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Emissions
Test Report

EUT Name: Wireless Video Access Point

Model No.: 405

CFR 47 Part 15.247 2012 and RSS 210:2010

Prepared for:

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Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	05/09/2013	Original Document	N/A
1	09/09/2013	Added 802.11a test result.	J. Luong

Note: Latest revision report will replace all previous reports.

Statement of Compliance

Manufacturer:	Pace Americas 310 Providence Mine Road, Ste. 200 Nevada City, CA 95959 (530) 274 5440
Requester / Applicant:	Mark Rieger
Name of Equipment:	Wireless Video Access Point
Model No.	405
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR 47 Part 15.247 2012 and RSS 210:2010
Test Dates:	April 8, 2013 to August 28, 2013

Guidance Documents:

Emissions: ANSI C63.10-2009, KDB 558074 D01 DTS Measurement Guidance v03r01nist

Test Methods:

Emissions: ANSI C63.10-2009, KDB 558074 D01 DTS Measurement Guidance v03r01

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that the equipment described above has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government. This report contains data that are not covered by A2LA accreditation. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.

Jeremy Luong	May 9, 2013	Jeremy Luong	May 9, 2013
Test Engineer	Date	Test Engineer	Date

Testing Cert #3331.02 **US5254** **2932M-1**

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the CFR 47 Part 15.247 2012 and RSS 210:2010 based on the results of testing performed on April 8, 2013 to August 28, 2013 on the Wireless Video Access Point Model 405 manufactured by Pace Americas This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

The 5725 MHz to 5850 MHz frequency band was covered this document.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method ANSI C63.4	Test Parameters (from Standard)	Result
Spurious Emission in Transmitted Mode	CFR47 15.209, RSS-GEN Sect.7.2.3	Class B	**Complied**
Restricted Bands of Operation	CFR47 15.205, RSS 210 Sect.2.6	Class B	**Complied**
AC Power Conducted Emission	CFR47 15.207, RSS-GEN Sect.7.2.2	Class B	**Complied**
Occupied Bandwidth	CFR47 15.247 (a2), RSS GEN Sect.4.4.1	≥ 500 kHz	**Complied**
Maximum Transmitted Power	CFR47 15.247 (b3), RSS 210 Sect. A.8.4	30 dBm	**Complied**
Peak Power Spectral Density	CFR47 15.247 (e), RSS 210 Sect. A.8.2	8 dBm/ 3 kHz.	**Complied**
Bandedge Measurement	CFR47 15.247 (d), RSS 210 Sect. A.8.5	20 dBr	**Complied**
RF Exposure	CFR47 15.247 (i), 2.1091	General Population	**Complied**

Note: This report is only covered for 5725 to 5850 MHz.

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

None

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America at 1279 Quarry Ln, Pleasanton, CA 94566 is recognized by the commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (US5254). The laboratory scope of accreditation includes: Title 47 CFR Parts 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 A2LA

TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:1999 and ISO 9002 (Lab Code Testing Cert #3331.02). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Canada – Industry Canada

TUV Rheinland of North America at the 1279 Quarry Ln, Pleasanton, CA 94566 address is accredited by Industry Canada for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by Industry Canada (File Number 2932M). This reference number is the indication to the Industry Canada Certification Officers that the site meets the requirements of RSS 212, Issue 1 (Provisional). The accreditation is updated every 3 years.

2.1.4 Japan – VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America at 1279 Quarry Ln, Pleasanton, CA 94566 has been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0031

VCCI Registration No. for Santa Clara: A-0032

2.1.5 Acceptance by Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at 1279 Quarry Ln, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory A2LA accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 1279 Quarry Lane, Pleasanton, California 94566, USA. The 2305 Mission College, Santa Clara, 95054, USA location is considered a Pleasanton annex.

2.2.1 Emission Test Facility

The Semi-Anechoic chamber and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2009, at a test distance of 3 and 5 meters. The site is listed with the FCC and accredited by A2LA (Lab Code Testing Cert #3331.02). The 3/5-meter semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2009, at a test distance of 3 meter and 5 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7 m x 4.8 m x 3.175 mm thick aluminum floor connected to PE ground.

For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of 10^9 Ohms/square on a 1.6 m x 0.8 m x 0.8 m high non-conductive table with a 3.175 mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470-kΩ resistors. The Vertical Coupling Plane consists of an aluminum plate 50 cm x 50 cm x 3.175 mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470-kΩ resistors.

For EFT, Surge, PQF, the HCP and VCP are removed.

RF Field Immunity testing is performed in a 7.3m x 4.3m x 4.1m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.8m x 3.7m x 3.175mm thick aluminum ground plane.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities; it is equal to the positive square root of the sum of the variances or co-variances of these other quantities, weighted according to how the measurement result varies with changes in these quantities. The term *standard uncertainty* is the result of a measurement expressed as a standard deviation.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

2.3.2 Measurement Uncertainty

Per CISPR 16-4-2	**U_{lab}**	**U_{cispr}**
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 40 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.3 dB

Voltech PM6000A

The estimated combined standard uncertainty for harmonic current and flicker measurements is ± 5.0%.	Per CISPR 16-4-2 Methods

2.3.3 Measurement Uncertainty Immunity

The estimated combined standard uncertainty for ESD immunity measurements is ± 8.2%.	Per IEC 61000-4-2
The estimated combined standard uncertainty for radiated immunity measurements is ± 4.10 dB.	Per IEC 61000-4-3
The estimated combined standard uncertainty for conducted immunity measurements with CDN is ± 3.66 dB	Per IEC 61000-4-6
The estimated combined standard uncertainty for power frequency magnetic field immunity is ± 2.9%.	Per IEC 61000-4-8

Thermo KeyTek EMC Pro

The estimated combined standard uncertainty for EFT fast transient immunity measurements is ± 2.6%.
The estimated combined standard uncertainty for surge immunity measurements is ± 2.6%.
The estimated combined standard uncertainty for voltage variation and interruption measurements is ± 1.74%.

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

3 Product Information

3.1 Product Description

The Pace 405 wireless video access point allows service providers to securely deliver high quality HD video to any location in a subscriber home. Using state of the art wireless technology including digital beam forming, customers retain traditional "wired" levels of service and quality while service providers enjoy the benefits of shortened installation times and more flexibility in how they deploy their IPTV or OTT services

Key Feature:

- 5 GHz 802.11n wireless access point
- 4x4 MIMO (up to 600 Mbps phy rate)
- High-Power Transmit For Maximum Coverage
- Gigabit Ethernet port
- Robust quality of service (QoS) and traffic management features
- Simple, push-button wireless setup for wireless set-tops
- TR-069 Management Client
- LEDs: Power, Wireless Signal Quality, Operational Mode (AP/STA), Ethernet Link, Wireless Pairing Indicator

3.2 Equipment Configuration

A description of the equipment configuration is given in the Test Plan Section. The EUT was tested as called for in the test standard and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to reach intended operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

3.3 Operating Mode

A description of the operation mode is given in the Test Plan Section. In the case of an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

3.4 Unique Antenna Connector

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of CFR47 Parts 15.211, 15.213, 15.217, 15.219, or 15.221.

3.4.1 Results

The Wireless Video Access Point has 4 internal fixed antennas, 3 onboard PCB dipole antennas and 1 stamped metal loop antenna. Each antenna has the maximum gain of 2 dBi. The total directional gain is 8 dBi. All antennas are integrated on the PCB. There is no external antenna connection available.

4 Emissions

Testing was performed in accordance with CFR 47 Part 15.247: 2012 and RSS 210 Annex 8: 2010. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in section 8 of the standard were used.

4.1 Output Power Requirements

The maximum output power requirement is the maximum equivalent isotropic radiated power delivering at the transmitting antenna under specified conditions of measurements in the presence of modulation.

