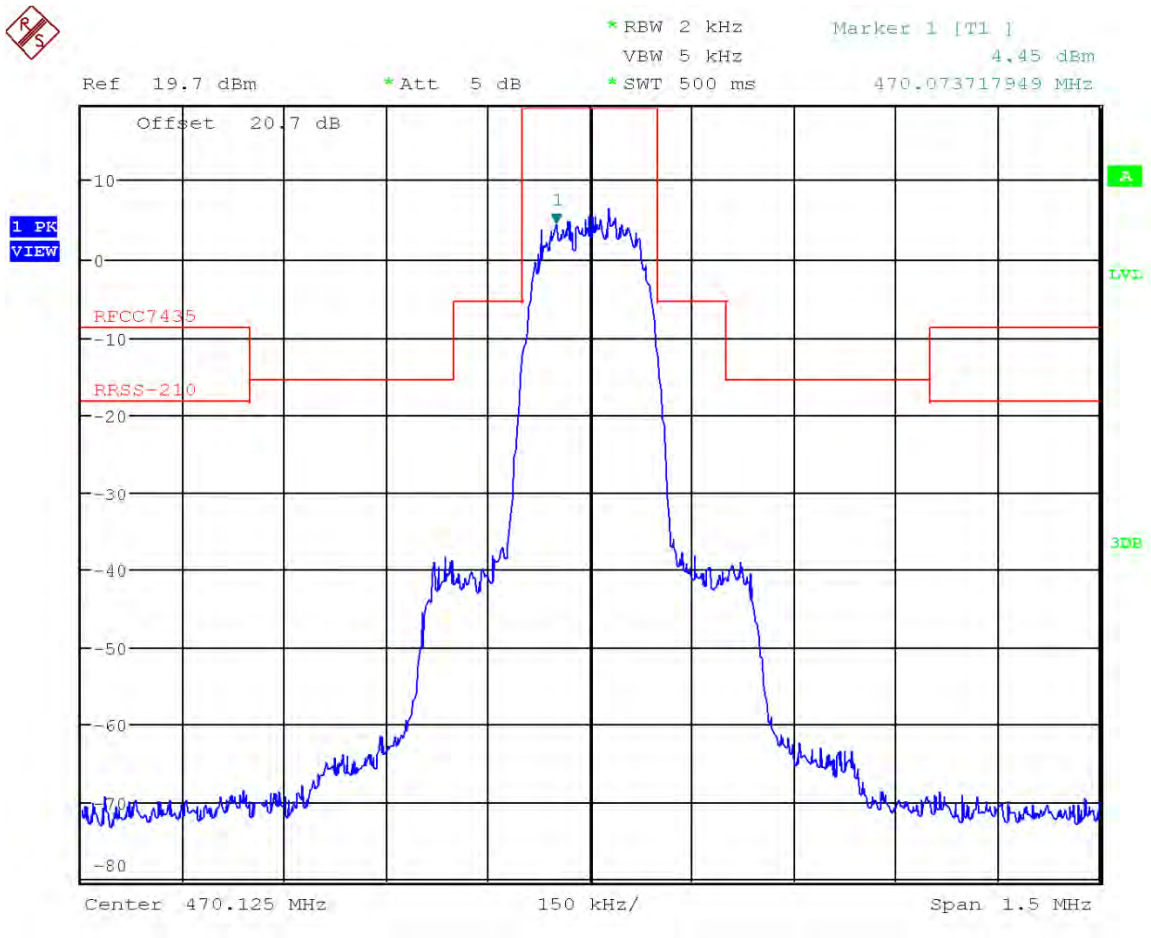
Test Information

EUT Name:	AD2 G55 #10
Serial Number:	TU162040050
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Output Power Reference Low Frequency (470.125MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 14:56:21 PM



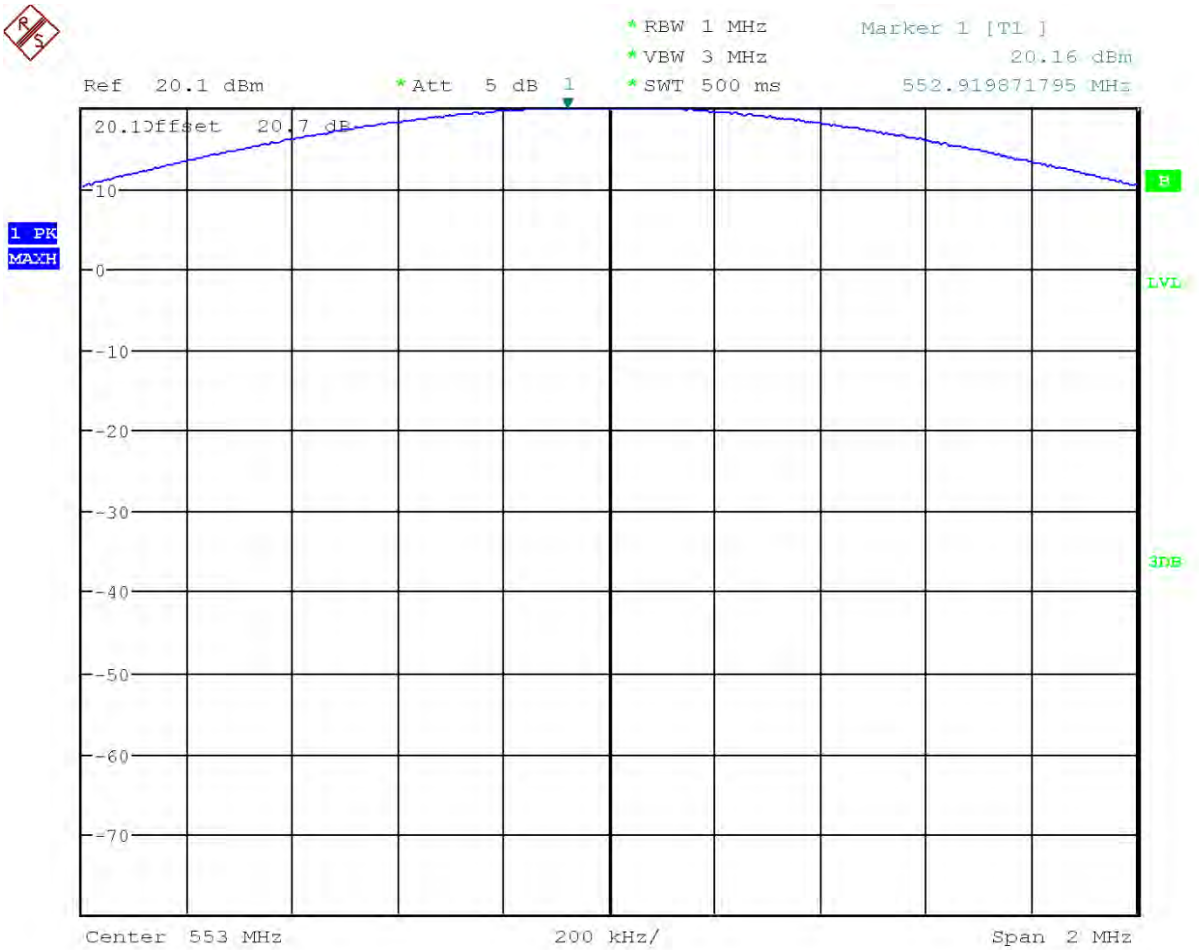
Test Information

EUT Name:	AD2 G55 #10
Serial Number:	TU162040050
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Low Frequency (470.125MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 14:57:34 PM



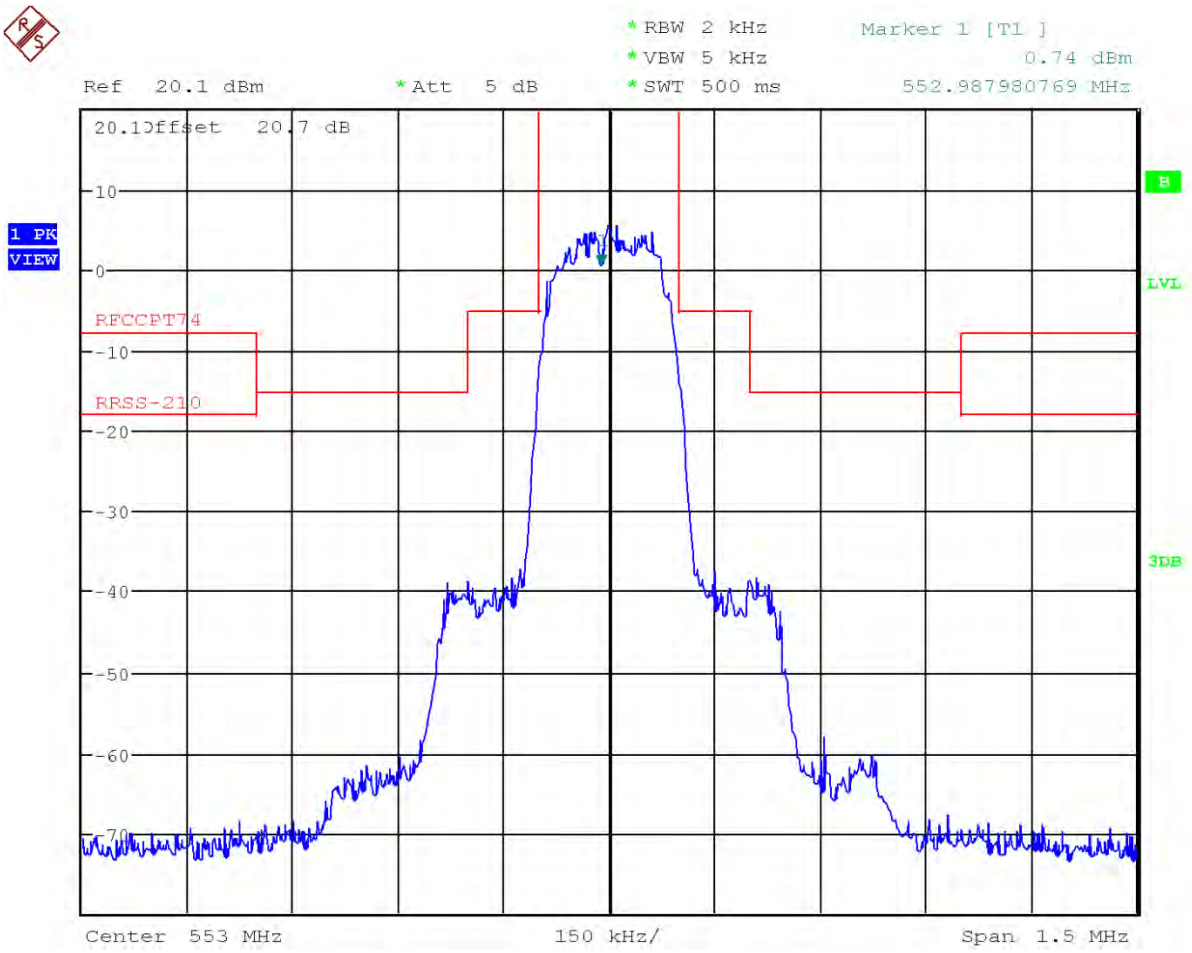
Test Information

EUT Name:	AD2 G55 #10
Serial Number:	TU162040050
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Output Power Reference Mid Frequency (553.000MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 3, 2017 18:49:20 PM



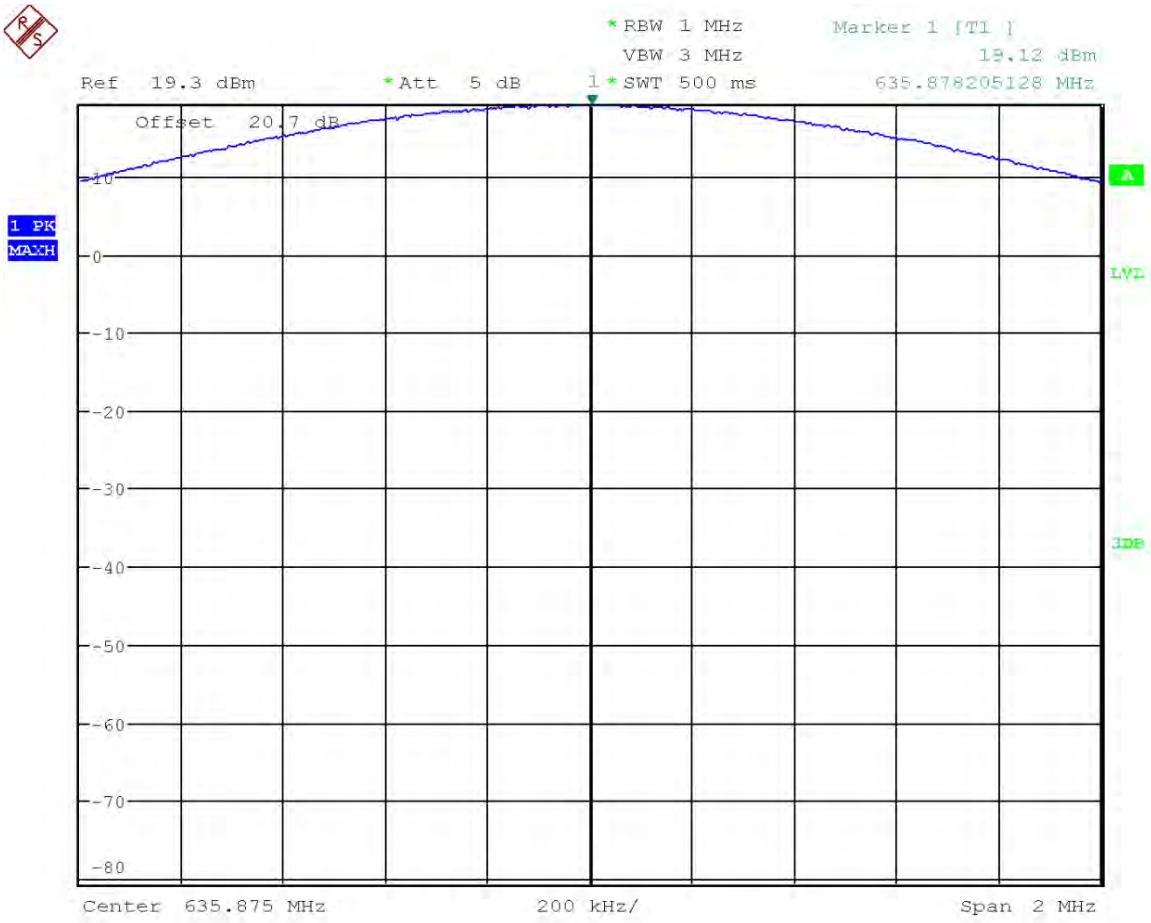
Test Information

EUT Name:	AD2 G55 #10
Serial Number:	TU162040050
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Mid Frequency (553.000MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 3, 2017 18:51:28 PM



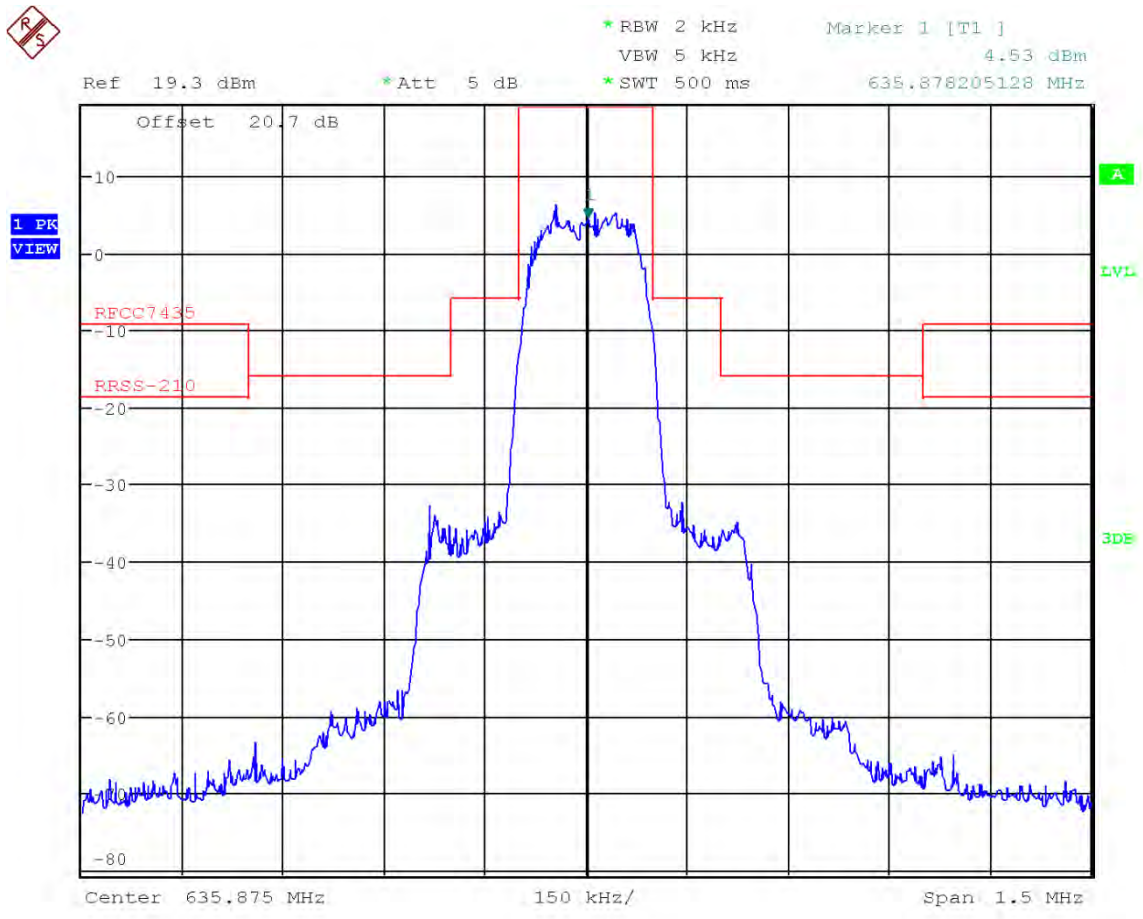
Test Information

EUT Name:	AD2 G55 #10
Serial Number:	TU162040050
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Output Power Reference High Frequency (635.875MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 15:03:41 PM