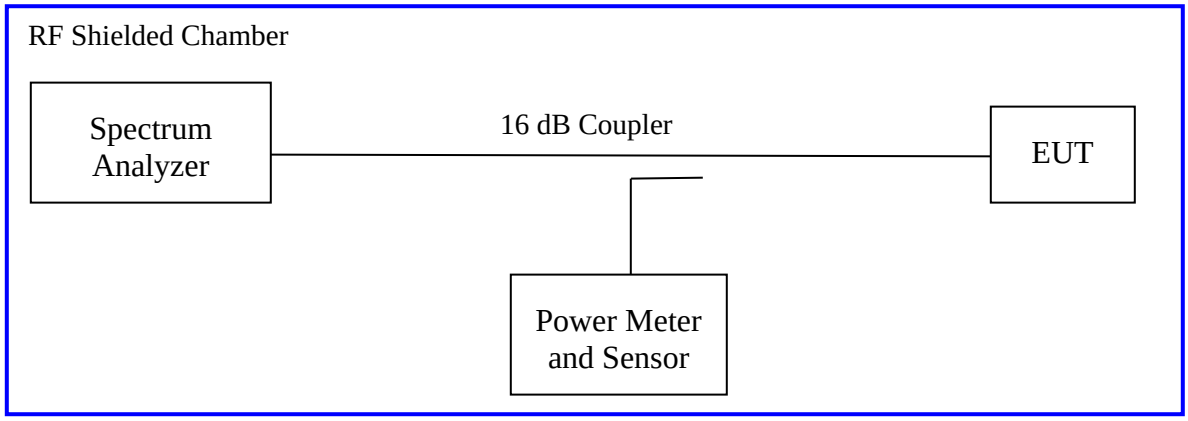
The maximum output power and harmonics shall not exceed CFR47 Part 15.247 (b3):2012 and RSS 210 A.8.4: 2010

The maximum transmitted power is +30 dBm or 1Watt.

4.1.1 Test Method

The ANSI C63.10-2009 Section 6.10.3.1 conducted method was used to measure the channel power output. The preliminary investigation was performed at different data rate/ chain to determine the highest power output for each mode. The worst findings were conducted on 3 channels in each mode on the sample, S/N 09130M000104, per CFR47 Part 15.247 (b3):2009 and RSS 210 A.8.4; 5725 MHz to 5850 MHz. The worst mode results indicated below.

Test Setup:



Method AVGSA-1 of "Guidelines forPerforming Compliance Measurements on Digital Transmission Systems (DTS) Operating under CFR47 Part 15.247"applies since the EUT continuously transmit; where duty cycle is greater than 98%. Sample detector was used.

Each chain was measured individually and applied the measure-and-sum approach per KDB66291.

4.1.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 2: RF Output Power at the Antenna Port – Test Results

Test Conditions: Conducted Measurement, Normal Temperature							
Antenna Type: Integrated				**Power Setting:** See test plan			
Max. Directional Gain: + 8 dBi				**Signal State:** Modulated at 100%.			
Ambient Temp.: 23 °C				**Relative Humidity:**33%			
802.11a Mode, 4x4							
Operating Channel	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Ch2 [dBm]**	**Ch3 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
5745	28.00	21.14	21.63	21.49	21.49	27.47	-0.53
5785	28.00	21.42	22.13	21.11	21.71	27.63	-0.37
5825	28.00	21.03	22.28	21.40	21.70	27.65	-0.35
Note: 1.The highest output power was observed at 802.11a 6 Mbps, 4 Data Streams. 2. RF output powers were summed per KDB 662911. 3. The total directional gain would be 8 dBi; 2 dBi +10*Log(4). Per CFR47 Part 15.247 (b) (4), the limit is reduced for every dBi gain exceeding 6 dBi. The limit would be 28.00 dBm.							
802.11n (HT20) Mode, 4x4							
Operating Channel	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Ch2 [dBm]**	**Ch3 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
5745	28.00	21.19	21.48	21.18	21.67	27.41	-0.59
5785	28.00	21.13	21.61	21.17	21.25	27.31	-0.69
5825	28.00	21.12	21.91	20.97	21.41	27.39	-0.61
Note: 1.The highest output power was observed at HT20 6.5 Mbps, 4 Data Streams. 2. All chains will be on at all time and beam performing. RF output powers were summed per KDB 662911. 3. The total directional gain would be 8 dBi; 2 dBi +10*Log(4). Per CFR47 Part 15.247 (b) (4), the limit is reduced for every dBi gain exceeding 6 dBi. The limit would be 28.00 dBm.							
802.11n (HT40) Mode, 4x4							
Operating Channel	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Ch2 [dBm]**	**Ch3 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
5755	28.00	20.74	21.20	20.82	20.93	26.95	-1.05

5795	28.00	20.42	20.80	20.53	20.23	26.52	-1.48

Note: 1.The highest output power was observed at HT40 13.5 Mbps, 4 Data Streams.
2. All chains will be on at all time and beam performing. RF output powers were summed per KDB 662911.
3. The total directional gain would be 8 dBi; 2 dBi +10*Log(4). Per CFR47 Part 15.247 (b) (4), the limit is reduced for every dBi gain exceeding 6 dBi. The limit would be 28.00 dBm.

Table 3: Average Output Power at the Antenna Port – Reference Only

Test Conditions: Conducted Measurement, Normal Temperature							
Antenna Type: Integrated				**Power Setting:** See test plan			
Max. Directional Gain: + 8 dBi				**Signal State:** Modulated at 100%.			
Ambient Temp.: 23 °C				**Relative Humidity:**33%			
802.11a Mode, 4x4							
Operating Channel	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Ch2 [dBm]**	**Ch3 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
5745		20.66	21.10	21.02	20.99	26.97	
5785		21.15	21.90	20.84	21.45	27.37	
5825		21.33	22.12	21.23	21.56	27.59	
Note: The highest output power was observed at 802.11a 6Mbps, 4 Data Streams.							
802.11n (HT20) Mode, 4x4							
Operating Channel	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Ch2 [dBm]**	**Ch3 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
5745		20.89	21.15	20.93	21.49	27.15	
5785		21.08	21.55	21.17	21.16	27.26	
5825		21.04	21.83	20.99	21.36	27.34	
Note: The highest output power was observed at HT20 6.5 Mbps, 4 Data Streams.							
802.11n (HT40) Mode, 4x4							
Operating Channel	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Ch2 [dBm]**	**Ch3 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
5755		20.42	20.80	20.53	20.23	26.52	
5795		20.43	21.16	20.56	20.21	26.62	
Note: The highest output power was observed at HT40 13.5 Mbps, 4 Data Streams.							

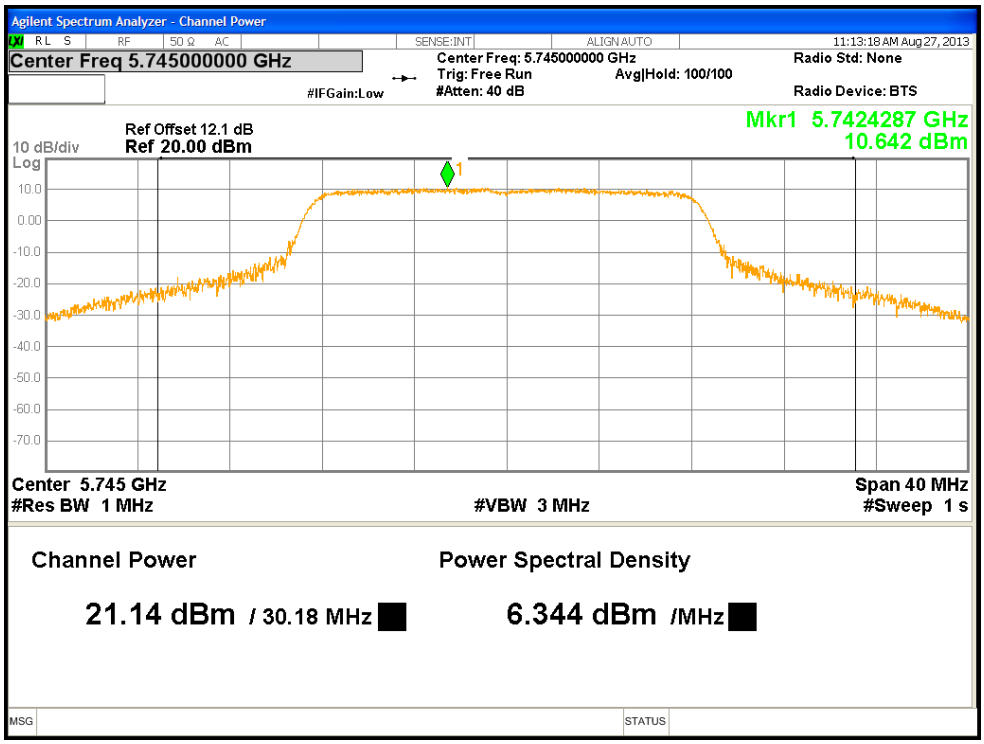


Figure 1: Maximum Transmitted Power, 5745 MHz at 802.11A, Chain 0

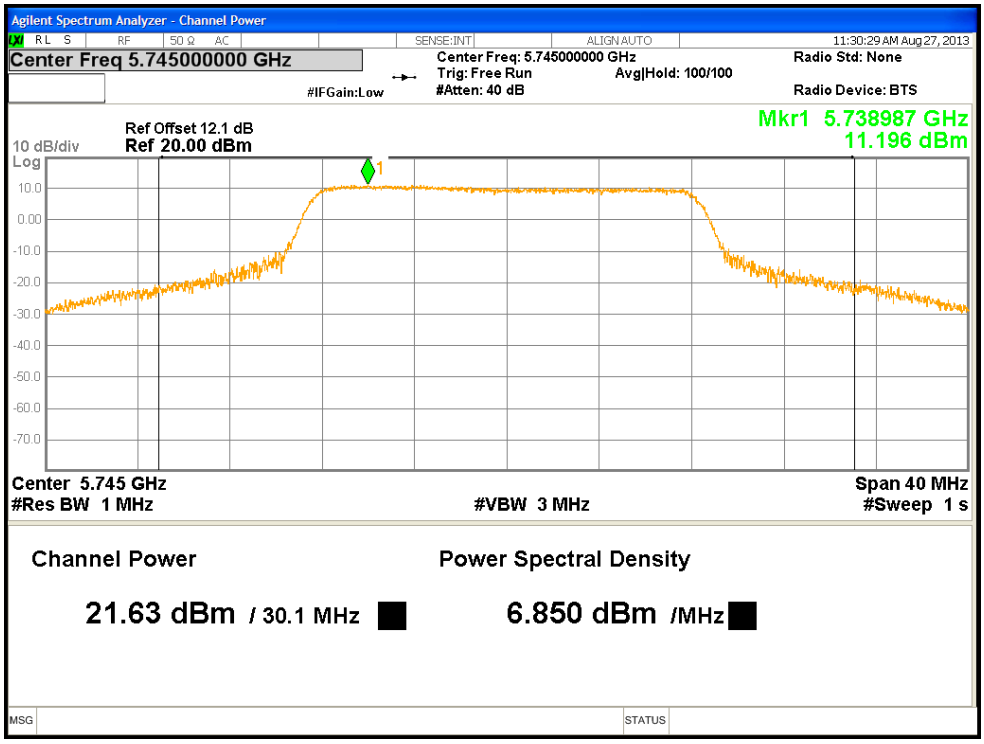


Figure 2: Maximum Transmitted Power, 5745 MHz at 802.11A, Chain 1

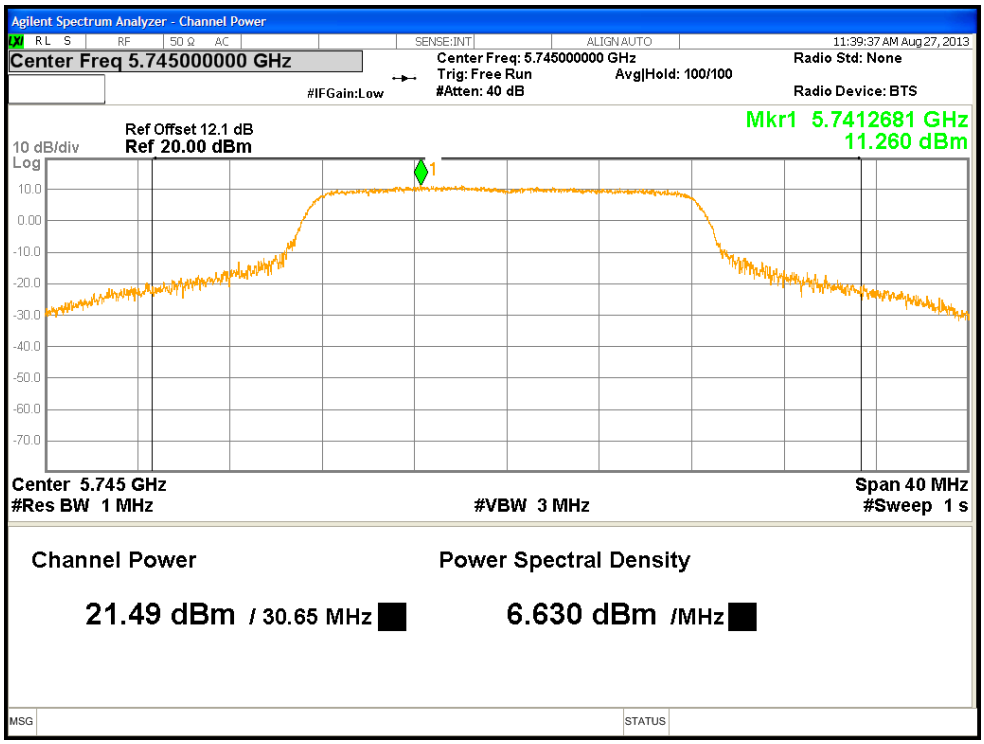


Figure 3: Maximum Transmitted Power, 5745 MHz at 802.11A, Chain 2

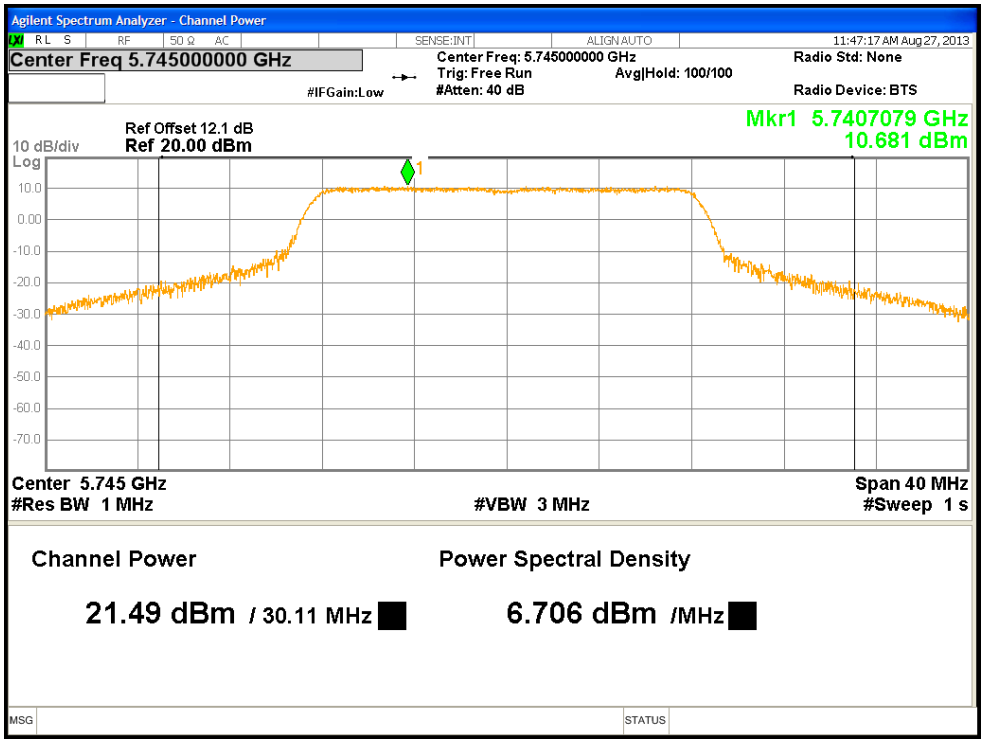