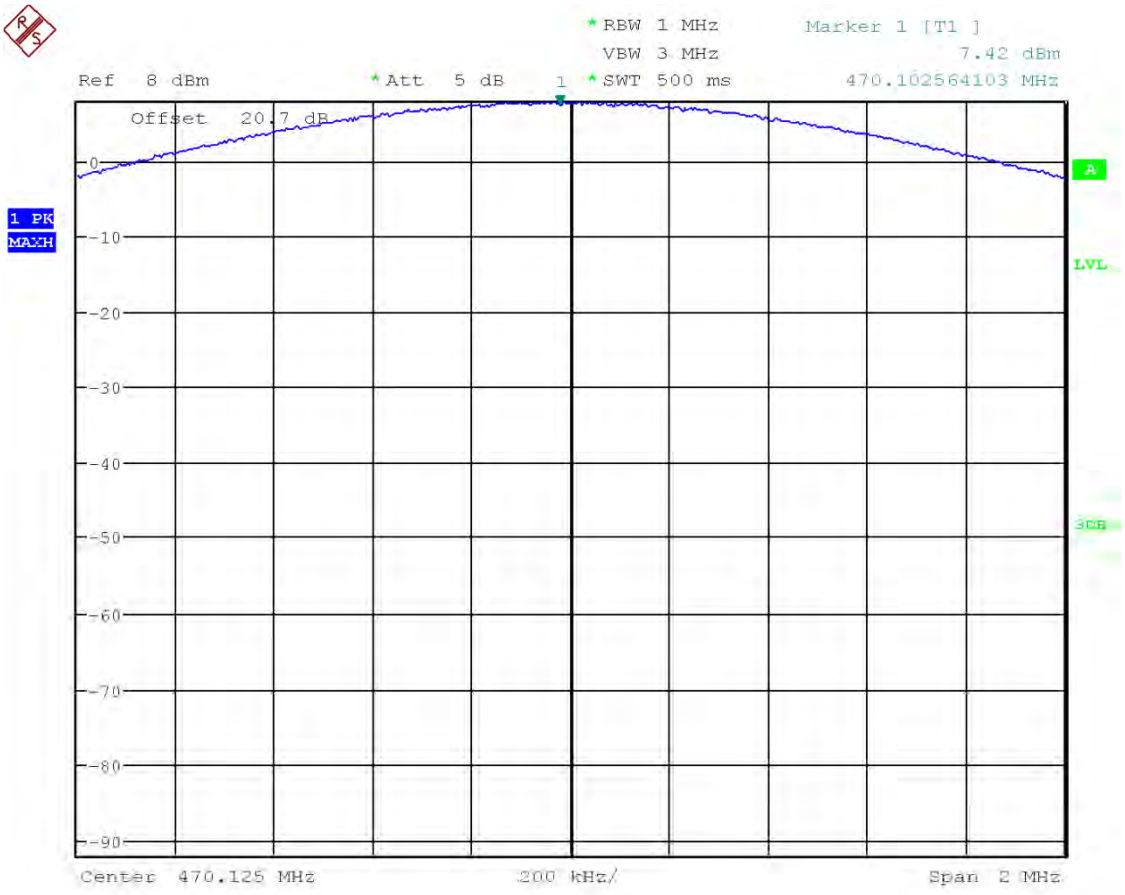
Test Information

EUT Name:	AD2 G55 #10
Serial Number:	TU162040050
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	High Frequency (635.875MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 15:04:51 PM



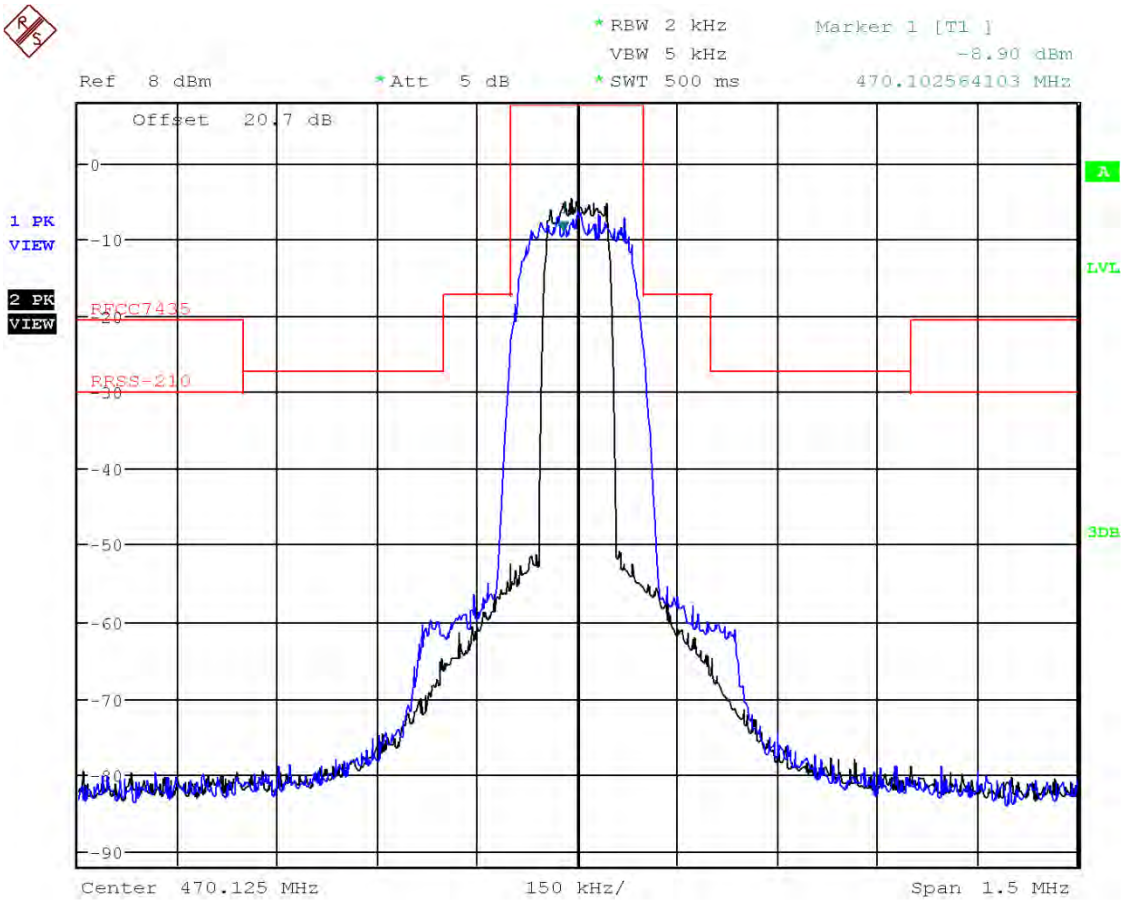
Test Information

EUT Name:	AD2 G55 #10
Serial Number:	TU162040050
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Output Power Reference Low Frequency (470.125MHz) at 2mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 17:55:11 PM



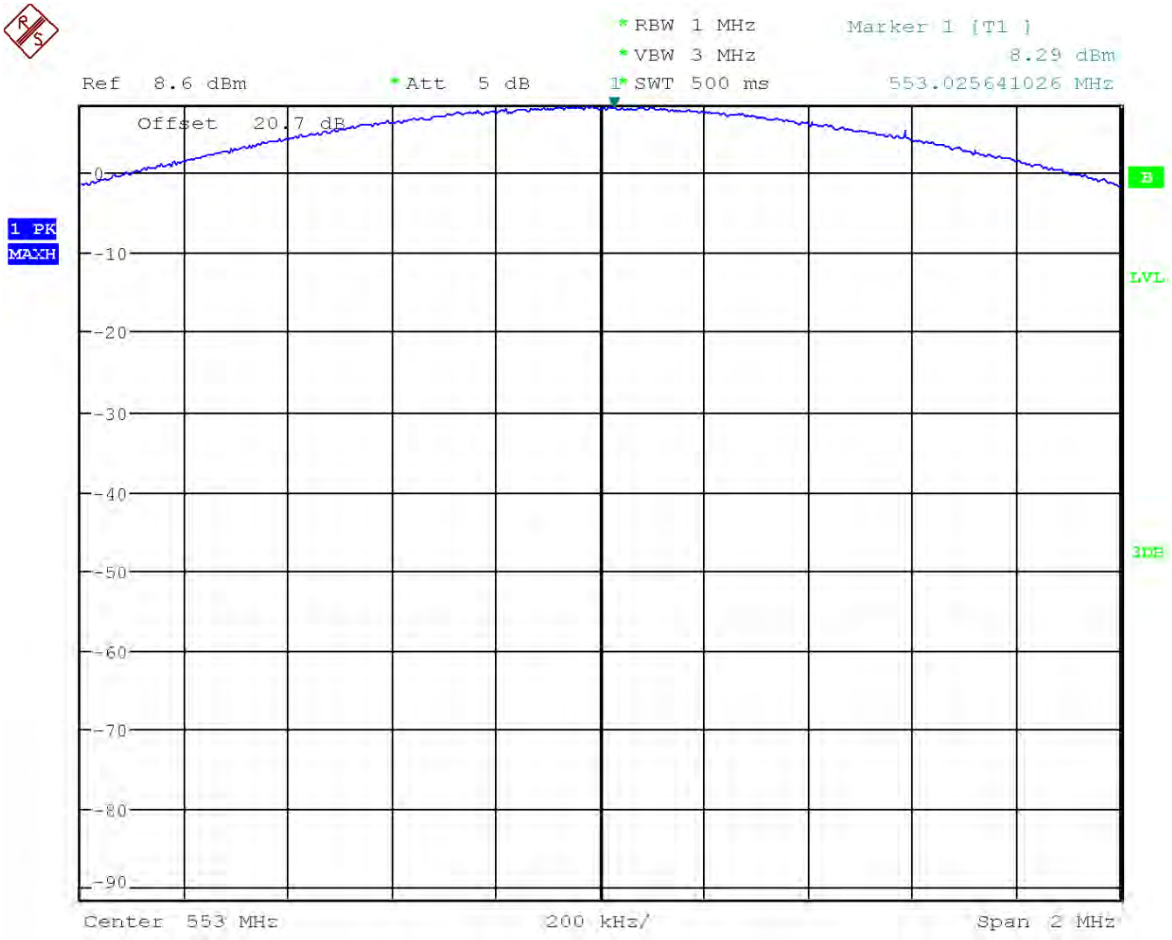
Test Information

EUT Name:	AD2 G55 #10
Serial Number:	TU162040050
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Low Frequency (470.125MHz) at 2mW in Normal Mode (Blue Trace) and High Density Mode (Black Trace) (Channel Bandwidth Options)
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 17:58:54 PM



Test Information

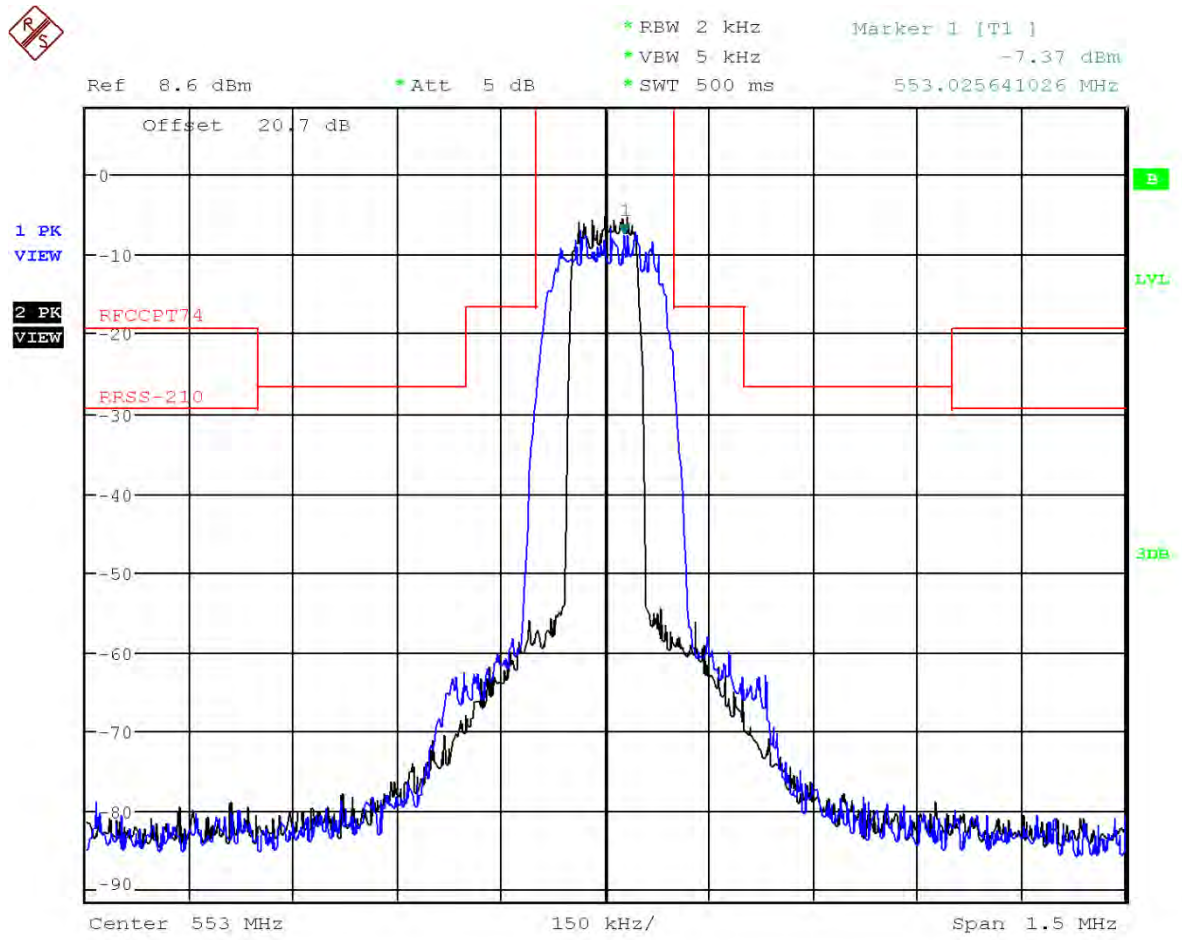
EUT Name:	AD2 G55 #10
Serial Number:	TU162040050
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Output Power Reference Mid Frequency (553.000MHz) at 2mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 3, 2017 18:59:44 PM



Appendix D

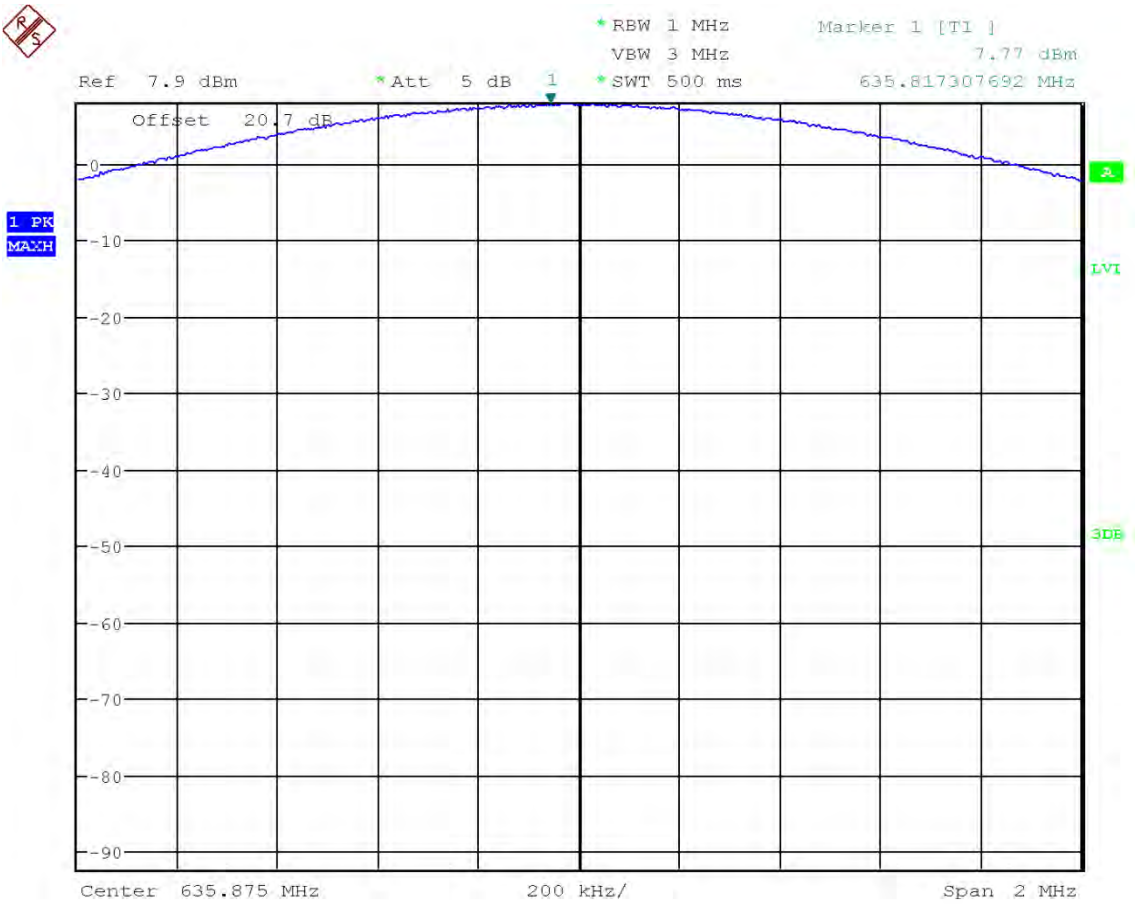
Test Information

EUT Name:	AD2 G55 #10
Serial Number:	TU162040050
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Mid Frequency (553.000MHz) at 2mW in Normal Mode (Blue Trace) and High Density Mode (Black Trace) (Channel Bandwidth Options)
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 3, 2017 19:03:49 PM



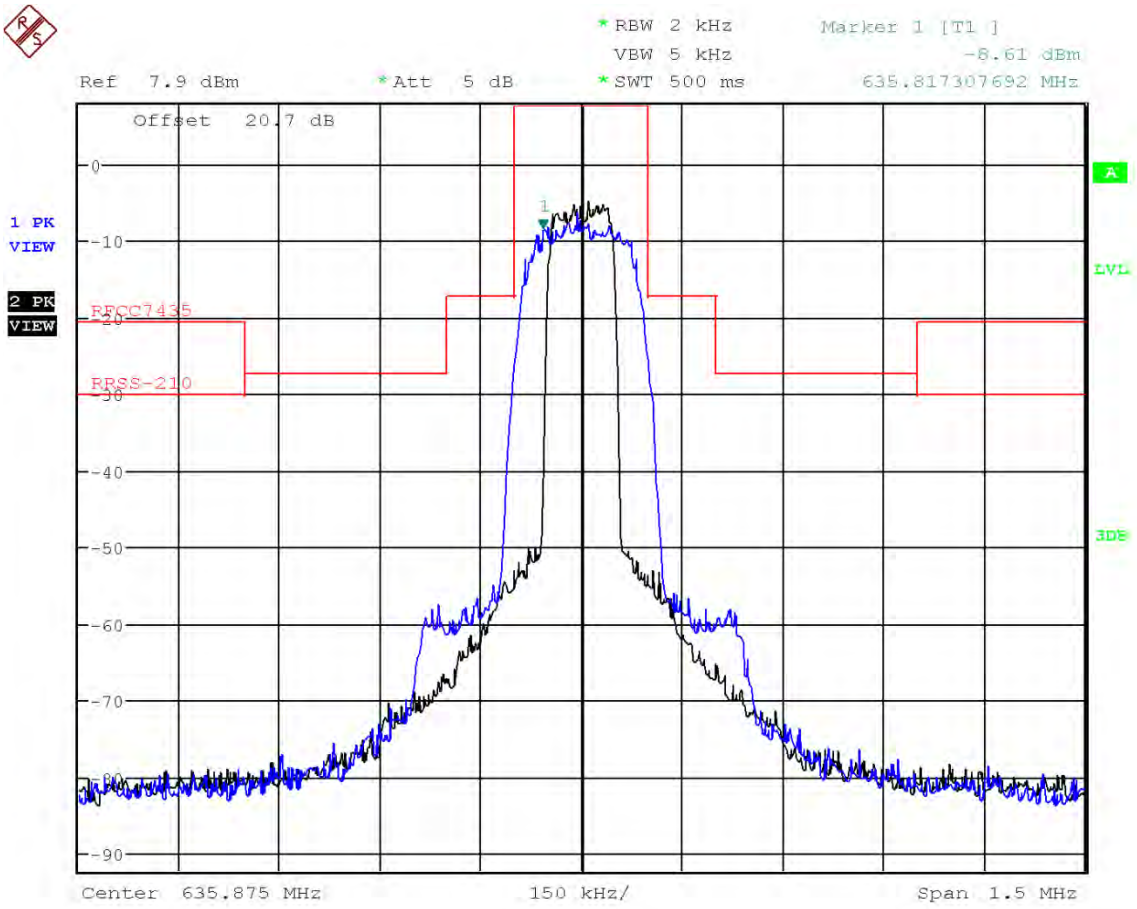
Test Information

EUT Name:	AD2 G55 #10
Serial Number:	TU162040050
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Output Power Reference High Frequency (635.875MHz) at 2mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 17:22:12 PM