Figure 4: Maximum Transmitted Power, 5745 MHz at 802.11A, Chain 3

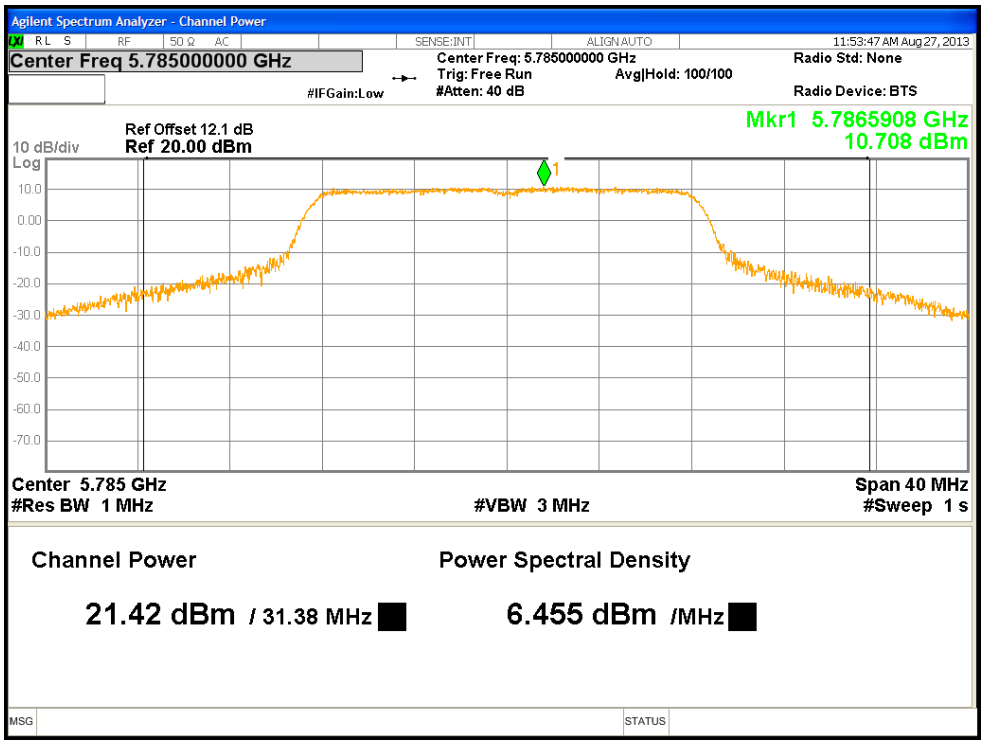


Figure 5: Maximum Transmitted Power, 5785 MHz at 802.11A, Chain 0

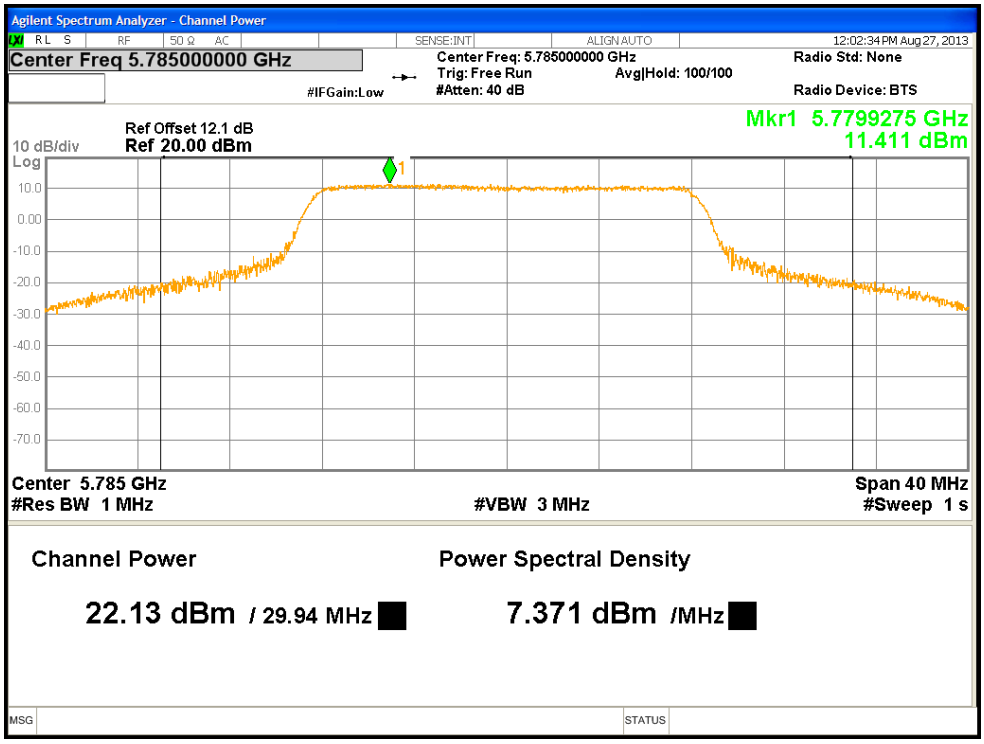


Figure 6: Maximum Transmitted Power, 5785 MHz at 802.11A, Chain 1

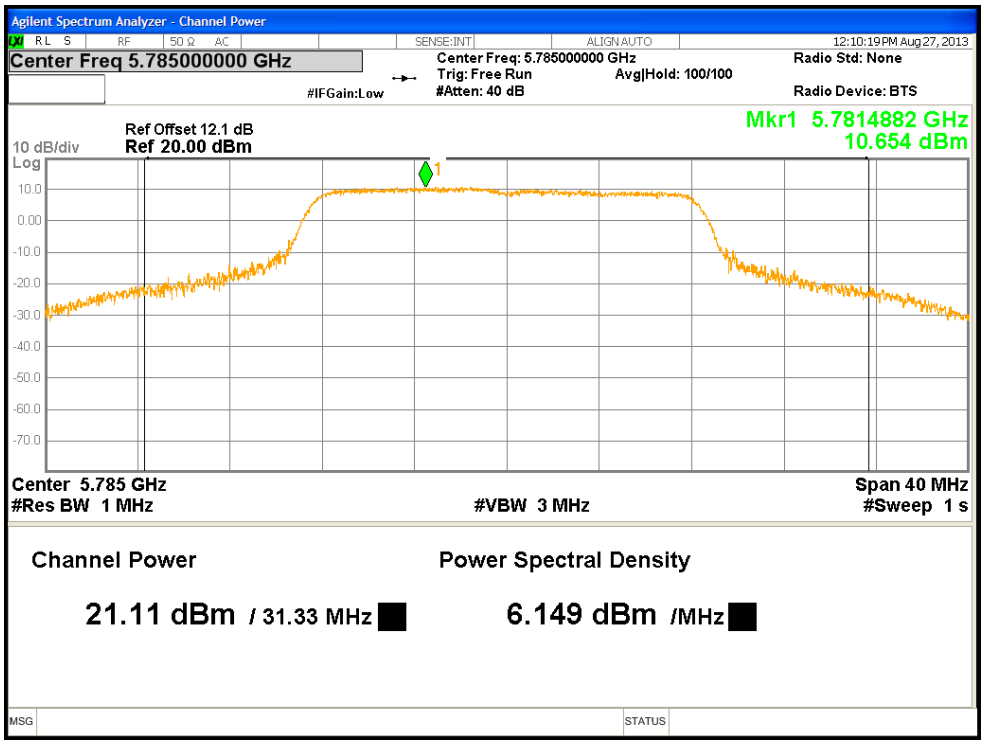


Figure 7: Maximum Transmitted Power, 5785 MHz at 802.11A, Chain 2

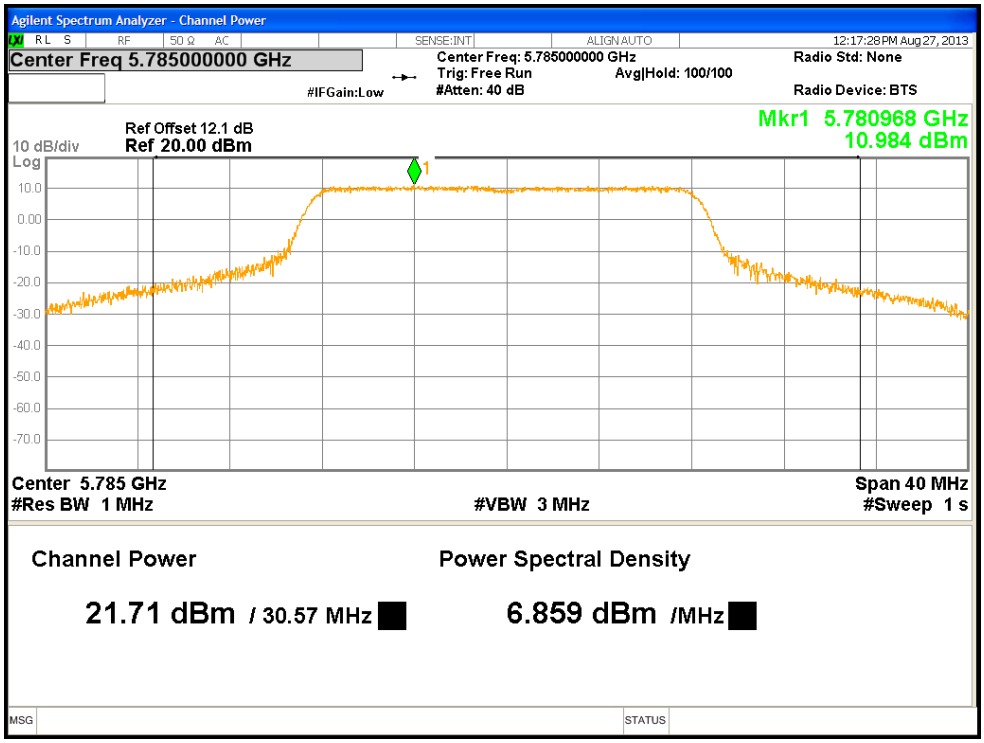


Figure 8: Maximum Transmitted Power, 5785 MHz at 802.11A, Chain 3

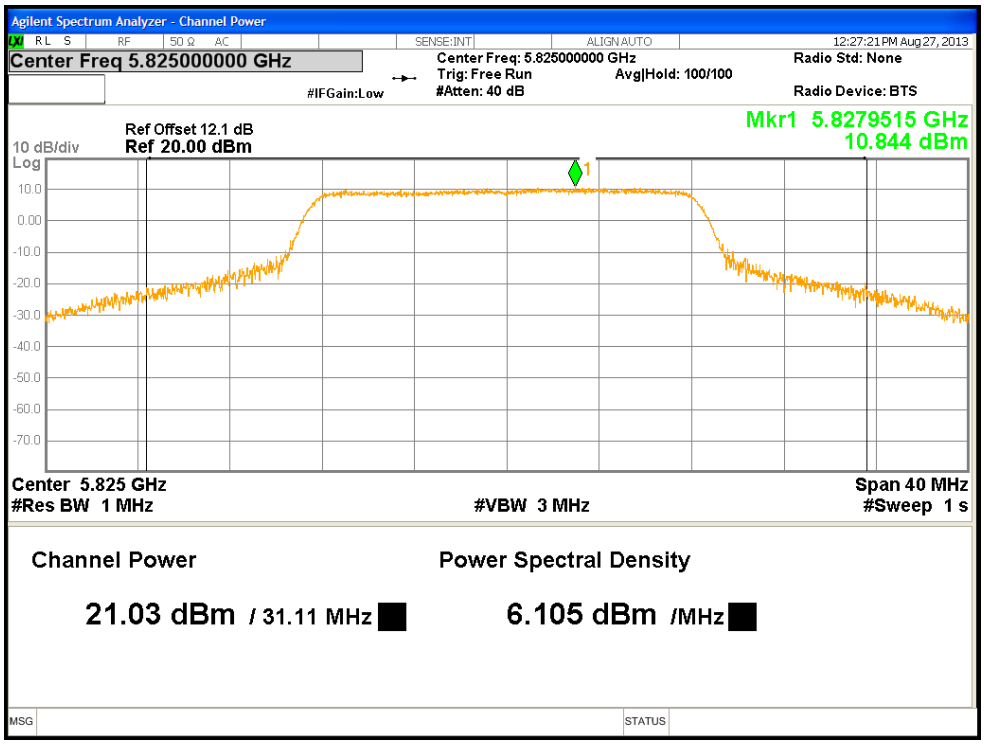


Figure 9: Maximum Transmitted Power, 5825 MHz at 802.11A, Chain 0

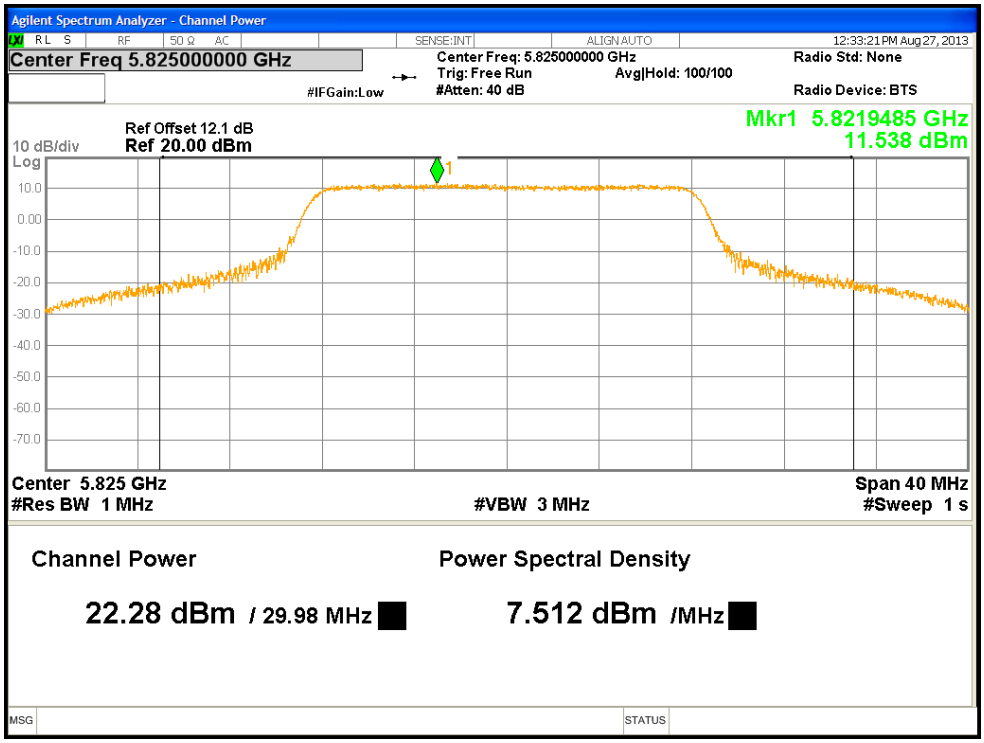


Figure 10: Maximum Transmitted Power, 5825 MHz at 802.11A, Chain 1

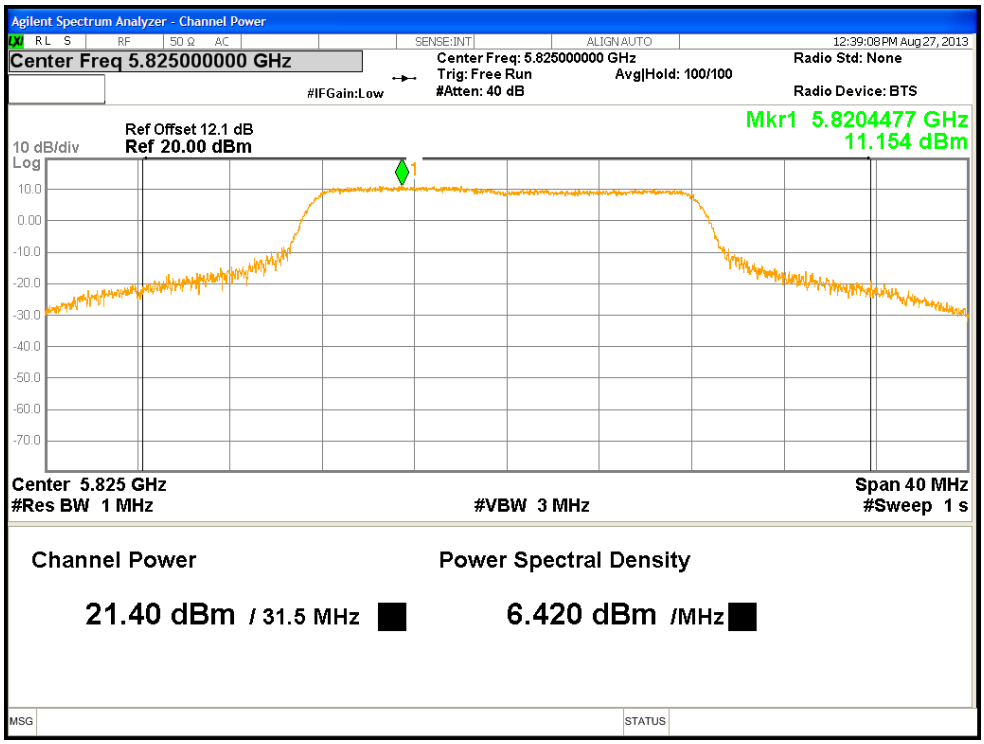