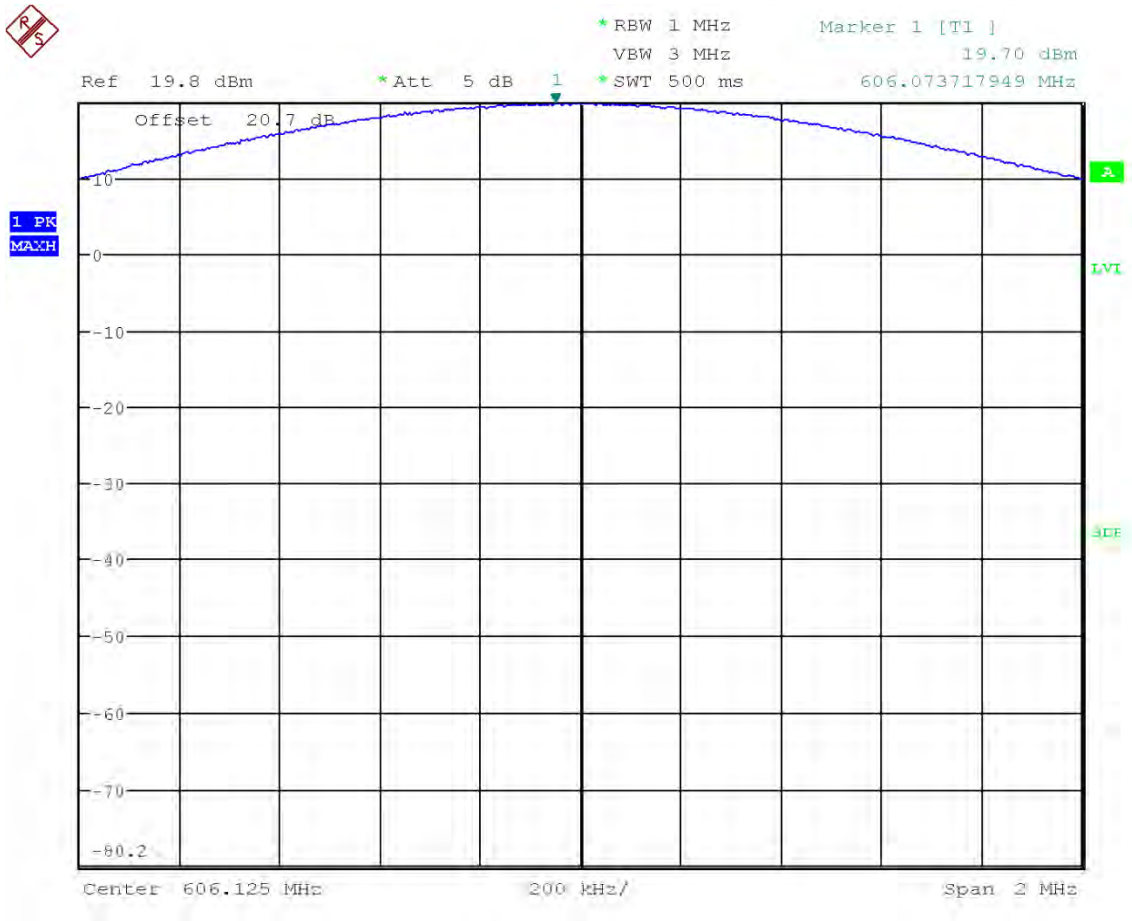
Test Information

EUT Name:	AD2 G55 #10
Serial Number:	TU162040050
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	High Frequency (635.875MHz) at 2mW in Normal Mode (Blue Trace) and High Density Mode (Black Trace) (Channel Bandwidth Options)
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 17:29:31 PM



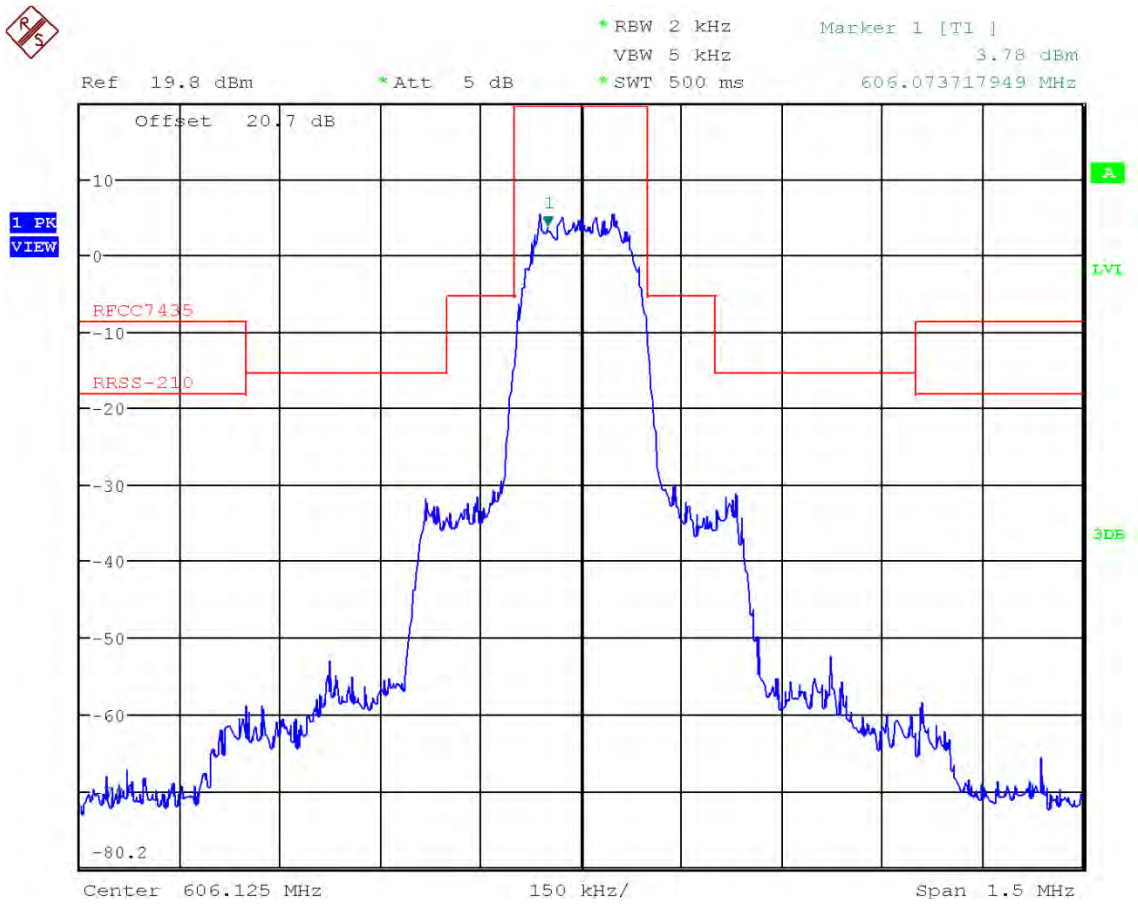
Test Information

EUT Name:	AD2 K53 #116
Serial Number:	TU162080143
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Output Power Reference Low Frequency (606.125MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 20, 2016 18:24:55 PM



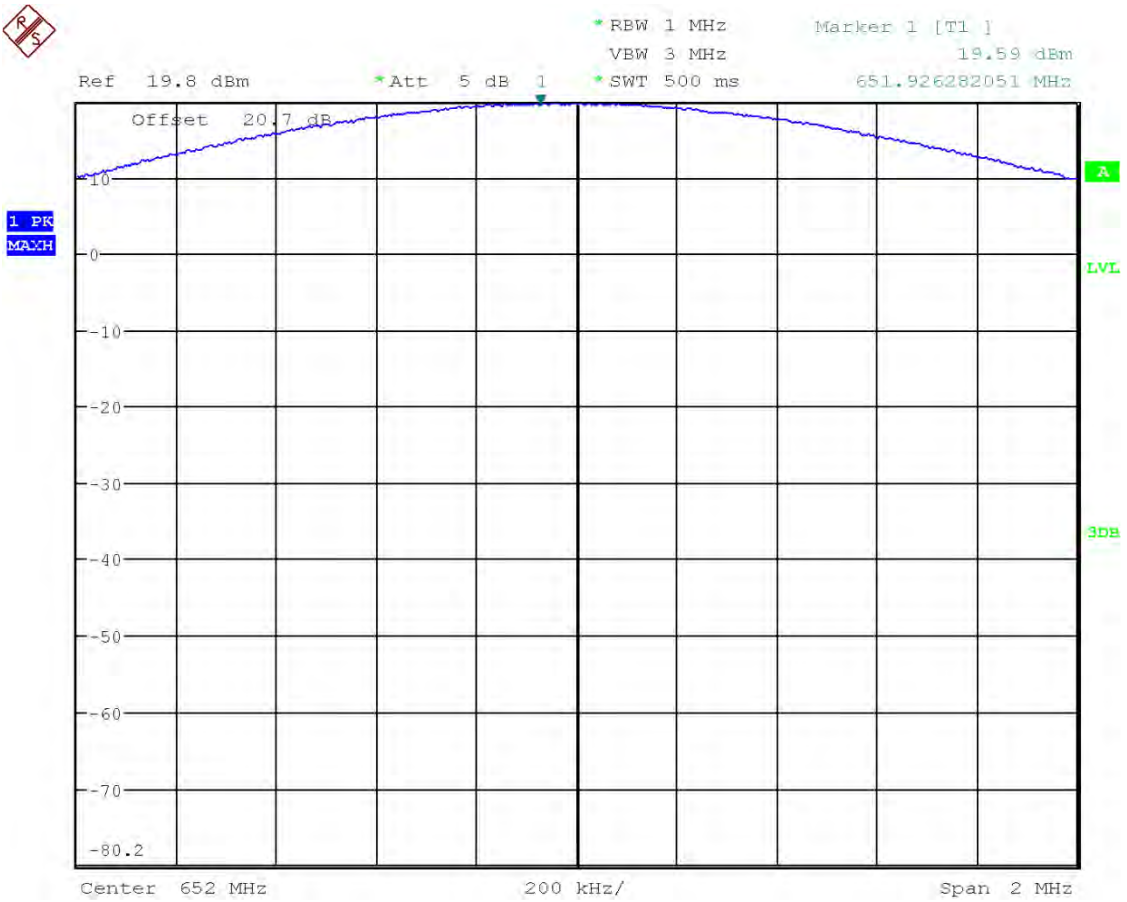
Test Information

EUT Name:	AD2 K53 #116
Serial Number:	TU162080143
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Low Frequency (606.125MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 20, 2016 18:34:53 PM



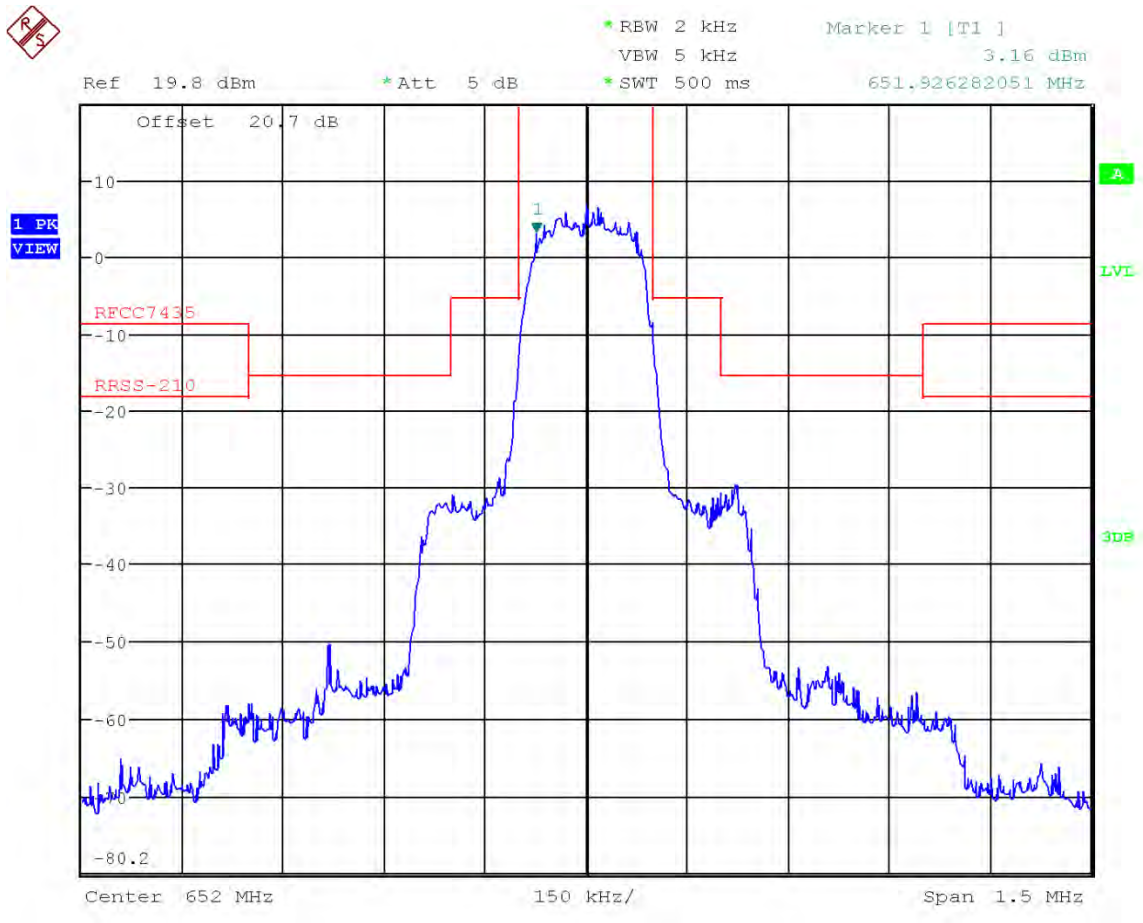
Test Information

EUT Name:	AD2 K53 #116
Serial Number:	TU162080143
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Output Power Reference Mid Frequency (652.000MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 20, 2016 18:17:03 PM



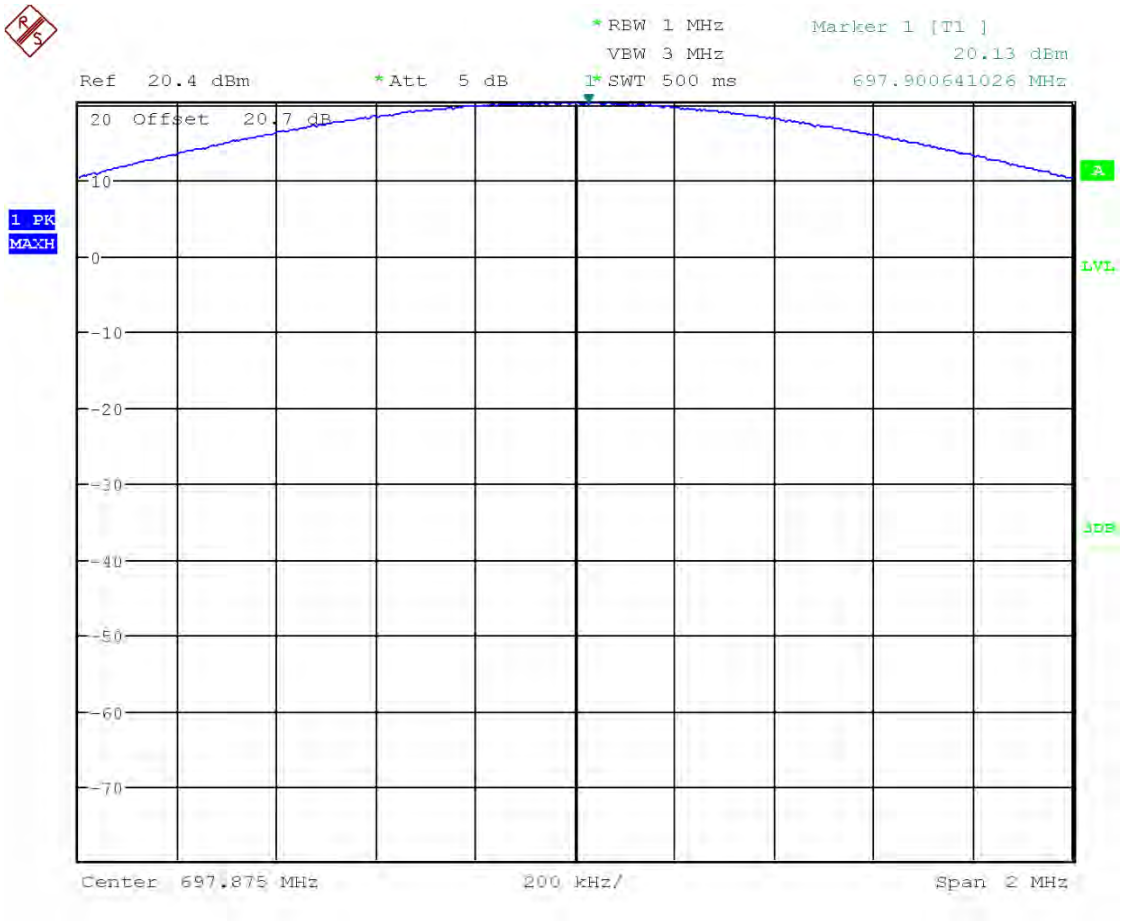
Test Information

EUT Name:	AD2 K53 #116
Serial Number:	TU162080143
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Mid Frequency (652.000MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 20, 2016 18:20:46 PM



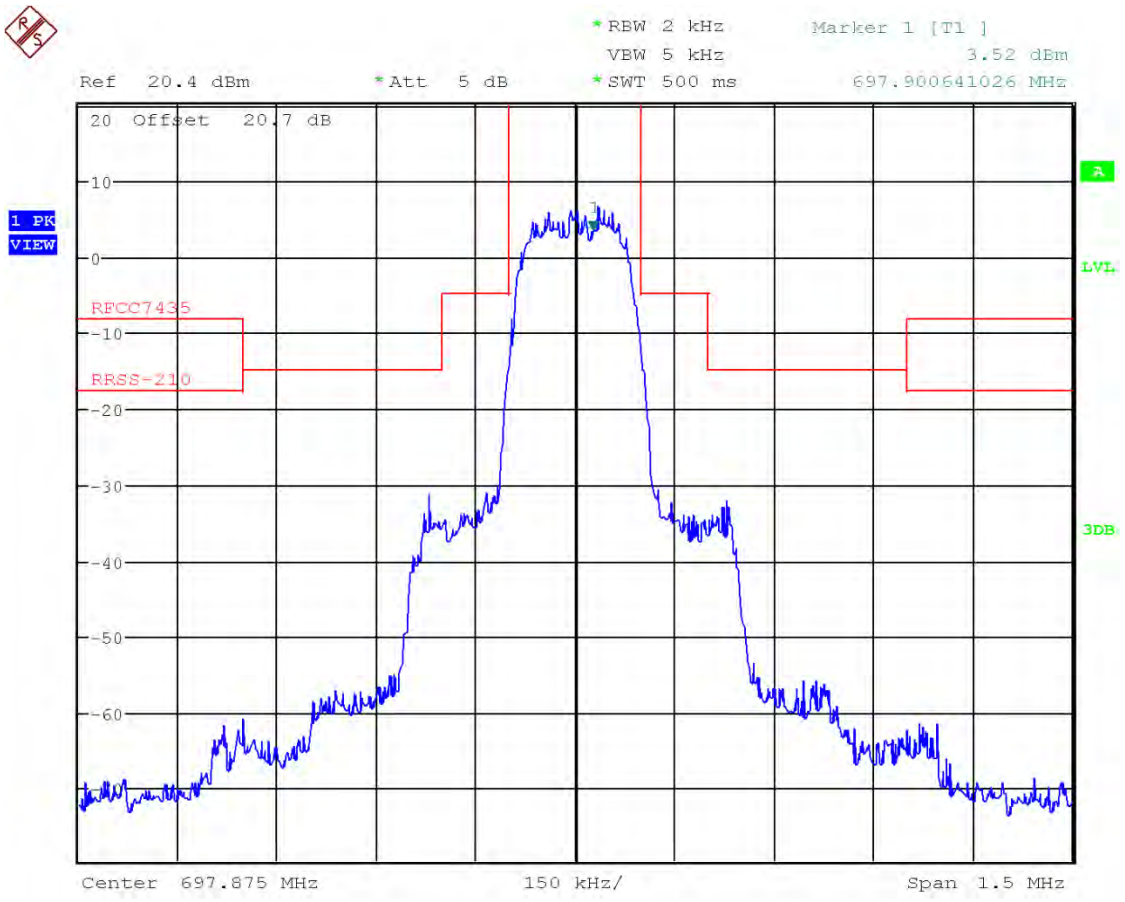
Test Information

EUT Name:	AD2 K53 #116
Serial Number:	TU162080143
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Output Power Reference High Frequency (697.875MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 20, 2016 17:26:03 PM