Figure 11: Maximum Transmitted Power, 5825 MHz at 802.11A, Chain 2

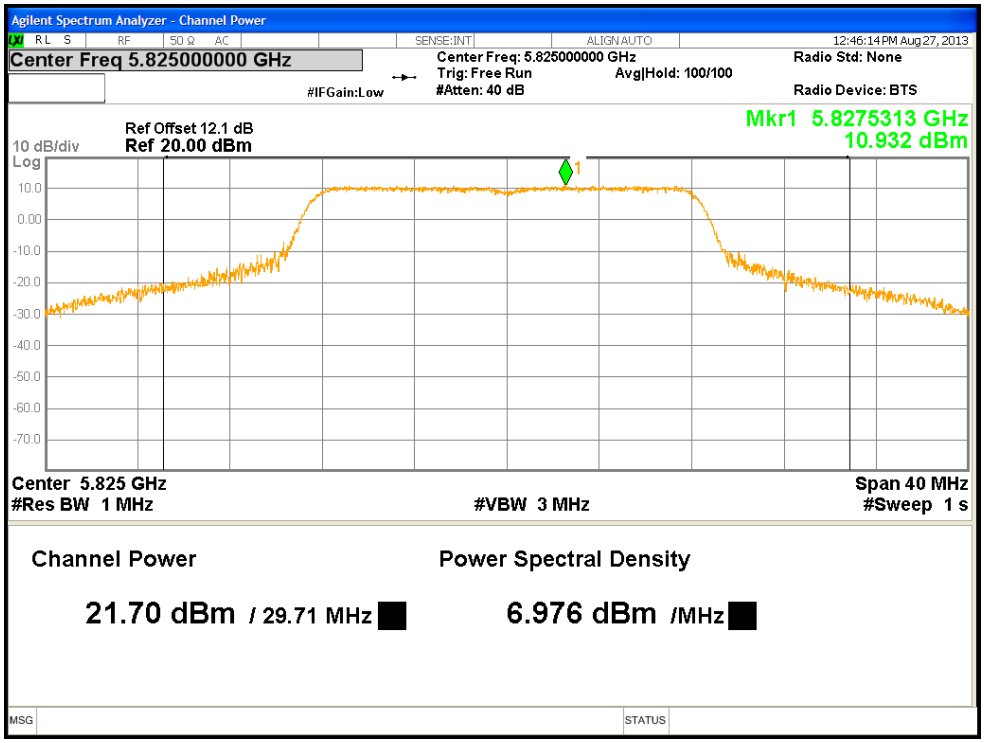


Figure 12: Maximum Transmitted Power, 5825 MHz at 802.11A, Chain 3

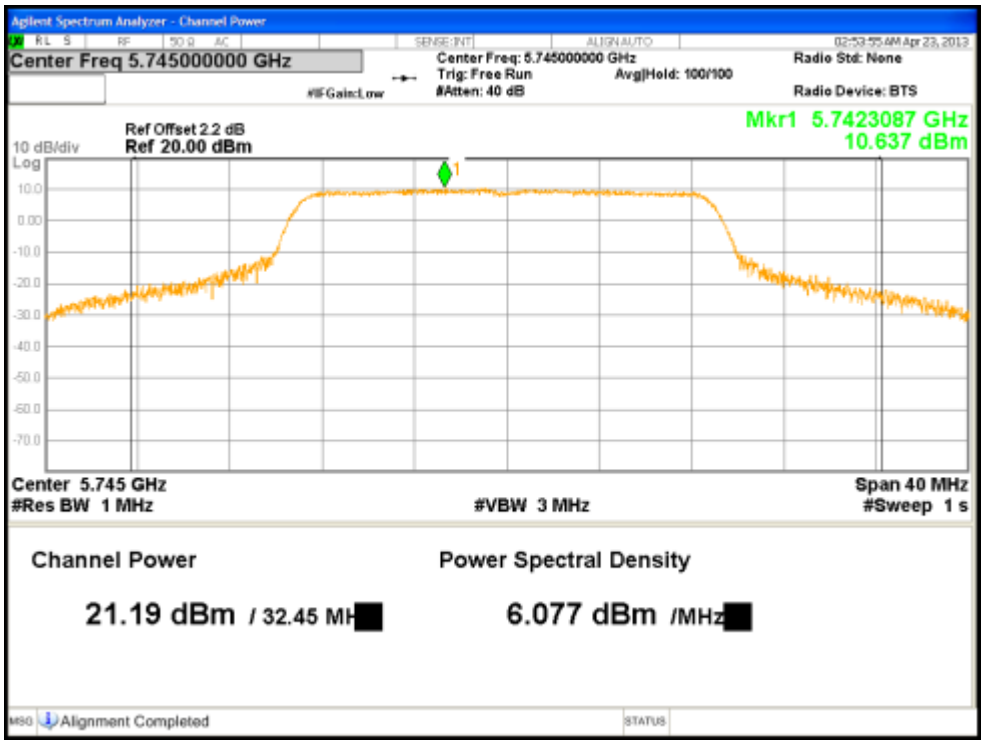


Figure 13: Maximum Transmitted Power, 5745 MHz at HT20, Chain 0

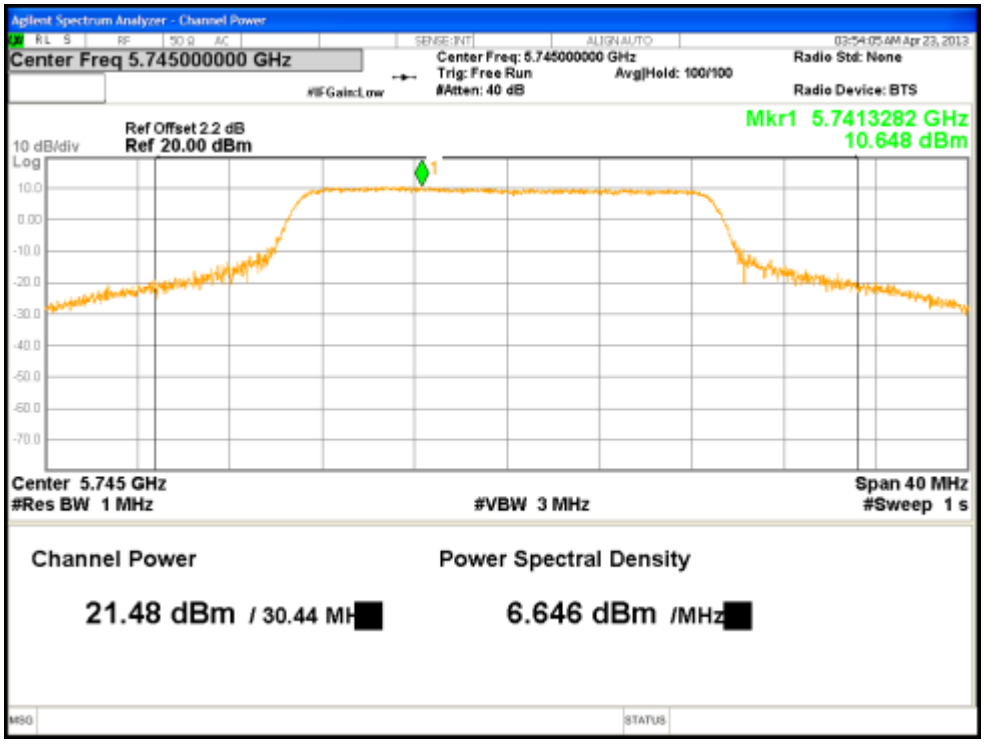


Figure 14: Maximum Transmitted Power, 5745 MHz at HT20, Chain 1

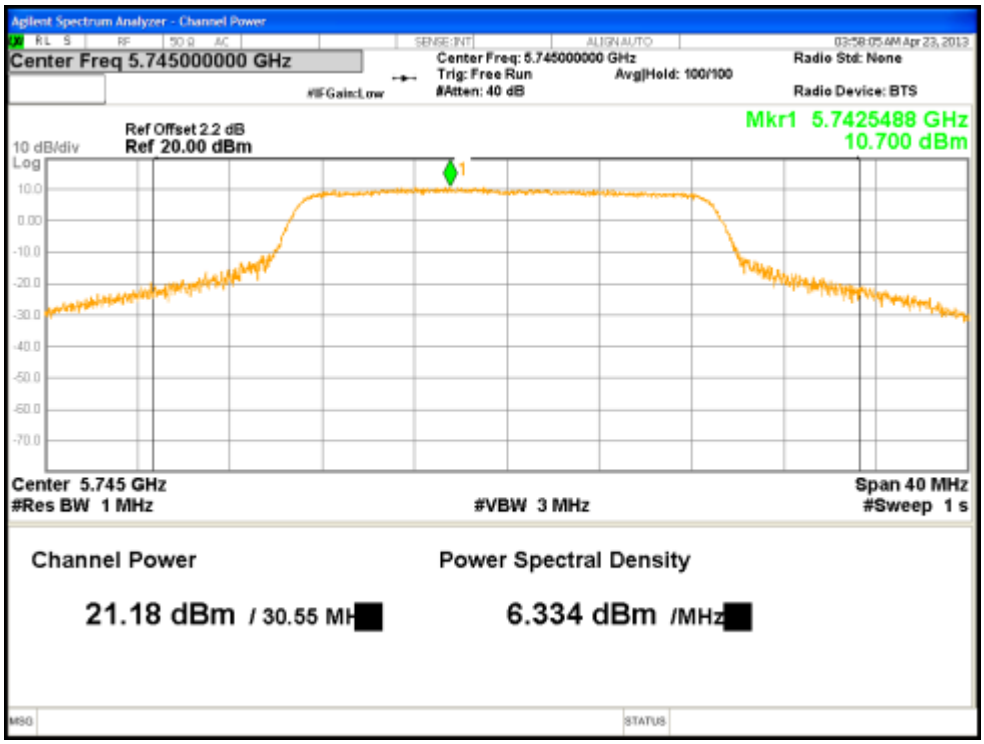


Figure 15: Maximum Transmitted Power, 5745 MHz at HT20, Chain 2

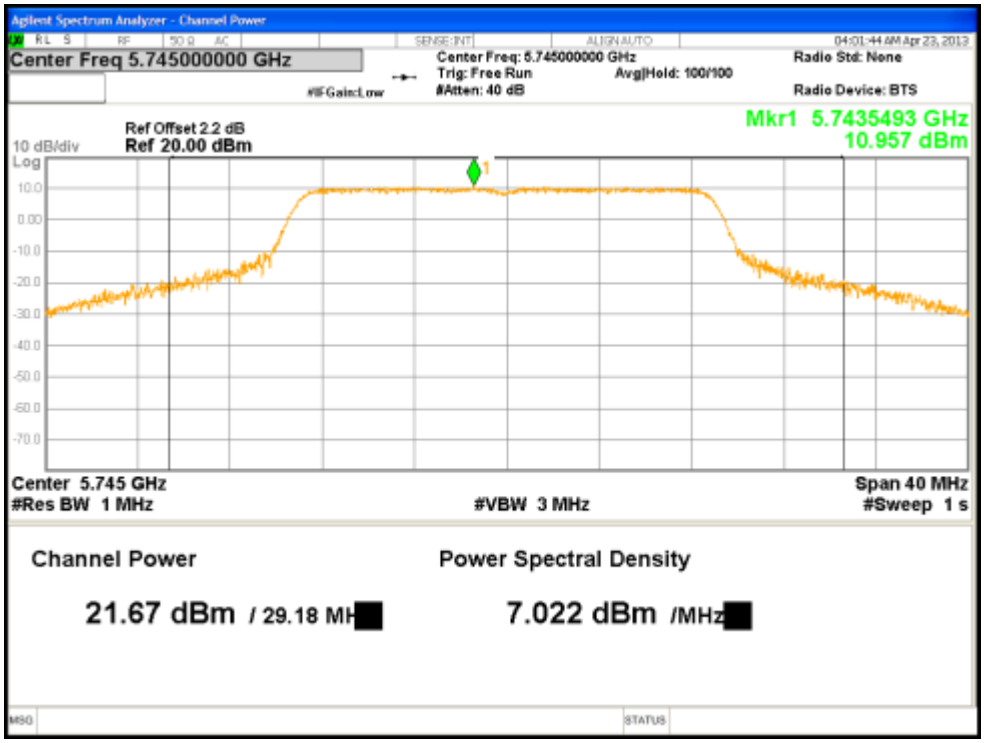


Figure 16: Maximum Transmitted Power, 5745 MHz at HT20, Chain 3

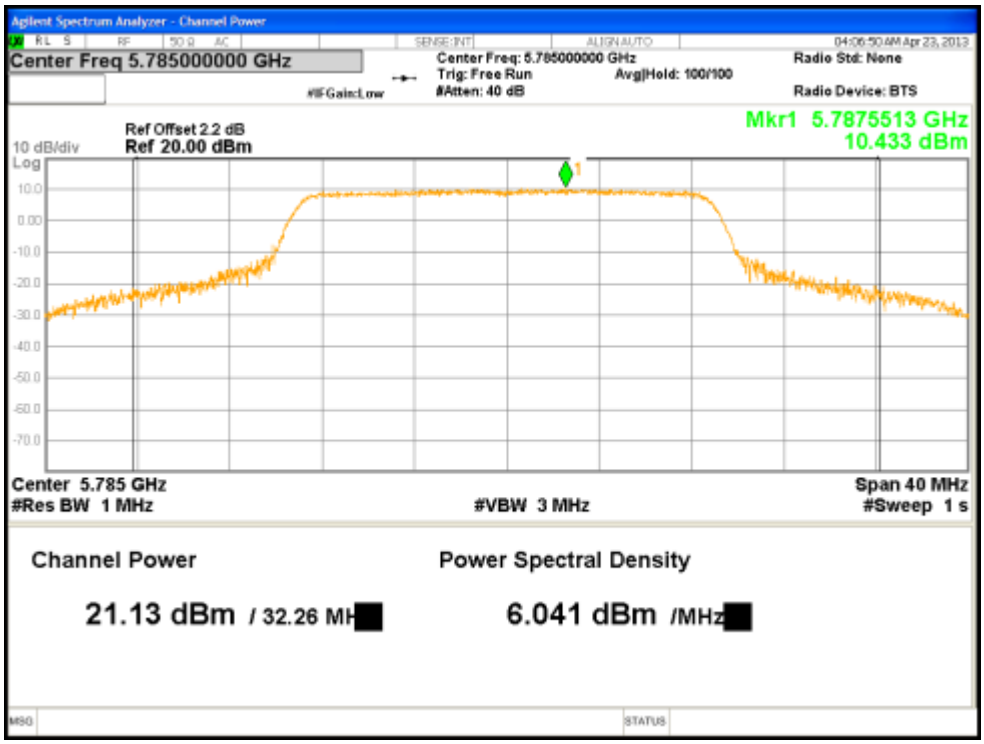


Figure 17: Maximum Transmitted Power, 5785 MHz at HT20, Chain 0

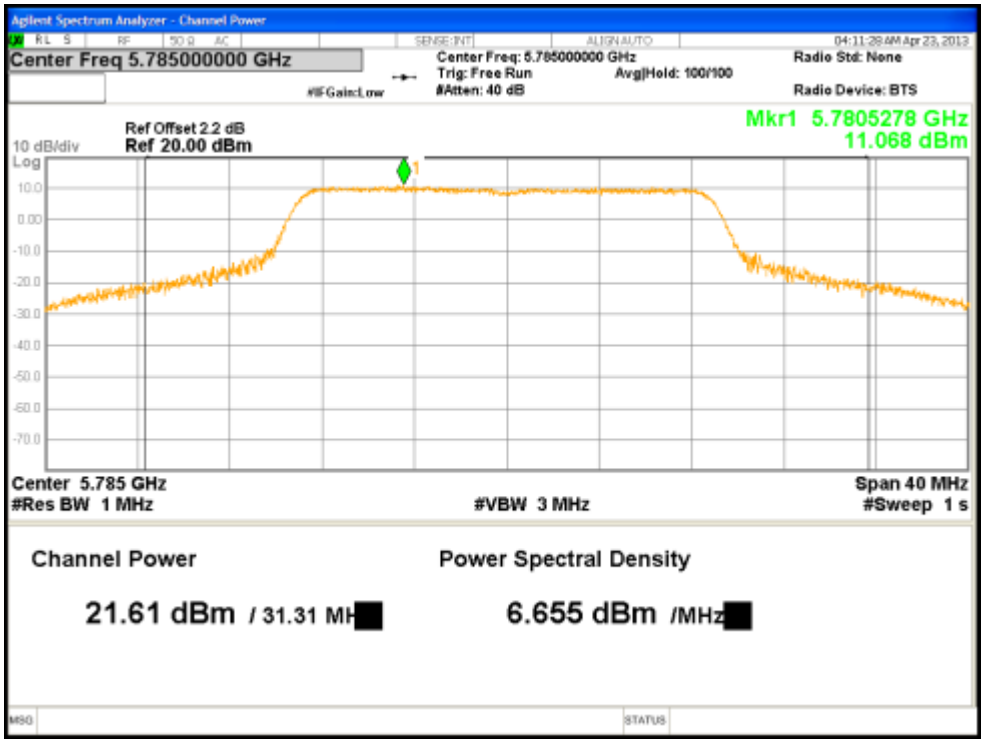