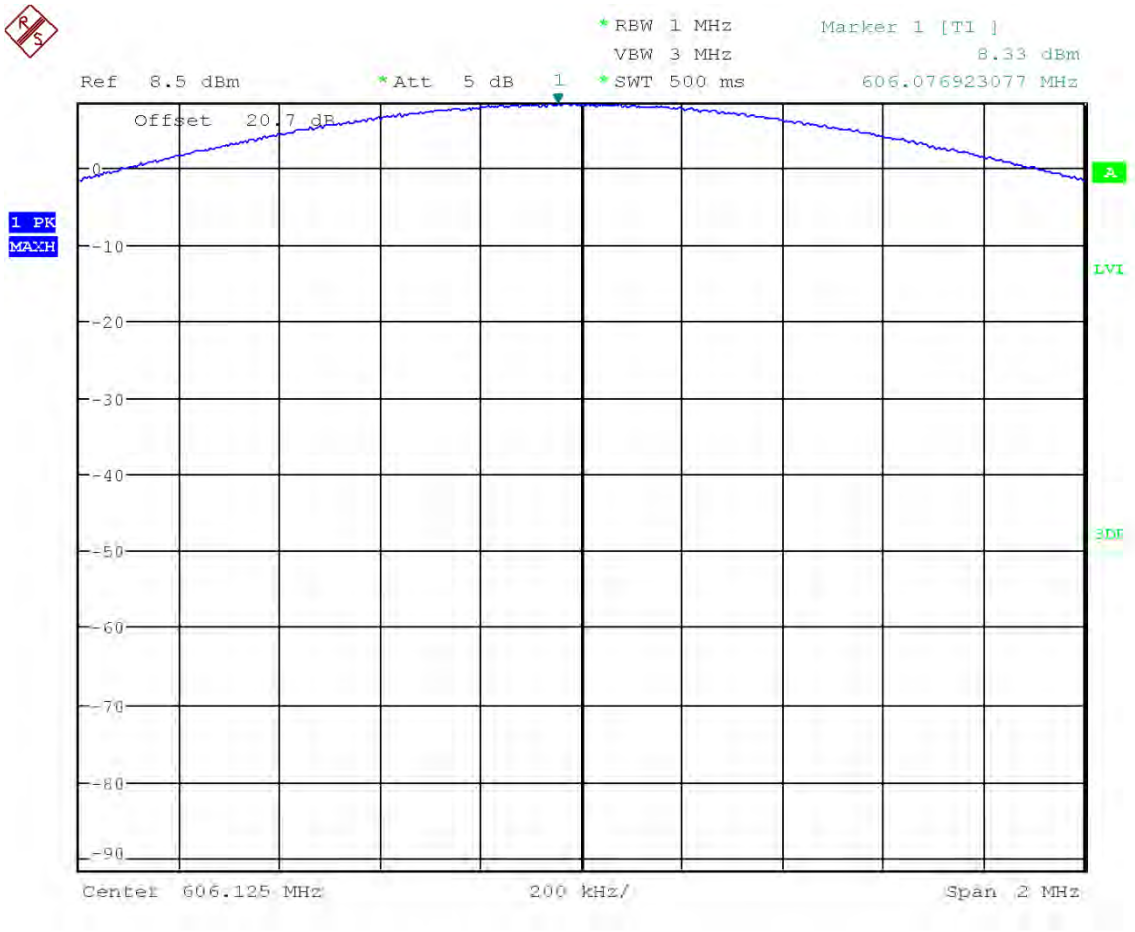
Test Information

EUT Name:	AD2 K53 #116
Serial Number:	TU162080143
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	High Frequency (697.875MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 20, 2016 18:13:38 PM



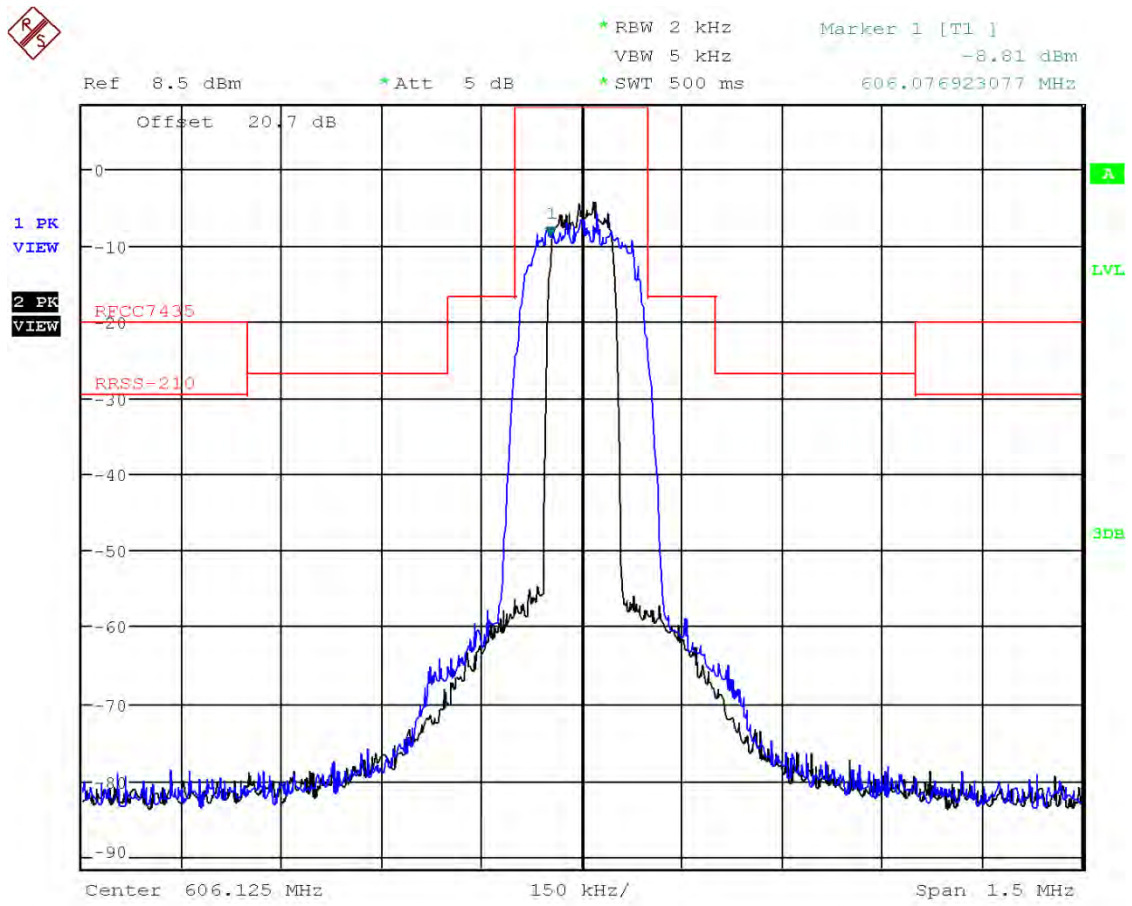
Test Information

EUT Name:	AD2 K53 #116
Serial Number:	TU162080143
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Output Power Reference Low Frequency (606.125MHz) at 2mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 10:47:28 AM



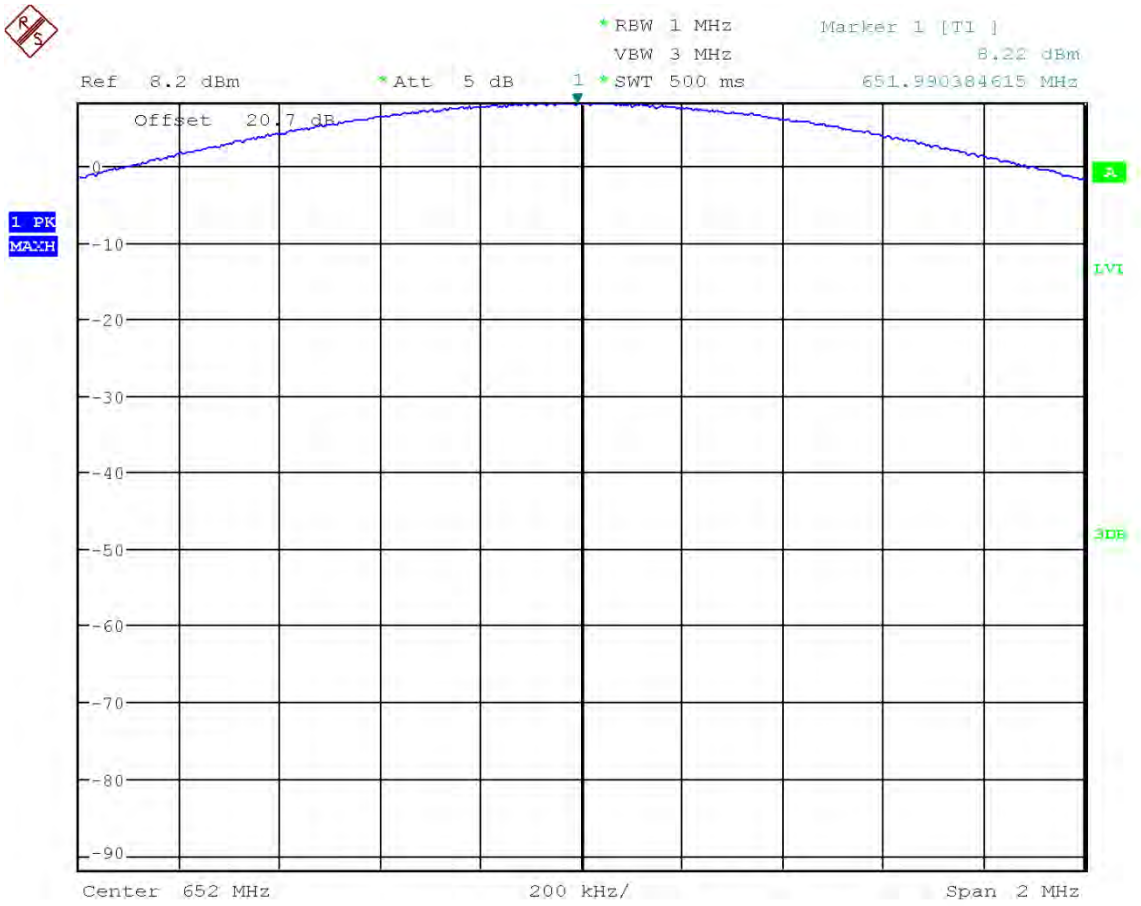
Test Information

EUT Name:	AD2 K53 #116
Serial Number:	TU162080143
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Low Frequency (606.125MHz) at 2mW in Normal Mode (Blue Trace) and High Density Mode (Black Trace) (Channel Bandwidth Options)
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 11:30:55 AM



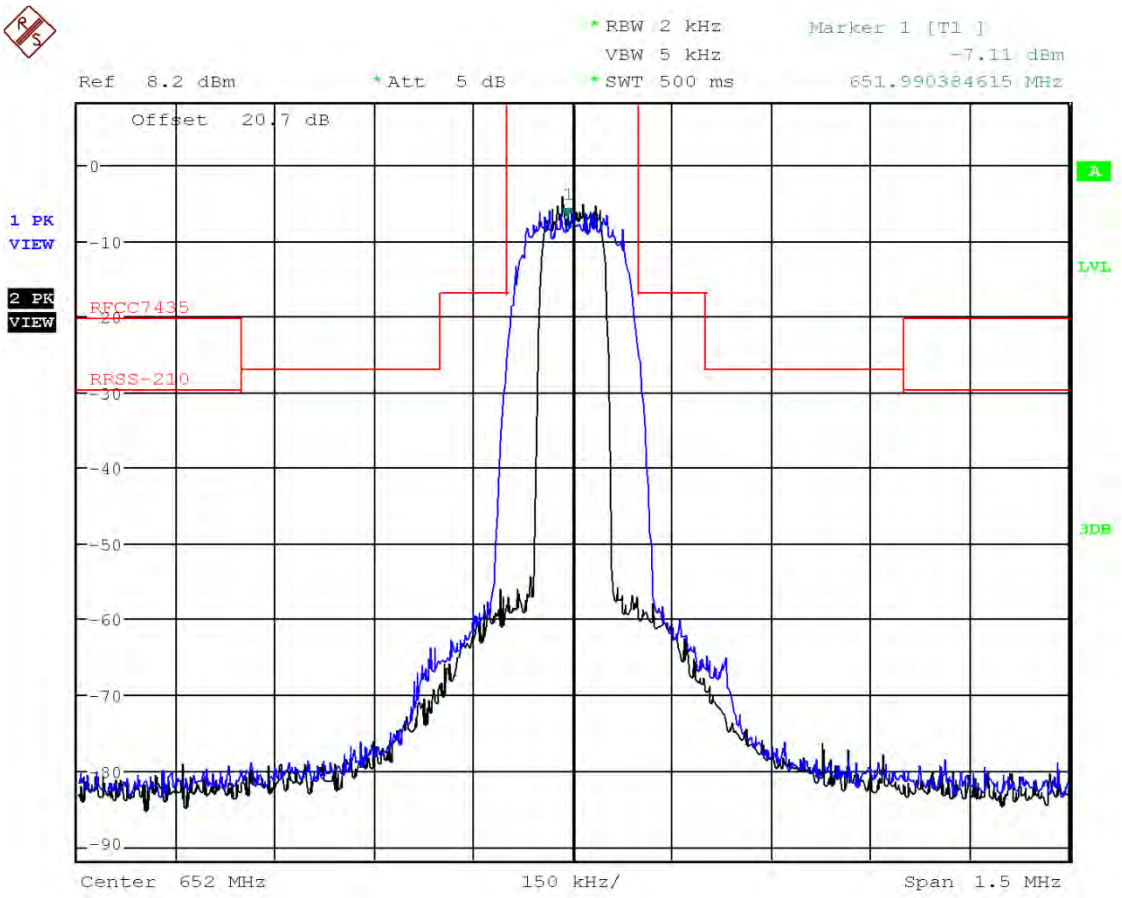
Test Information

EUT Name:	AD2 K53 #116
Serial Number:	TU162080143
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Output Power Reference Mid Frequency (652.000MHz) at 2mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 11:34:59 AM



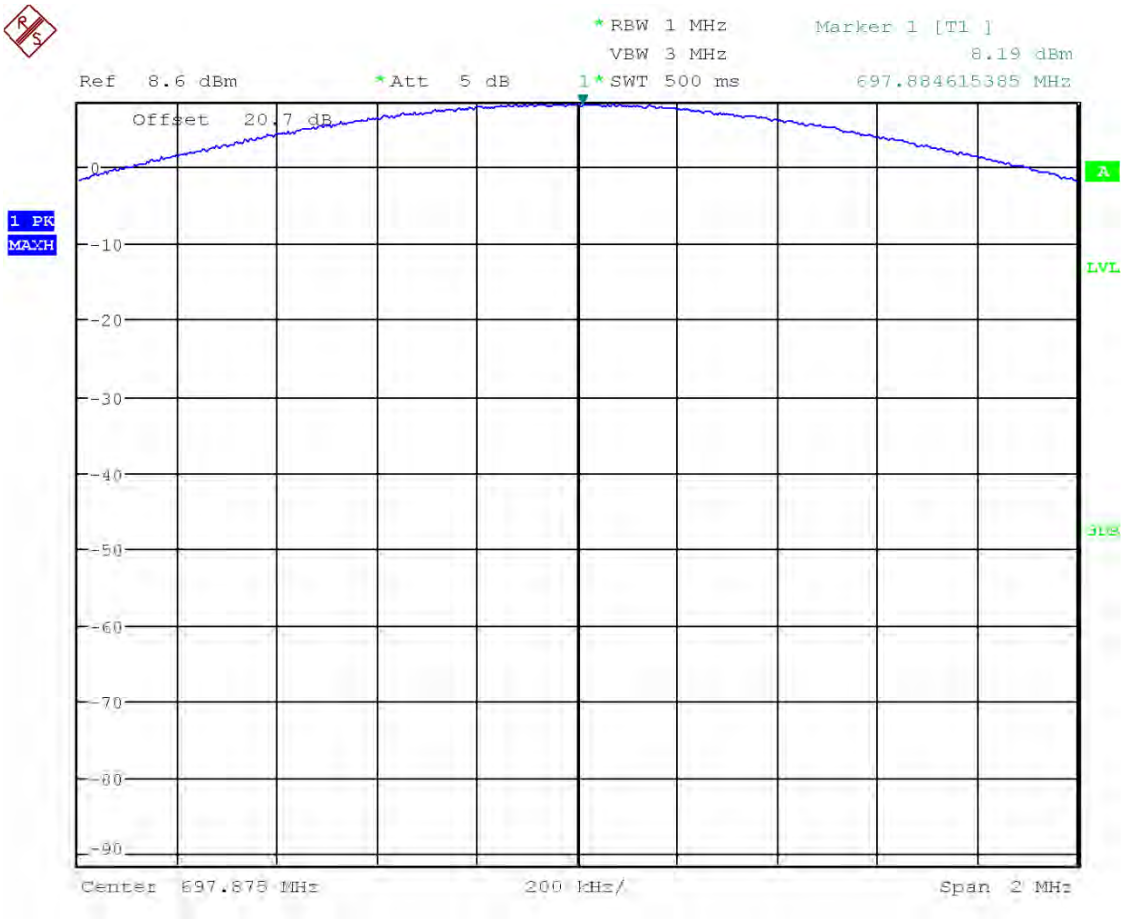
Test Information

EUT Name:	AD2 K53 #116
Serial Number:	TU162080143
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Mid Frequency (652.000MHz) at 2mW in Normal Mode (Blue Trace) and High Density Mode (Black Trace) (Channel Bandwidth Options)
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 11:39:16 AM



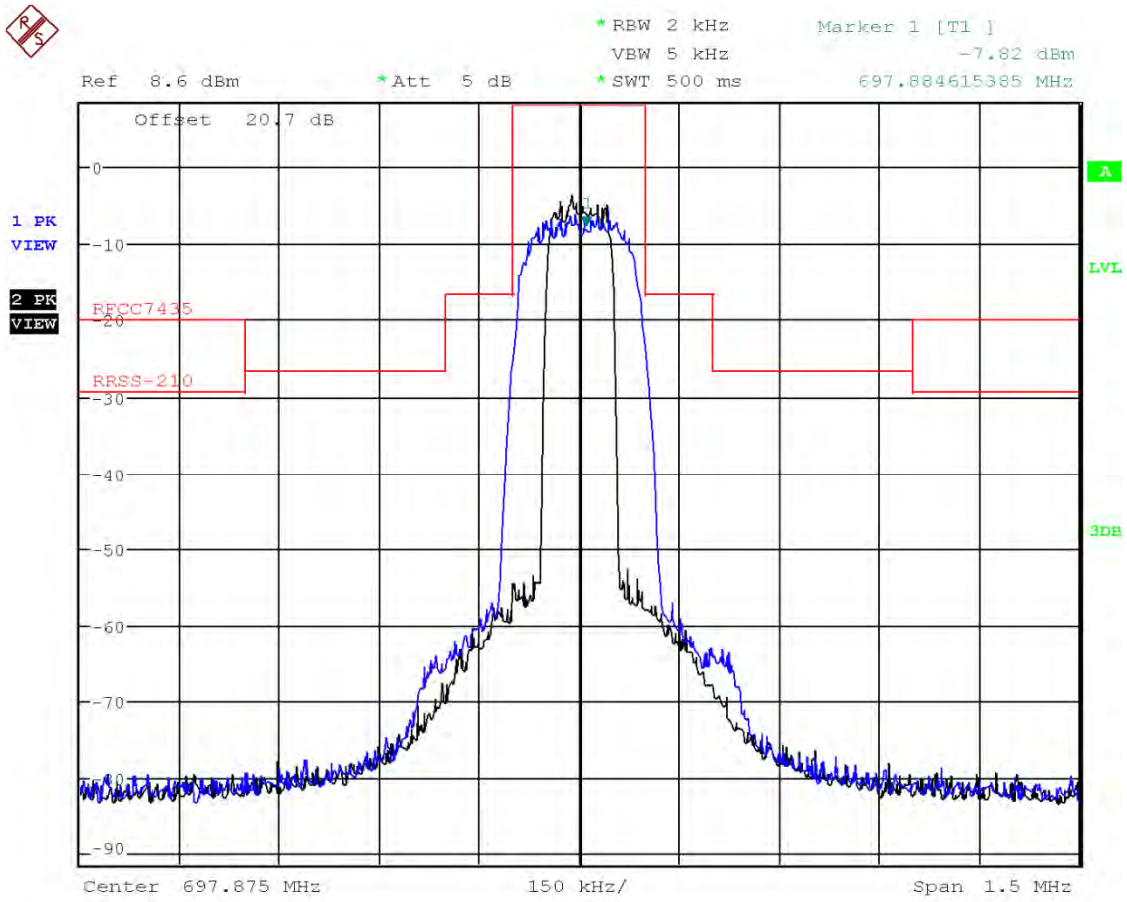
Test Information

EUT Name:	AD2 K53 #116
Serial Number:	TU162080143
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	Output Power Reference High Frequency (697.875MHz) at 2mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 11:45:09 AM



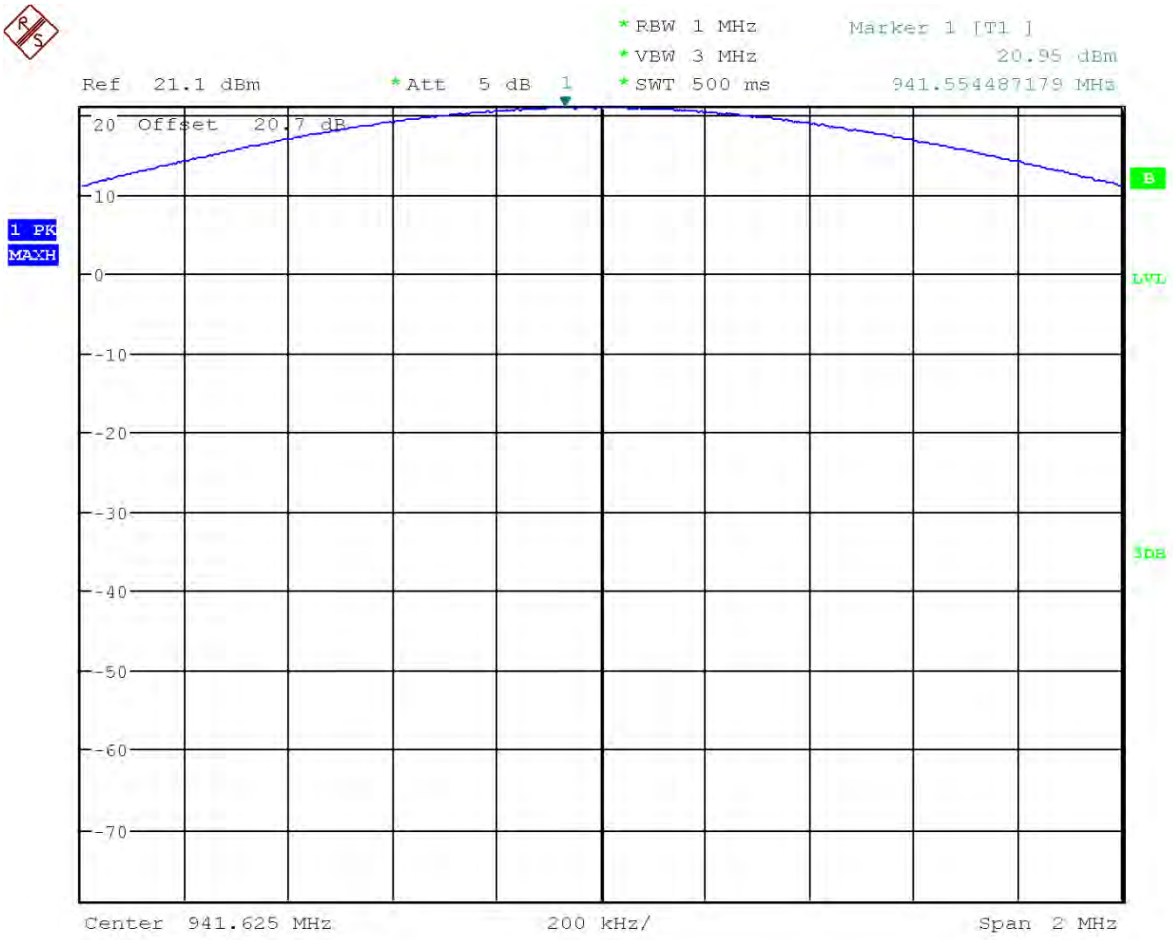
Test Information

EUT Name:	AD2 K53 #116
Serial Number:	TU162080143
Test Description:	FCC Part 74.861 and RSS-210 Occupied Bandwidth
Operating Conditions:	High Frequency (697.875MHz) at 2mW in Normal Mode (Blue Trace) and High Density Mode (Black Trace) (Channel Bandwidth Options)
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	October 21, 2016 11:49:02 PM



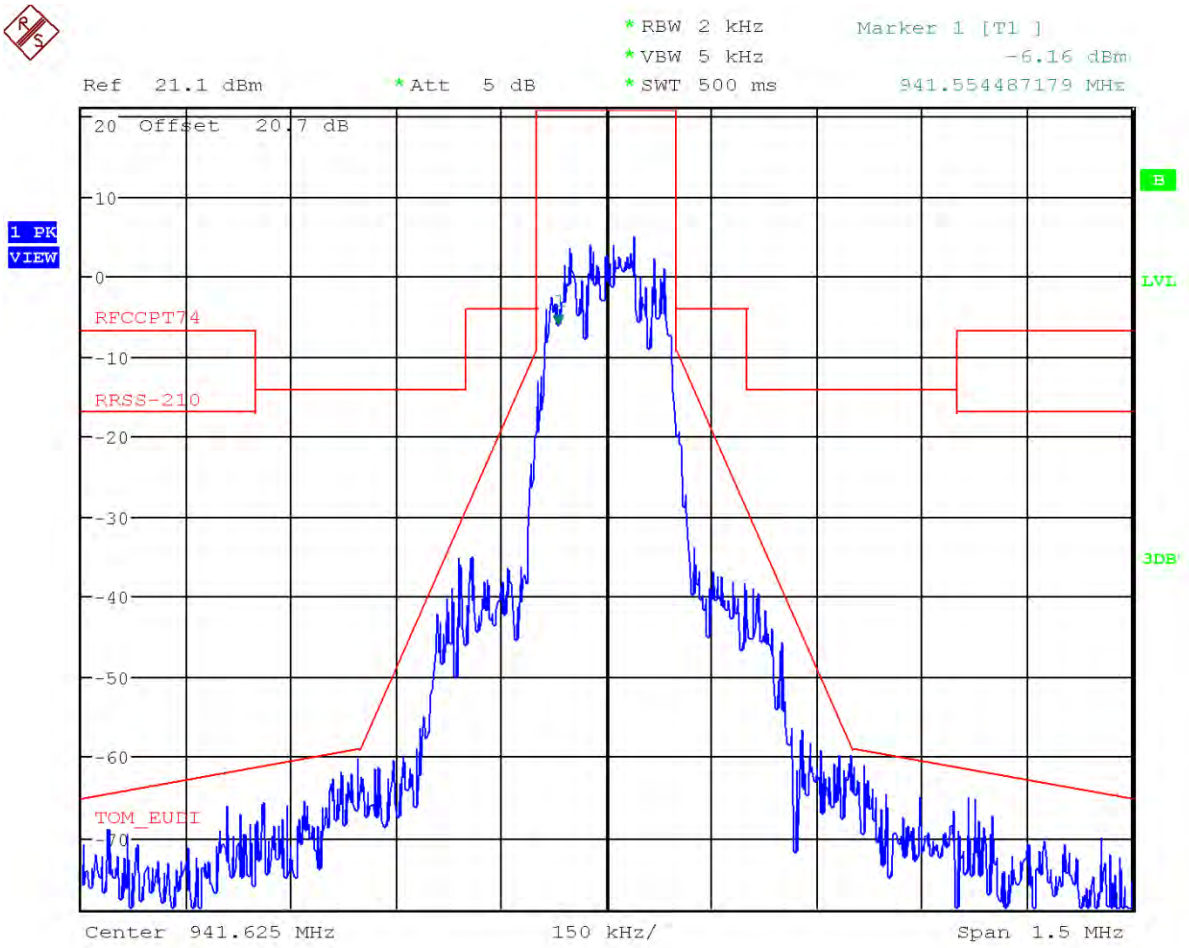
Test Information

EUT Name:	AD2 X55 #201
Serial Number:	TU162090245
Test Description:	FCC Part 74.861 Occupied Bandwidth EN300 422 Necessary Bandwidth Output Power Reference
Operating Conditions:	Low Frequency (941.625MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 7, 2017 17:47:47 PM



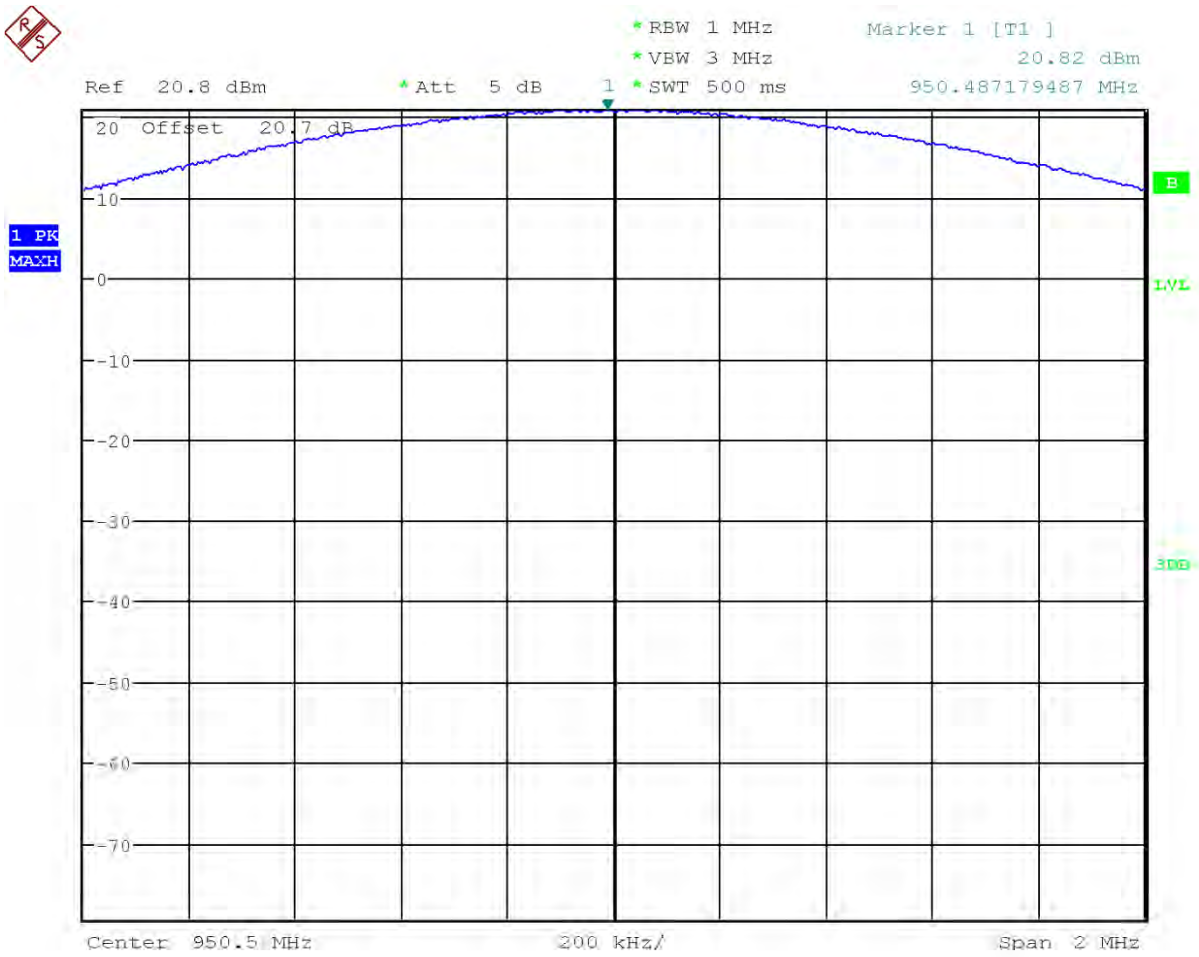
Test Information

EUT Name:	AD2 X55 #201
Serial Number:	TU162090245
Test Description:	FCC Part 74.861 Occupied Bandwidth EN300 422 Necessary Bandwidth
Operating Conditions:	Low Frequency (941.625MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 7, 2017 18:05:31 PM



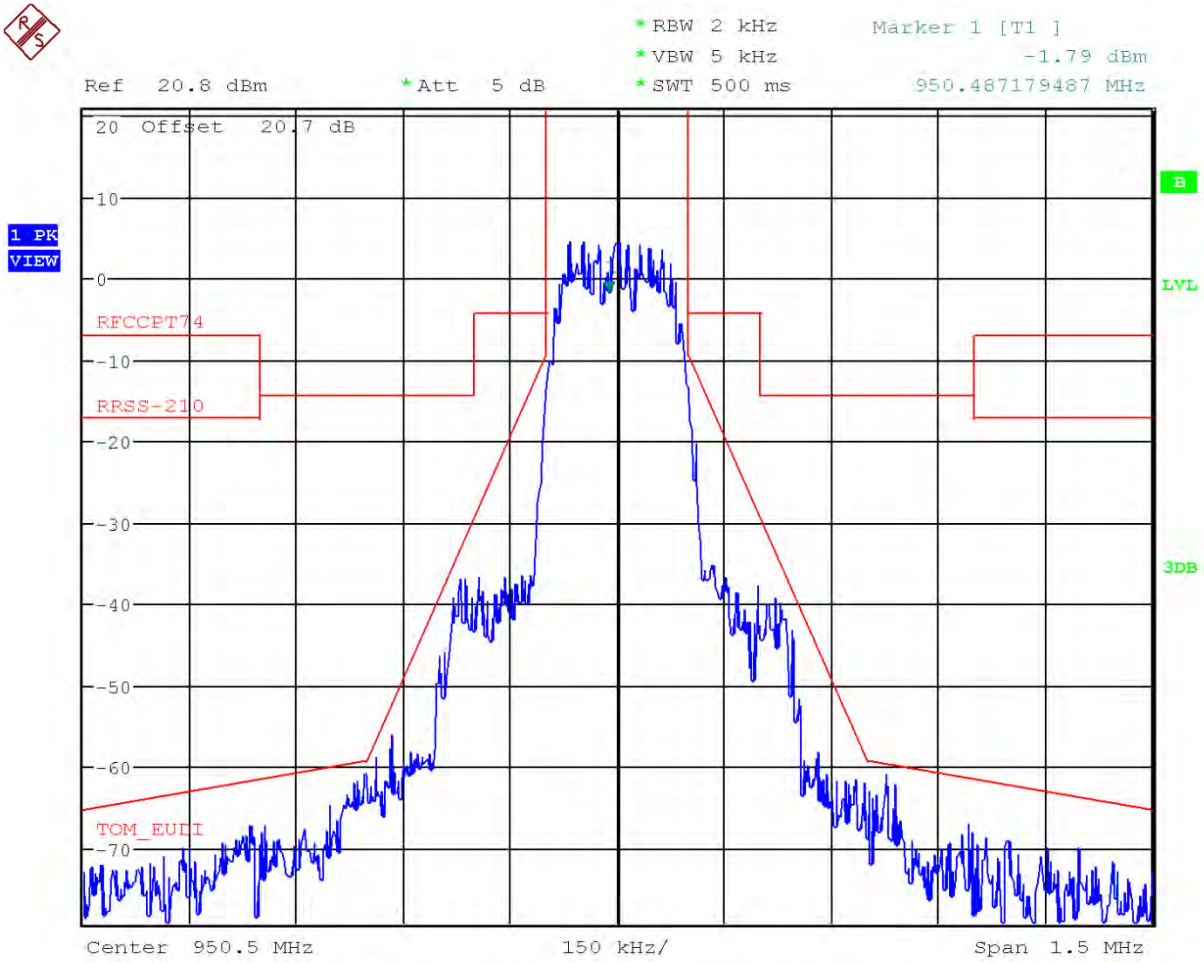
Test Information

EUT Name:	AD2 X55 #201
Serial Number:	TU162090245
Test Description:	FCC Part 74.861 Occupied Bandwidth EN300 422 Necessary Bandwidth Output Power Reference
Operating Conditions:	Mid Frequency (950.500MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 9, 2017 17:28:32 PM



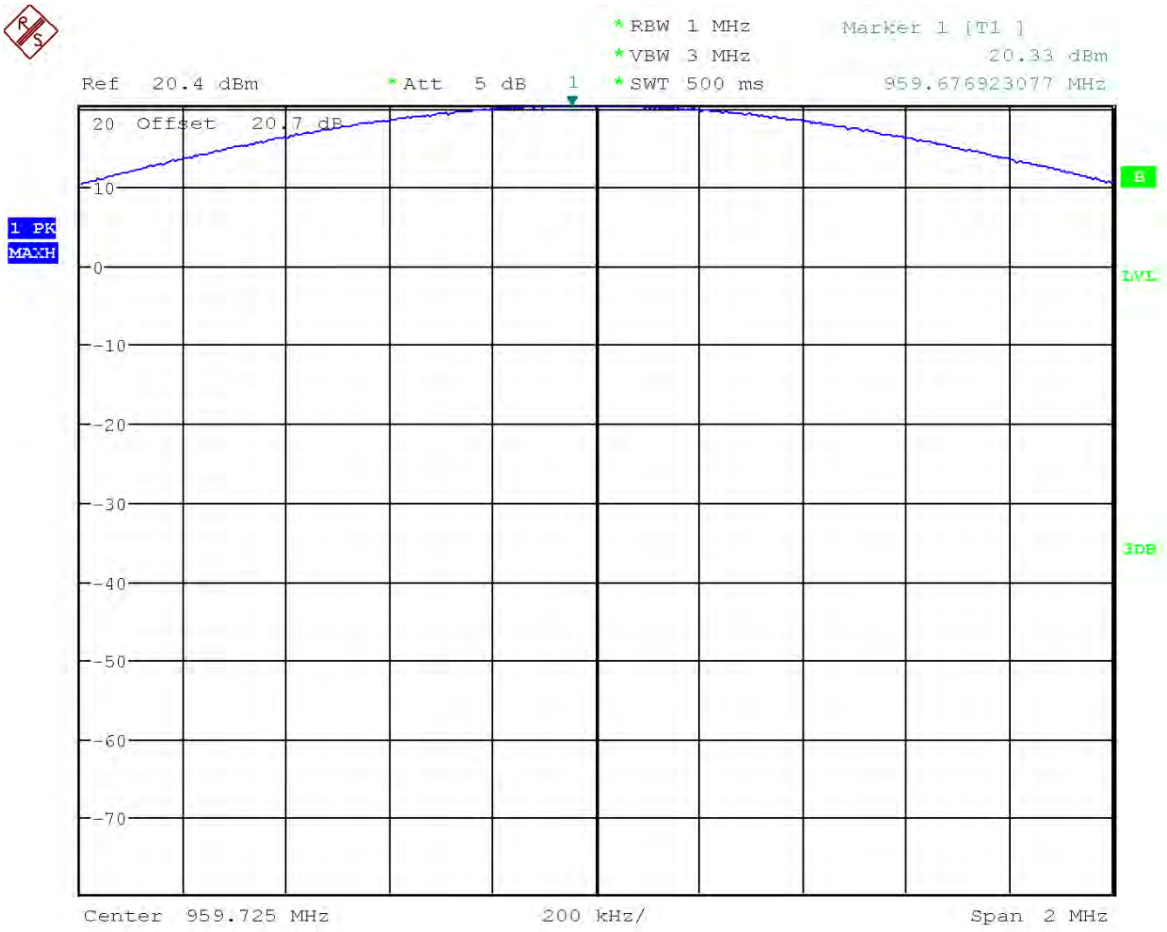
Test Information

EUT Name:	AD2 X55 #201
Serial Number:	TU162090245
Test Description:	FCC Part 74.861 Occupied Bandwidth EN300 422 Necessary Bandwidth
Operating Conditions:	Mid Frequency (950.500MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 9, 2017 17:39:10 PM



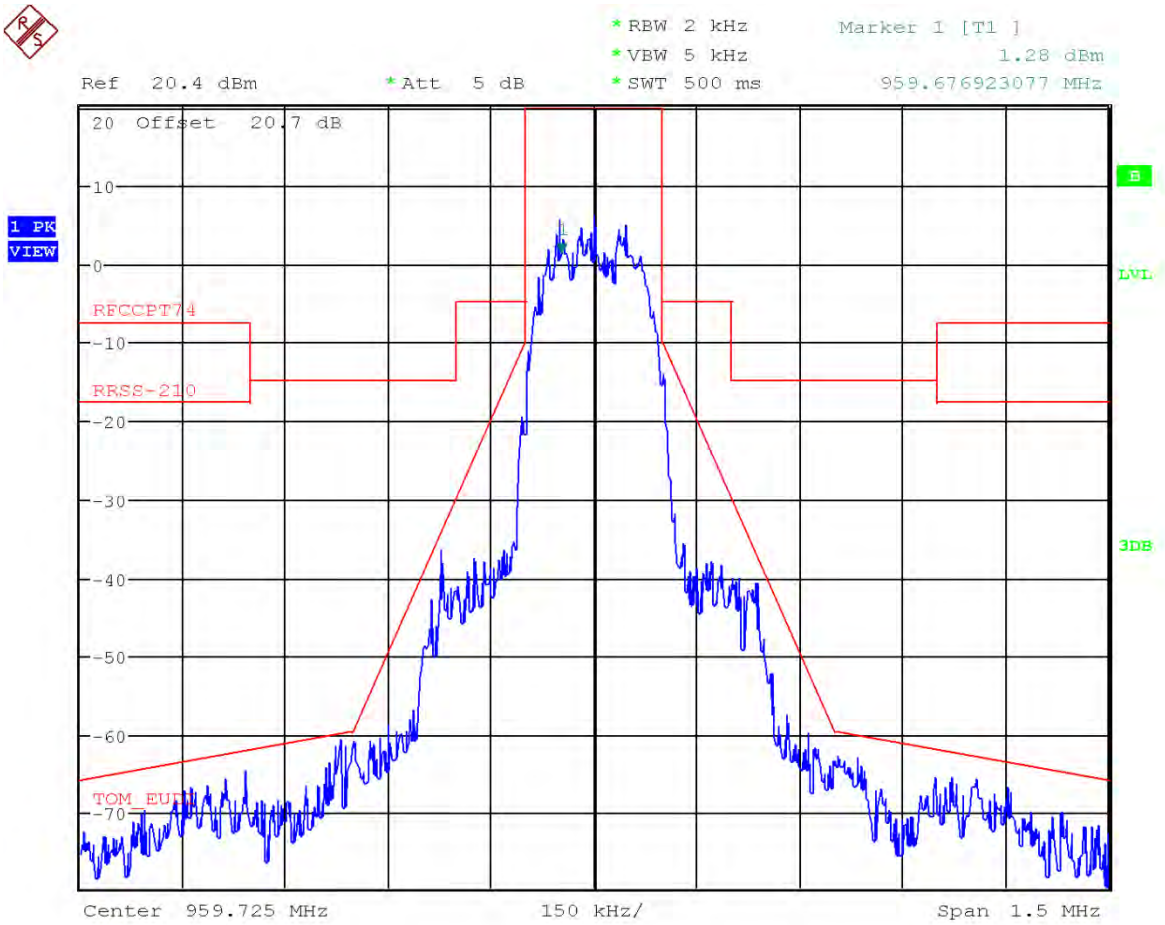
Test Information

EUT Name:	AD2 X55 #201
Serial Number:	TU162090245
Test Description:	FCC Part 74.861 Occupied Bandwidth EN300 422 Necessary Bandwidth Output Power Reference
Operating Conditions:	High Frequency (959.725MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 7, 2017 18:33:26 PM



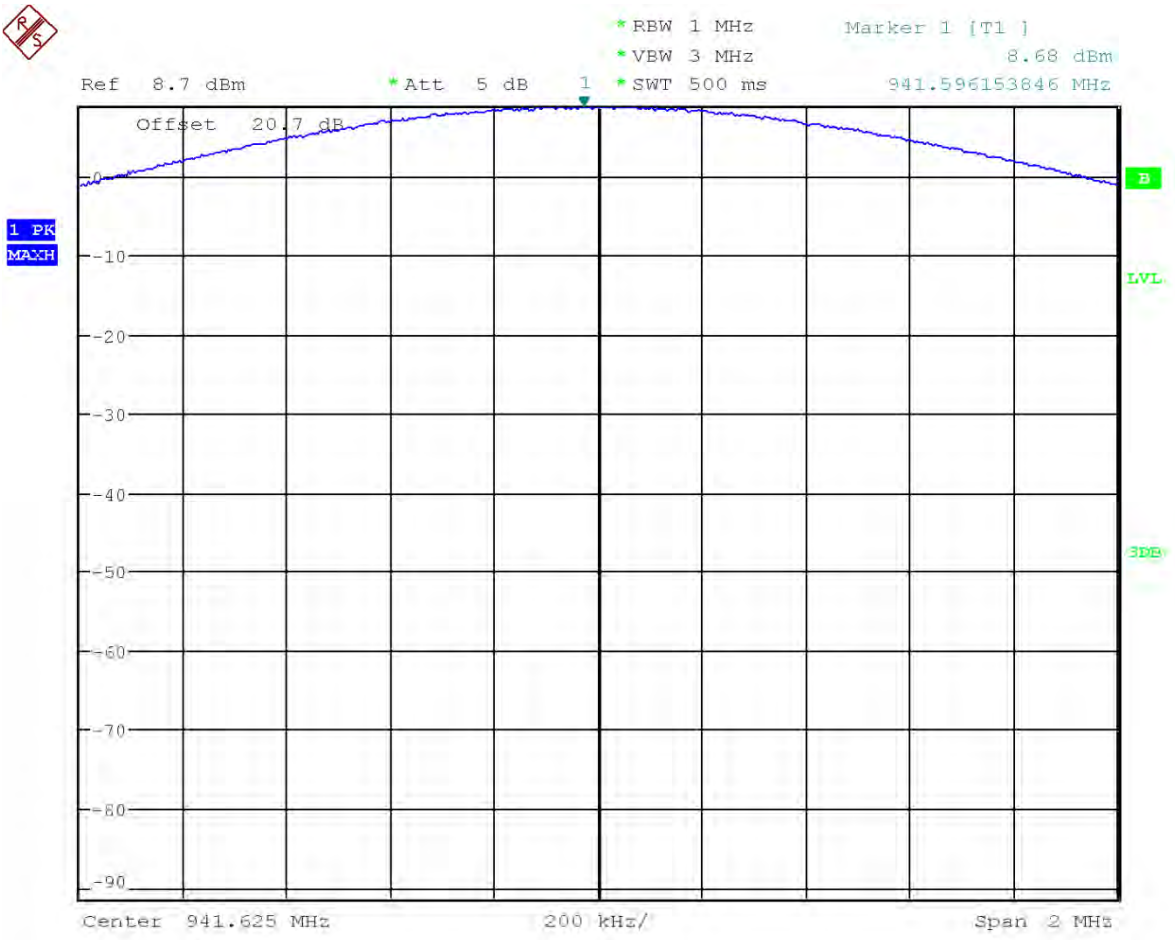
Test Information

EUT Name:	AD2 X55 #201
Serial Number:	TU162090245
Test Description:	FCC Part 74.861 Occupied Bandwidth EN300 422 Necessary Bandwidth
Operating Conditions:	High Frequency (959.725MHz) at 35mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 7, 2017 18:39:45 PM



Test Information

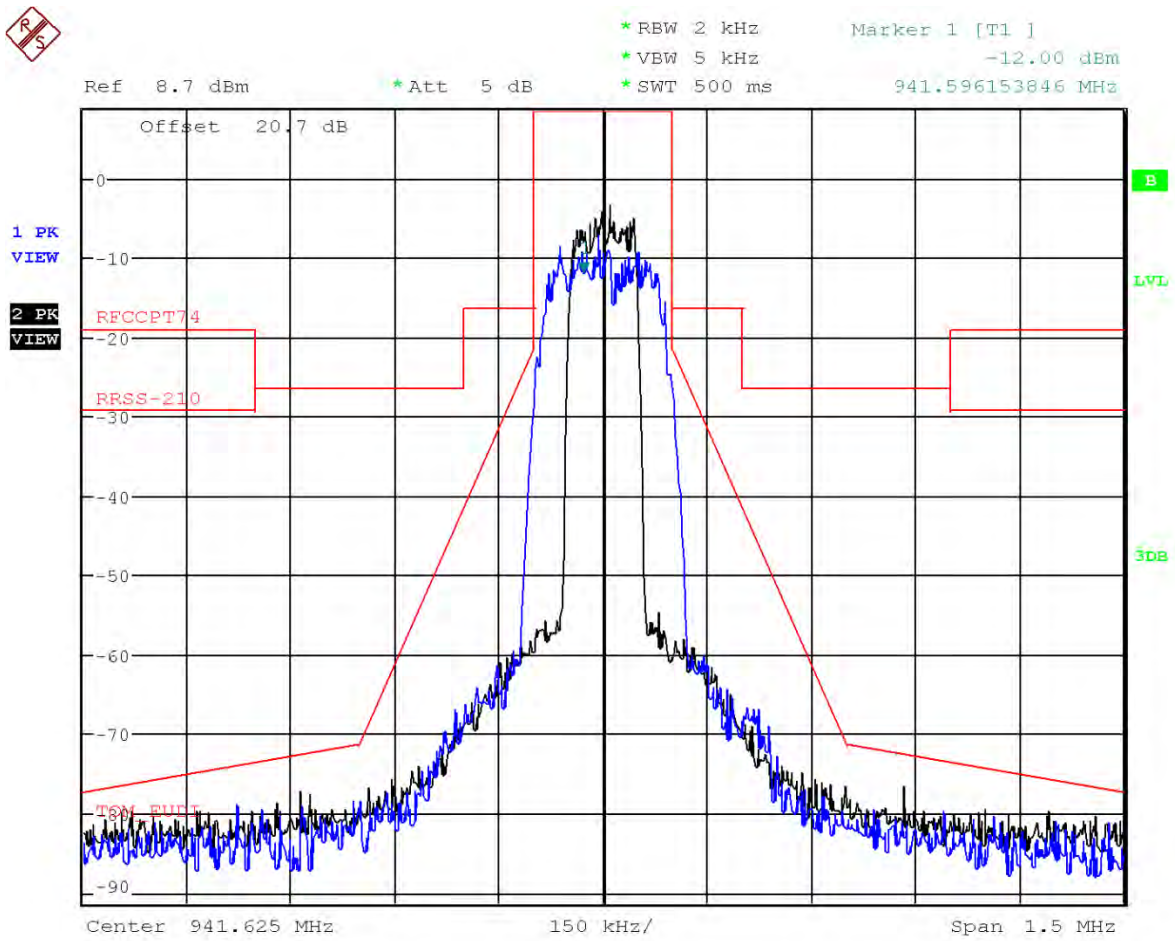
EUT Name:	AD2 X55 #201
Serial Number:	TU162090245
Test Description:	FCC Part 74.861 Occupied Bandwidth EN300 422 Necessary Bandwidth Output Power Reference
Operating Conditions:	Low Frequency (941.625MHz) at 2mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 7, 2017 18:21:04 PM



Appendix D

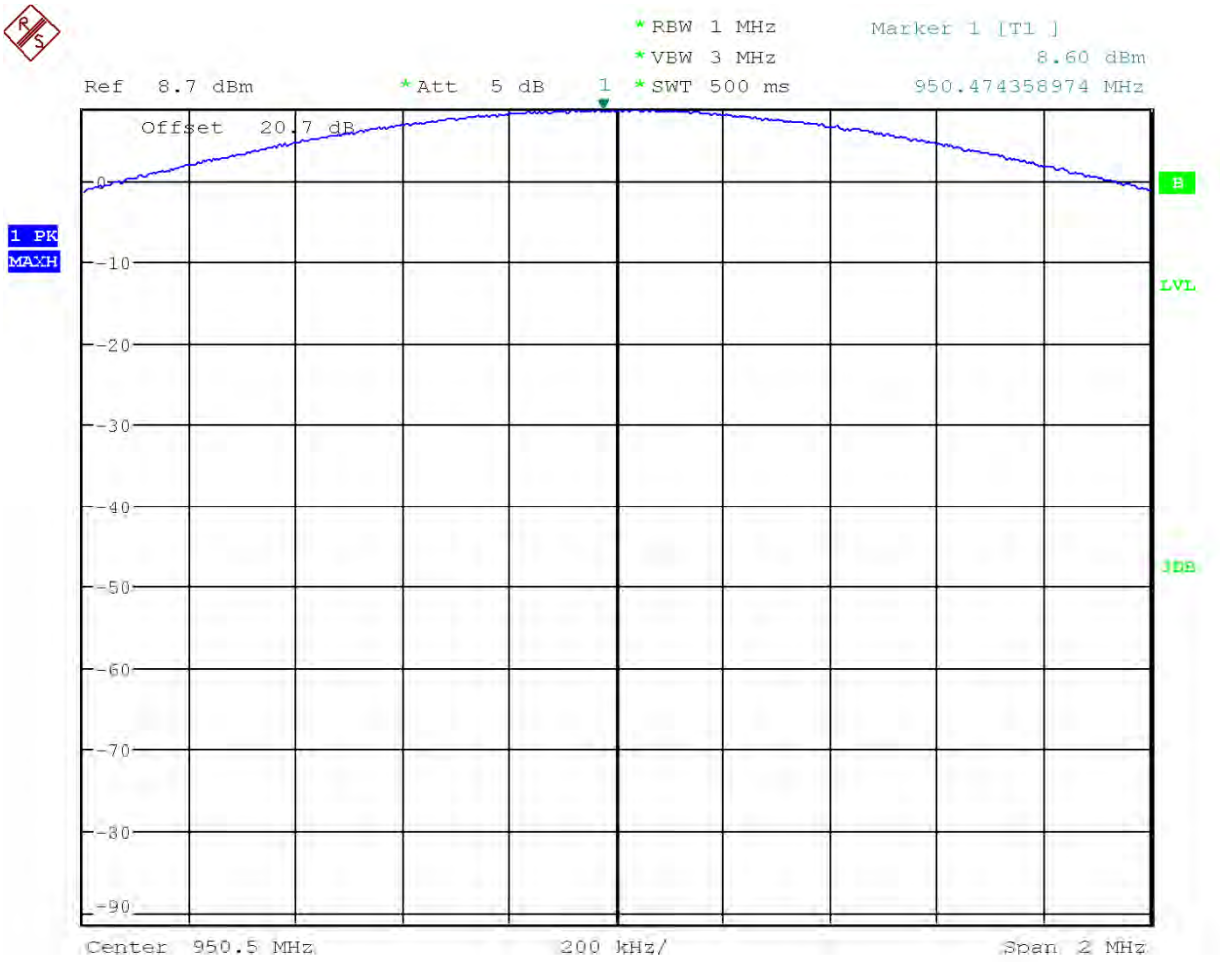
Test Information

EUT Name:	AD2 X55 #201
Serial Number:	TU162090245
Test Description:	FCC Part 74.861 Occupied Bandwidth EN300 422 Necessary Bandwidth
Operating Conditions:	Low Frequency (941.625MHz) at 2mW in Normal Mode (Blue Trace) and High Density Mode (Black Trace) (Channel Bandwidth Options)
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 7, 2017 18:26:32 PM



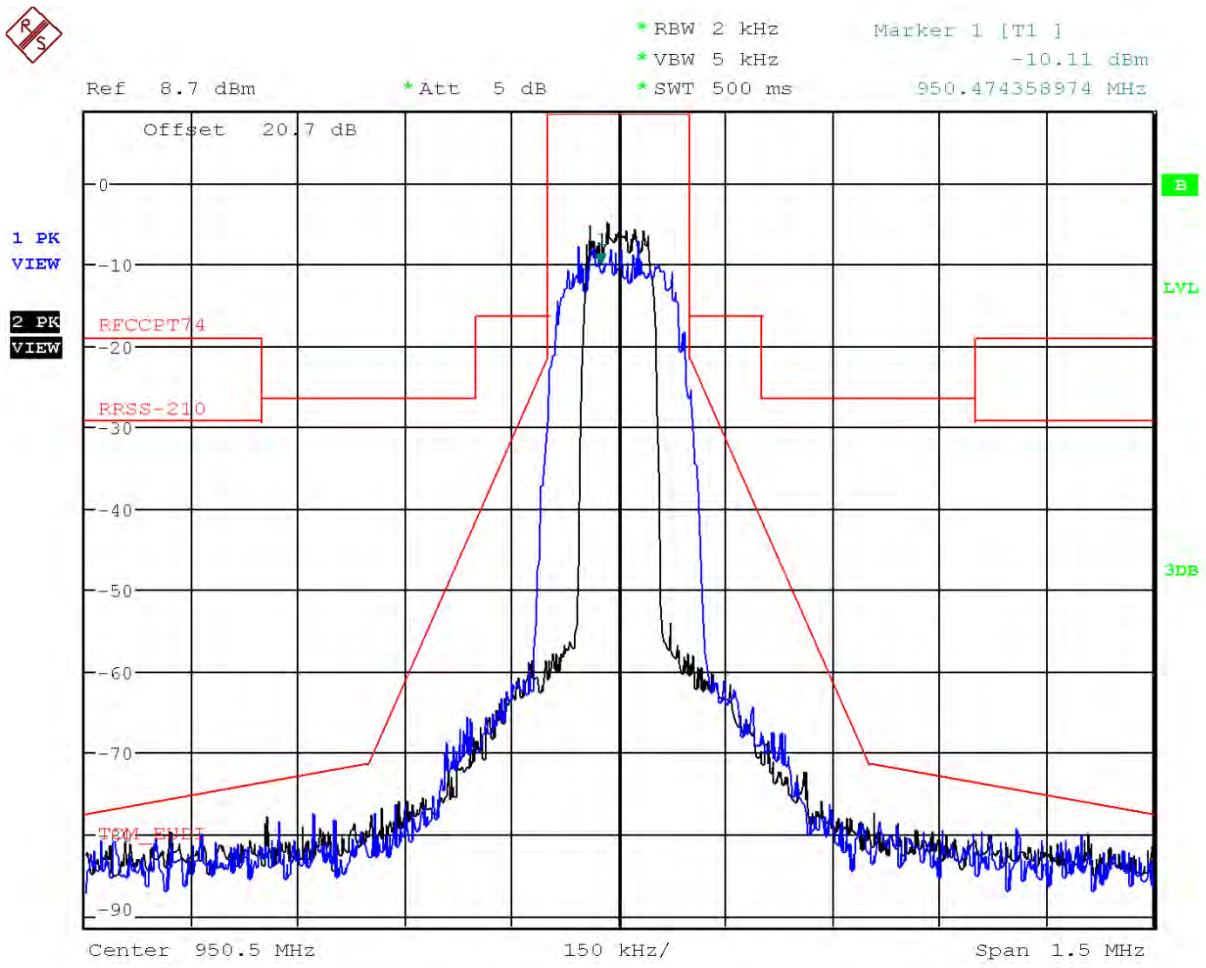
Test Information

EUT Name:	AD2 X55 #201
Serial Number:	TU162090245
Test Description:	FCC Part 74.861 Occupied Bandwidth EN300 422 Necessary Bandwidth Output Power Reference
Operating Conditions:	Mid Frequency (950.500MHz) at 2mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 9, 2017 17:41:52 PM



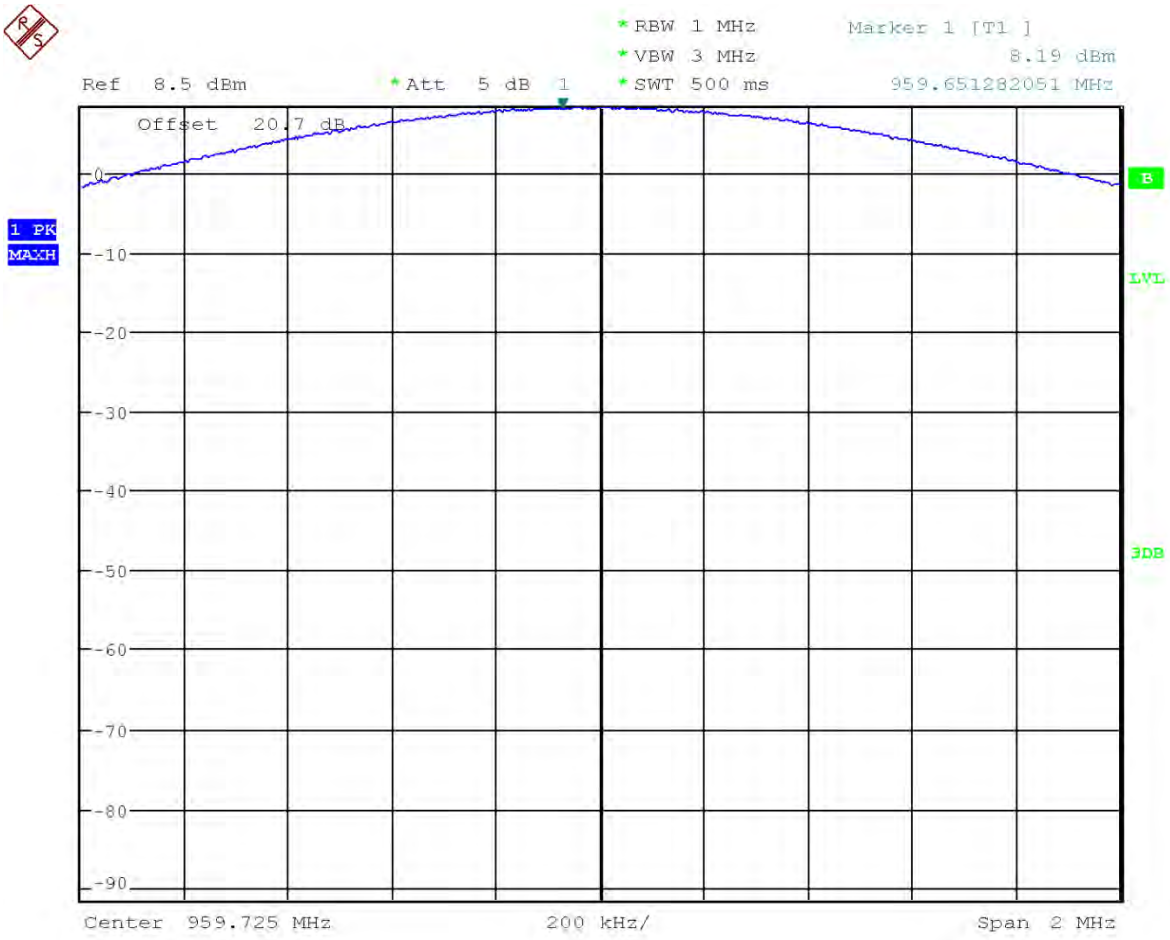
Test Information

EUT Name:	AD2 X55 #201
Serial Number:	TU162090245
Test Description:	FCC Part 74.861 Occupied Bandwidth EN300 422 Necessary Bandwidth
Operating Conditions:	Mid Frequency (950.500MHz) at 2mW in Normal Mode (Blue Trace) and High Density Mode (Black Trace) (Channel Bandwidth Options)
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 9, 2017 17:45:04 PM



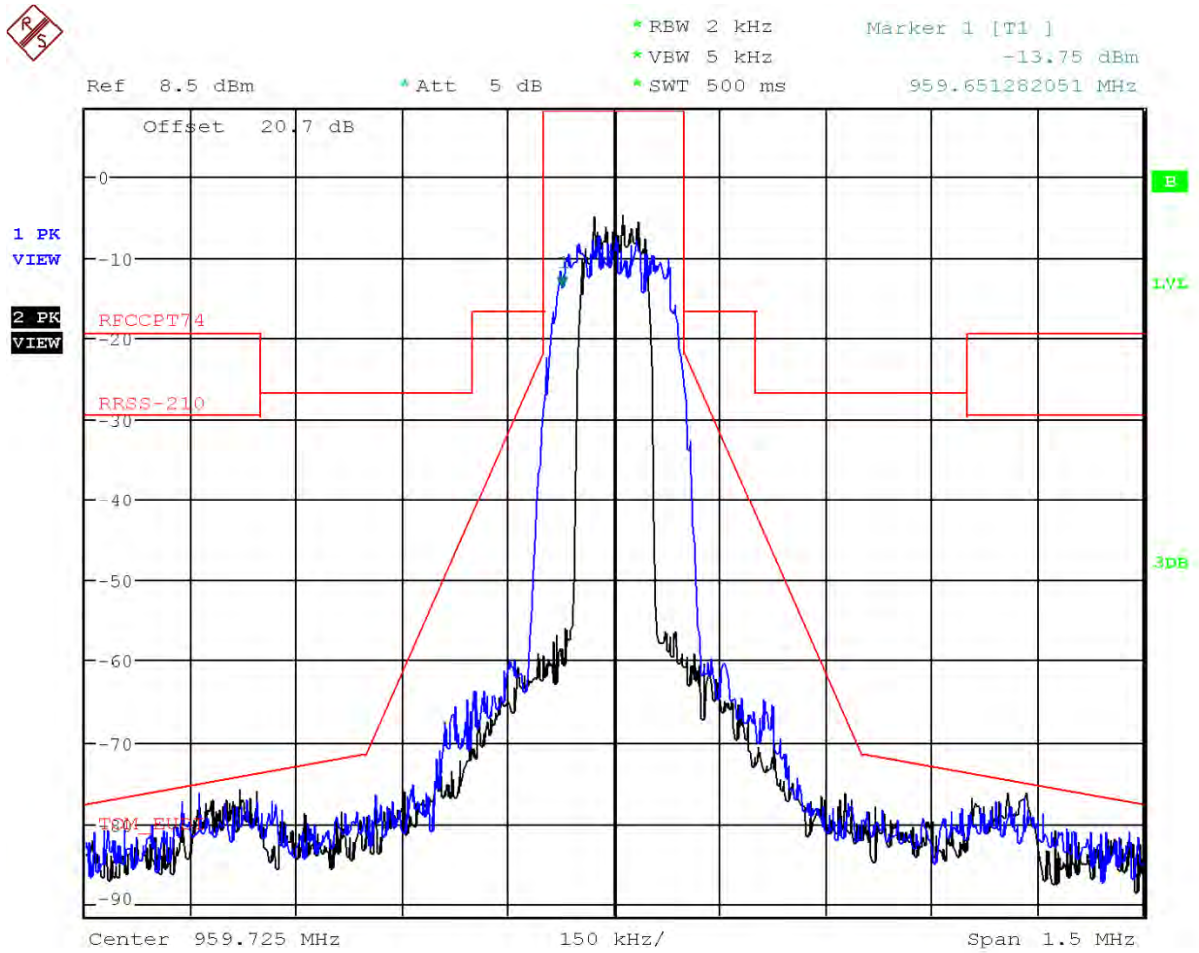
Test Information

EUT Name:	AD2 X55 #201
Serial Number:	TU162090245
Test Description:	FCC Part 74.861 Occupied Bandwidth EN300 422 Necessary Bandwidth Output Power Reference
Operating Conditions:	High Frequency (959.725MHz) at 2mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 7, 2017 18:46:50 PM



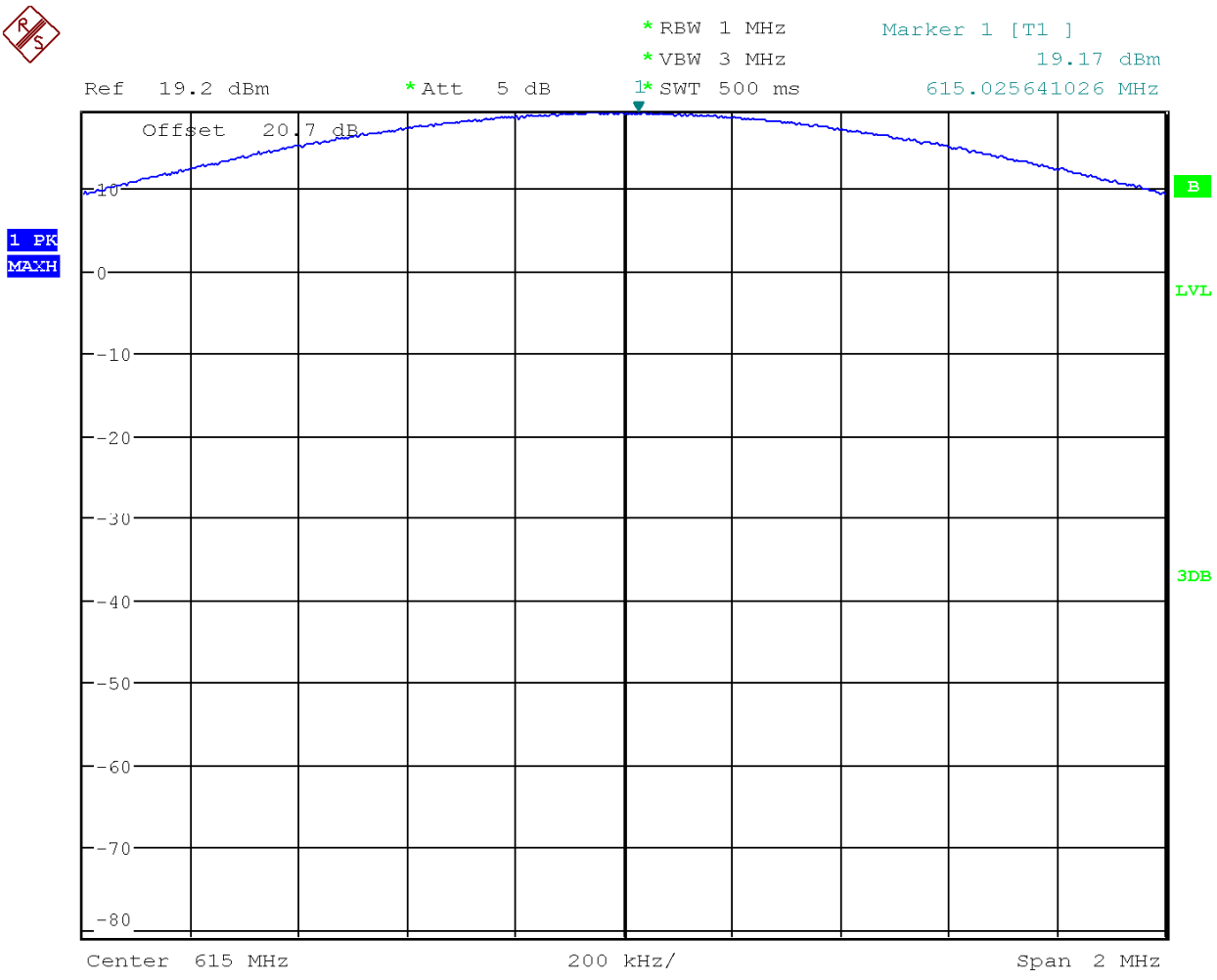
Test Information

EUT Name:	AD2 X55 #201
Serial Number:	TU162090245
Test Description:	FCC Part 74.861 Occupied Bandwidth EN300 422 Necessary Bandwidth
Operating Conditions:	High Frequency (959.725MHz) at 2mW in Normal Mode (Blue Trace) and High Density Mode (Black Trace) (Channel Bandwidth Options)
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	February 7, 2017 18:51:30 PM



Test Information

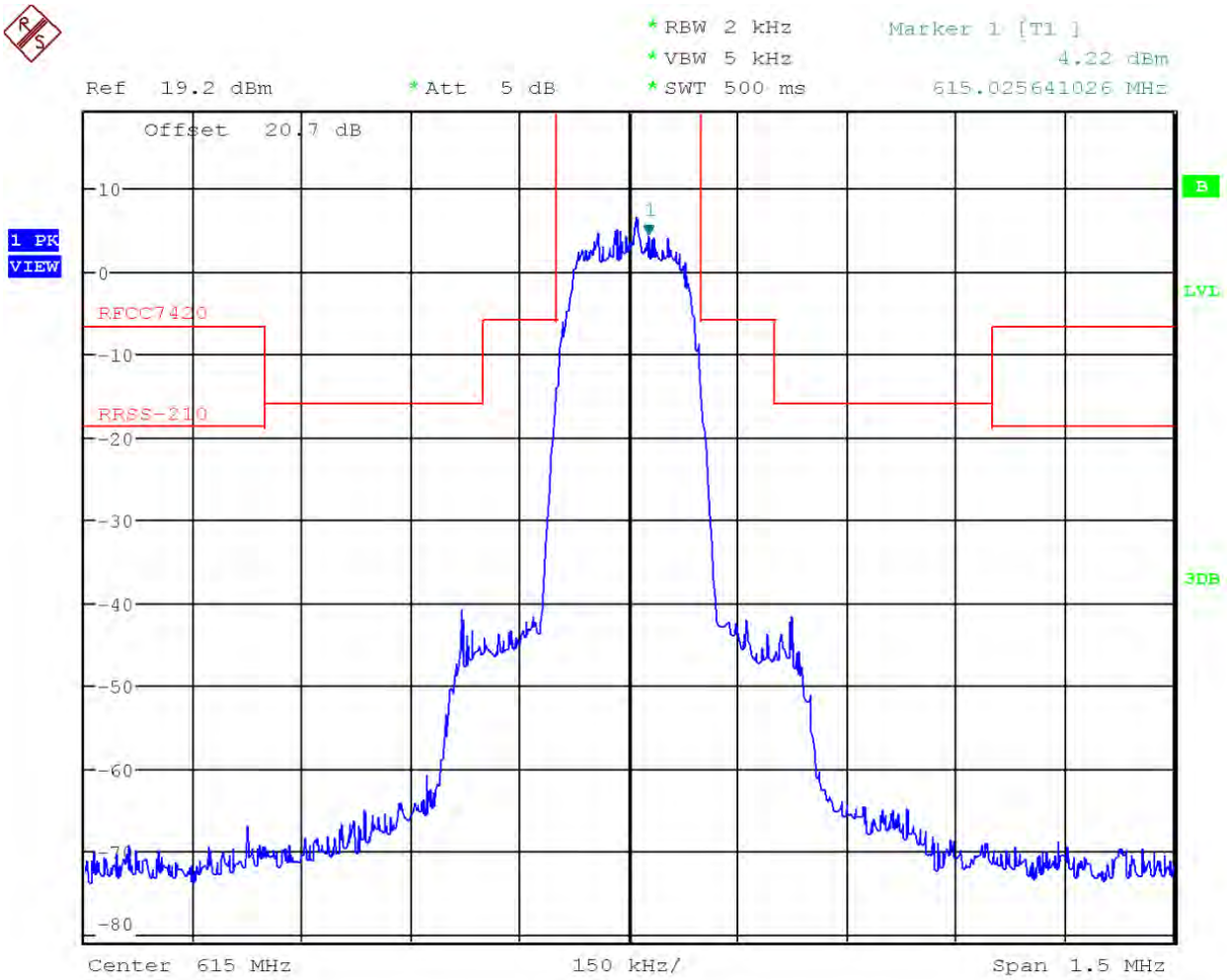
EUT Name:	AD2 G57 #43
Serial Number:	TU163360199
Test Description:	FCC Part 74.861 Occupied Bandwidth
Operating Conditions:	Output Power Reference 615MHz (Mid Frequency) at 20mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	March 9, 2017 17:27:09 PM



Appendix D

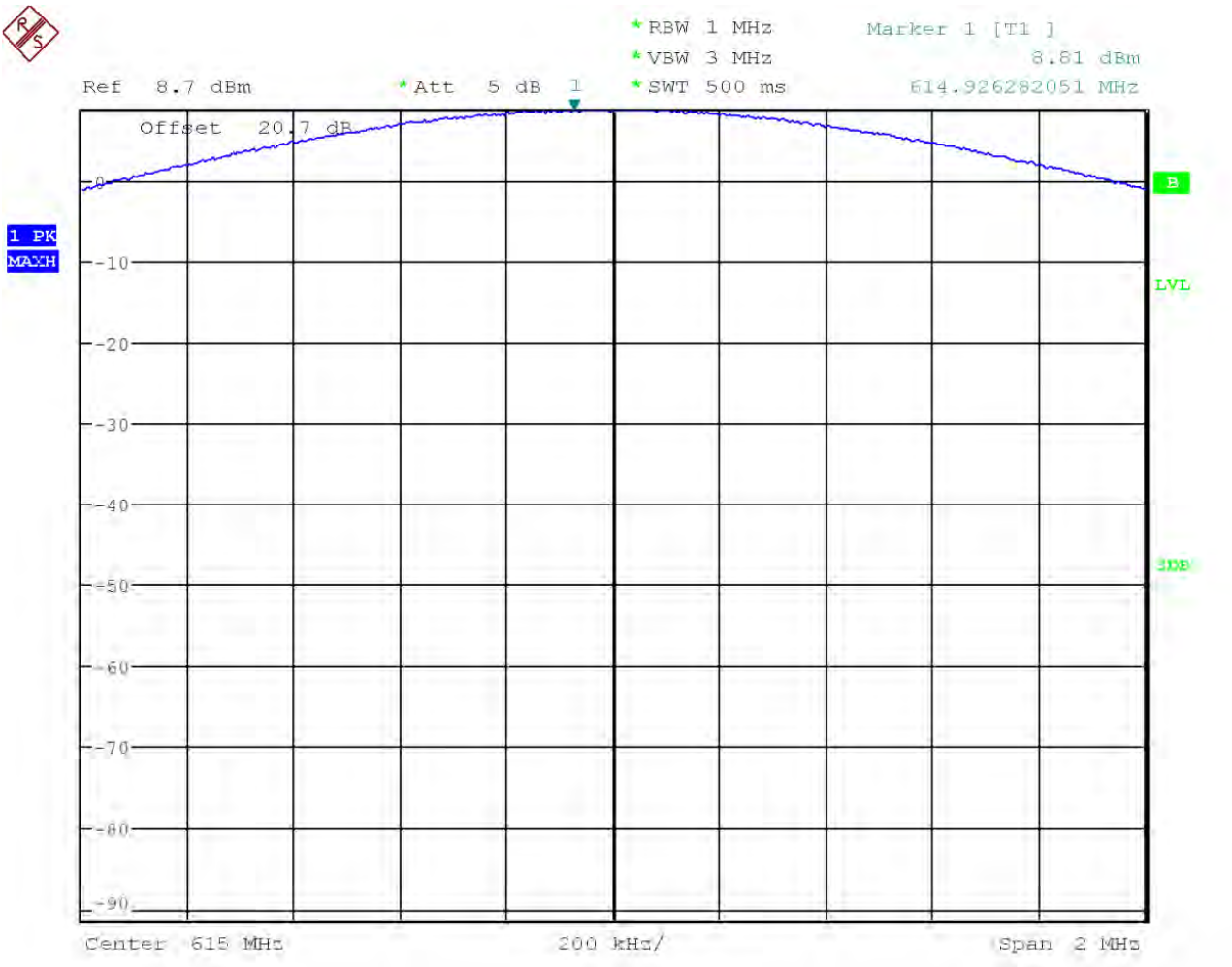
Test Information

EUT Name:	AD2 G57 #43
Serial Number:	TU163360199
Test Description:	FCC Part 74.861 Occupied Bandwidth
Operating Conditions:	615MHz (Mid Frequency) at 20mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	March 9, 2017 17:31:09 PM



Test Information

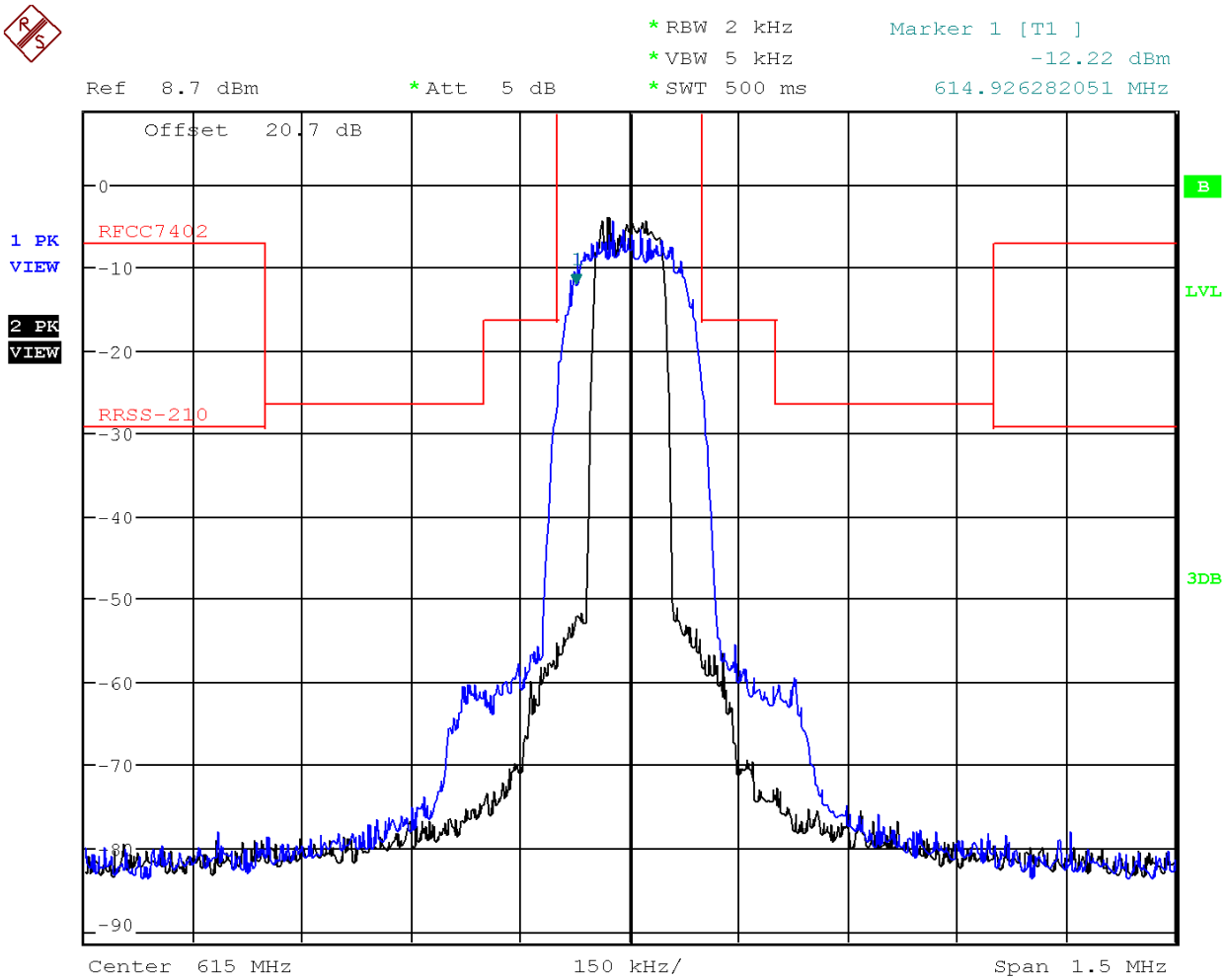
EUT Name:	AD2 G57 #43
Serial Number:	TU163360199
Test Description:	FCC Part 74.861 Occupied Bandwidth
Operating Conditions:	Output Power Reference 615MHz (Mid Frequency) at 2mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	March 9, 2017 17:36:44 PM



Appendix D

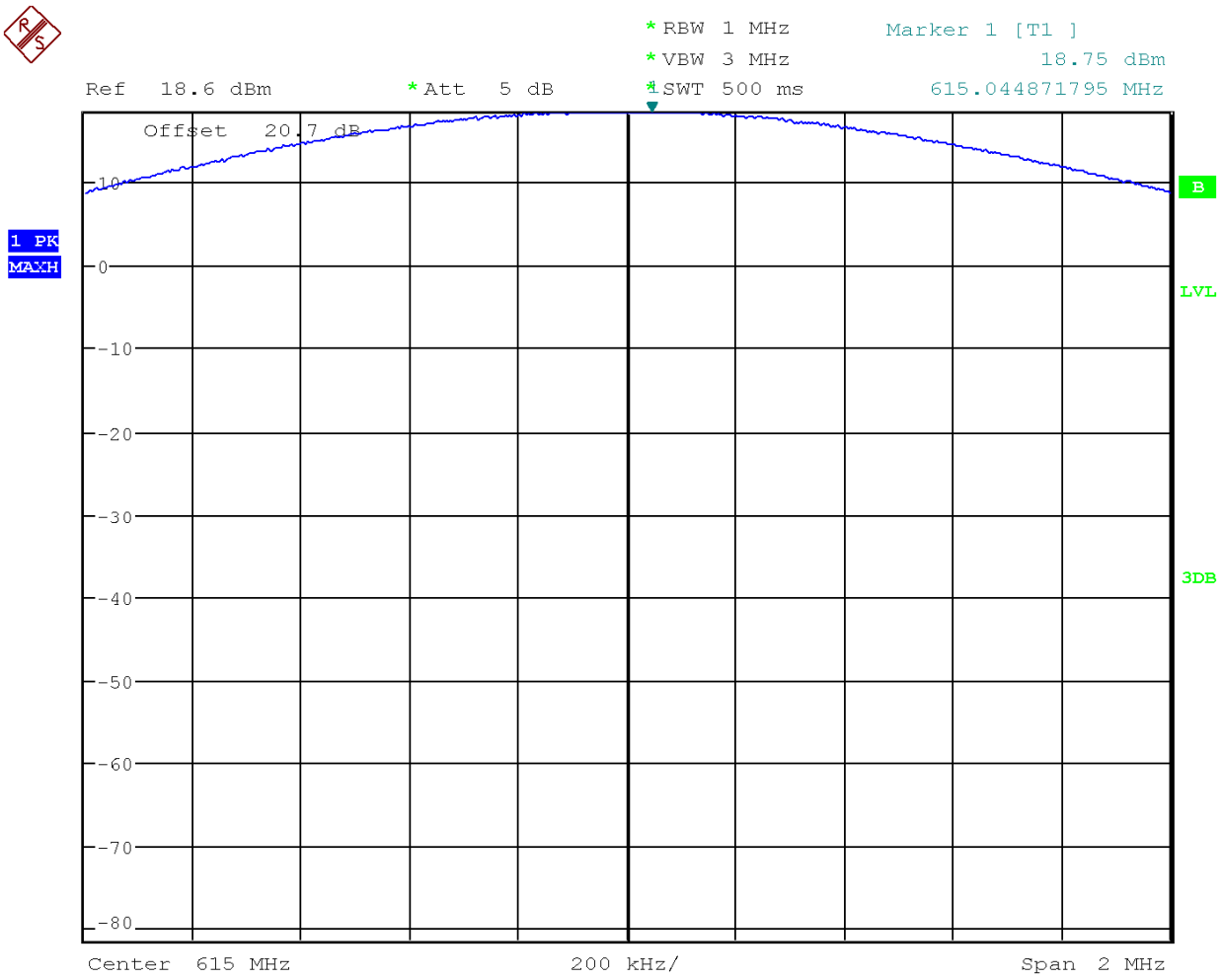
Test Information

EUT Name:	AD2 G57 #43
Serial Number:	TU163360199
Test Description:	FCC Part 74.861 Occupied Bandwidth
Operating Conditions:	615MHz (Mid Frequency) at 2mW in Normal Mode (Blue Trace) and High Density Mode (Black Trace) (Channel Bandwidth Options)
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	March 9, 2017 17:40:59 PM



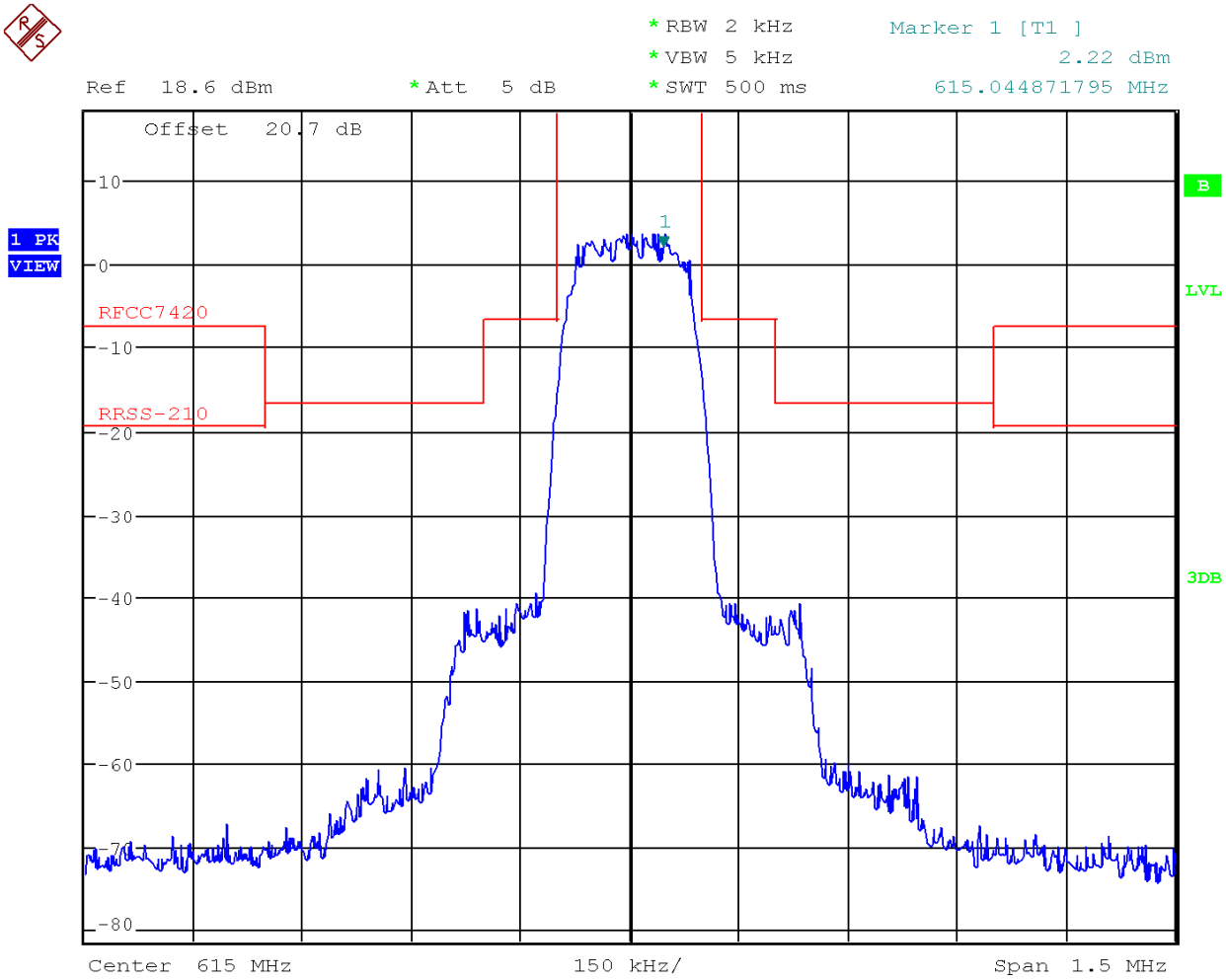
Test Information

EUT Name:	AD2 K54 #66
Serial Number:	TU163370212
Test Description:	FCC Part 74.861 Occupied Bandwidth
Operating Conditions:	Output Power Reference 615MHz (Mid Frequency) at 20mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	March 9, 2017 18:25:21 PM



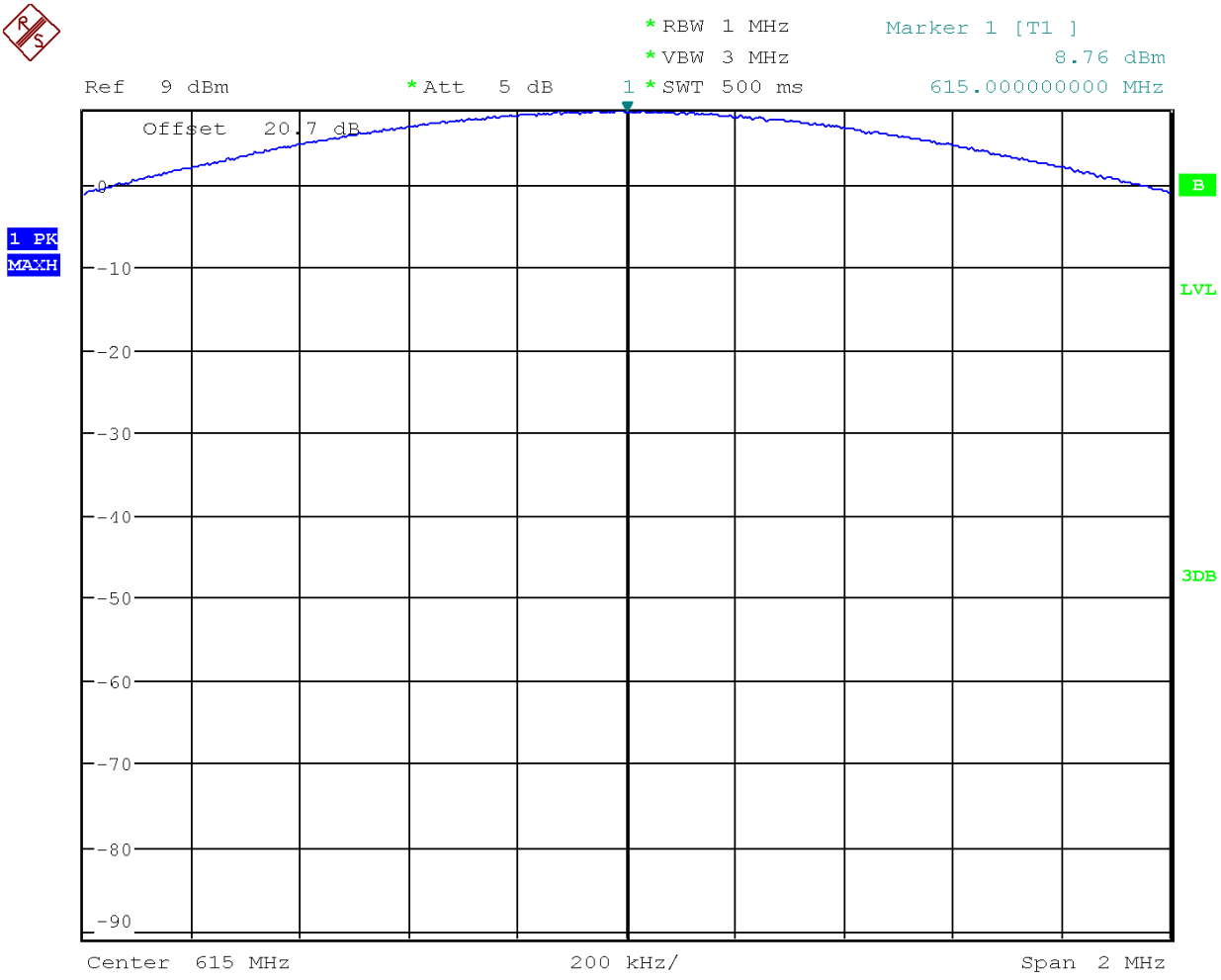
Test Information

EUT Name:	AD2 K54 #66
Serial Number:	TU163370212
Test Description:	FCC Part 74.861 Occupied Bandwidth
Operating Conditions:	615MHz (Mid Frequency) at 20mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	March 9, 2017 18:28:23 PM



Test Information

EUT Name:	AD2 K54 #66
Serial Number:	TU163370212
Test Description:	FCC Part 74.861 Occupied Bandwidth
Operating Conditions:	Output Power Reference 615MHz (Mid Frequency) at 2mW
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	March 9, 2017 18:32:43 PM



Test Information

EUT Name:	AD2 K54 #66
Serial Number:	TU163370212
Test Description:	FCC Part 74.861 Occupied Bandwidth
Operating Conditions:	615MHz (Mid Frequency) at 2mW in Normal Mode (Blue Trace) and High Density Mode (Black Trace) (Channel Bandwidth Options)
Operator Name:	Alex Stelmaszczyk
Comment:	R & S FSU Spectrum Analyzer
Test Date:	March 9, 2017 18:36:31 PM