Figure 18: Maximum Transmitted Power, 5785 MHz at HT20, Chain 1

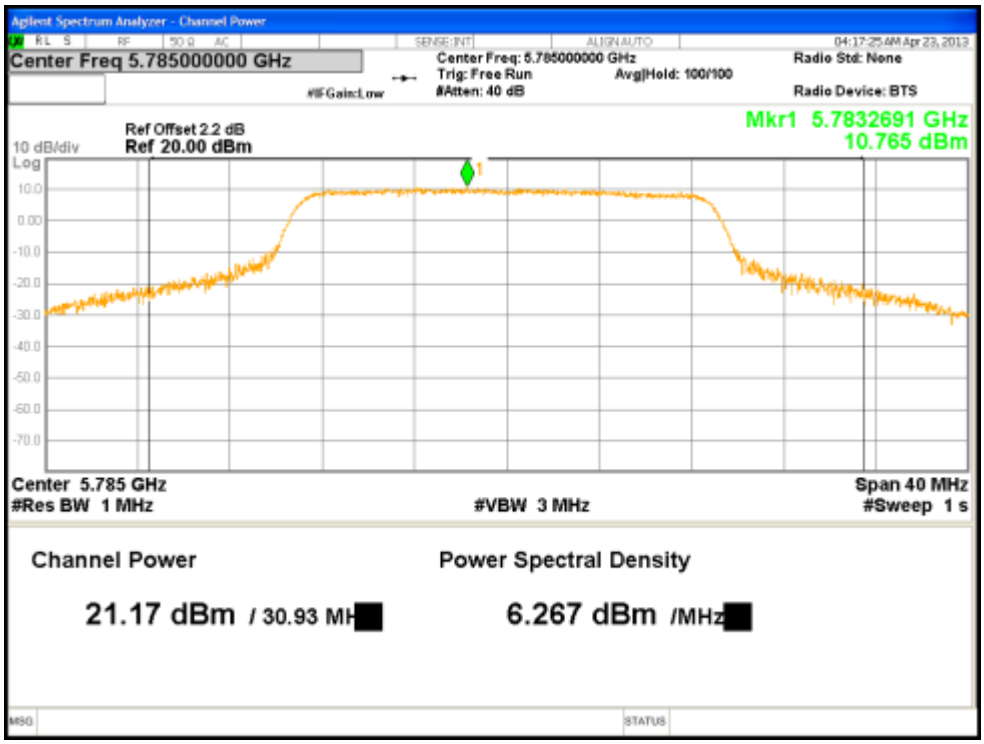


Figure 19: Maximum Transmitted Power, 5785 MHz at HT20, Chain 2

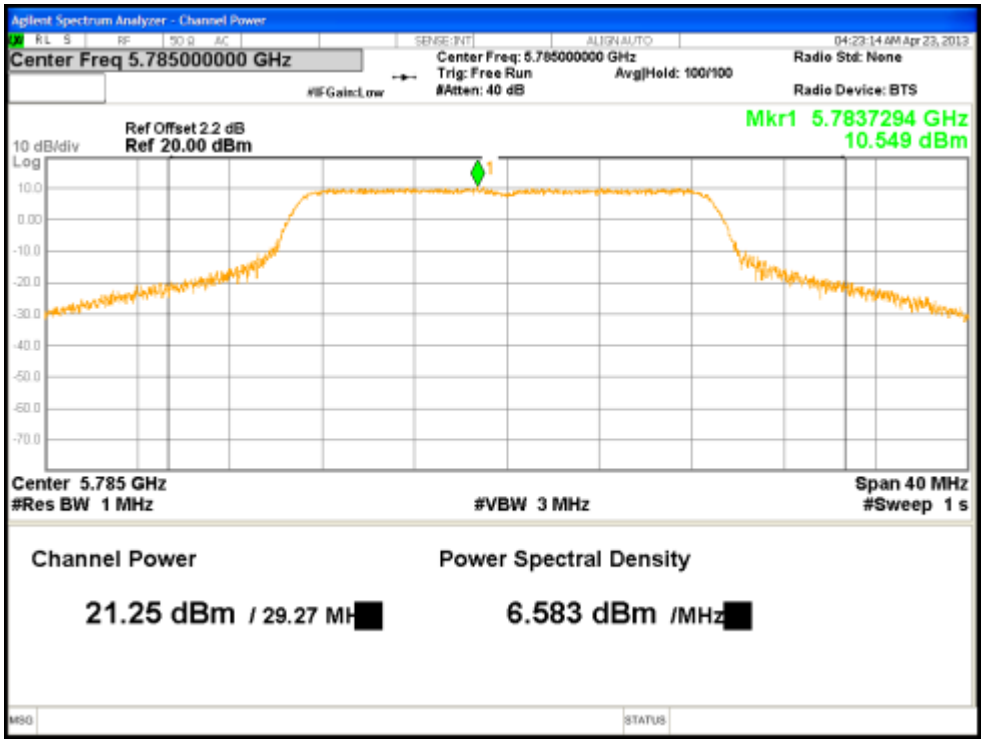


Figure 20: Maximum Transmitted Power, 5785 MHz at HT20, Chain 3

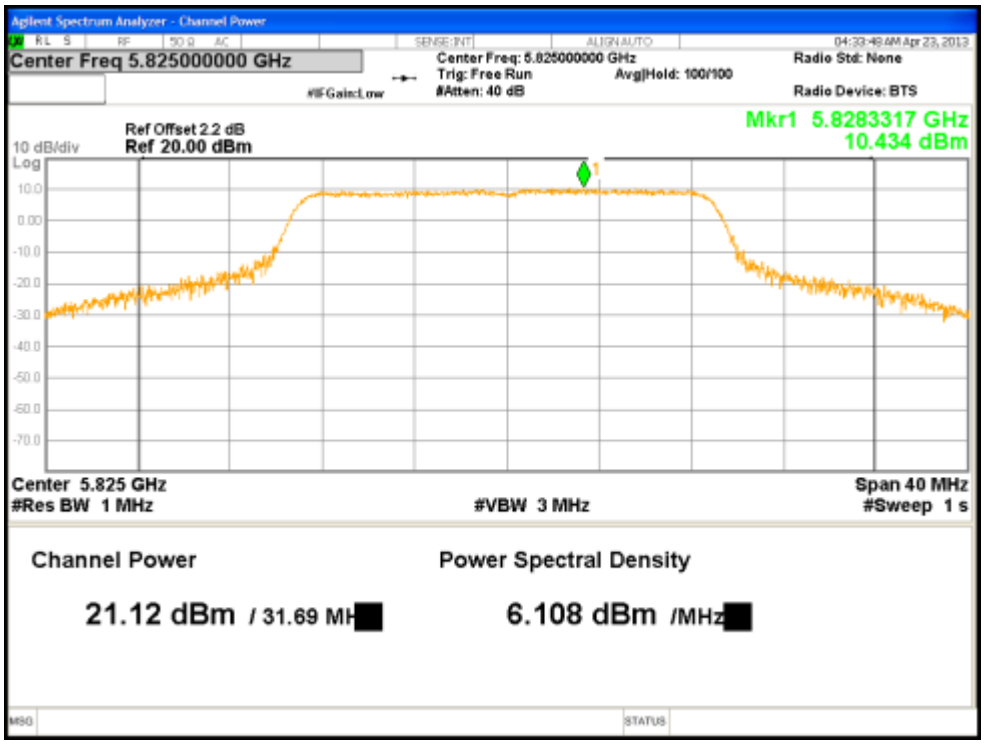


Figure 21: Maximum Transmitted Power, 5825 MHz at HT20, Chain 0

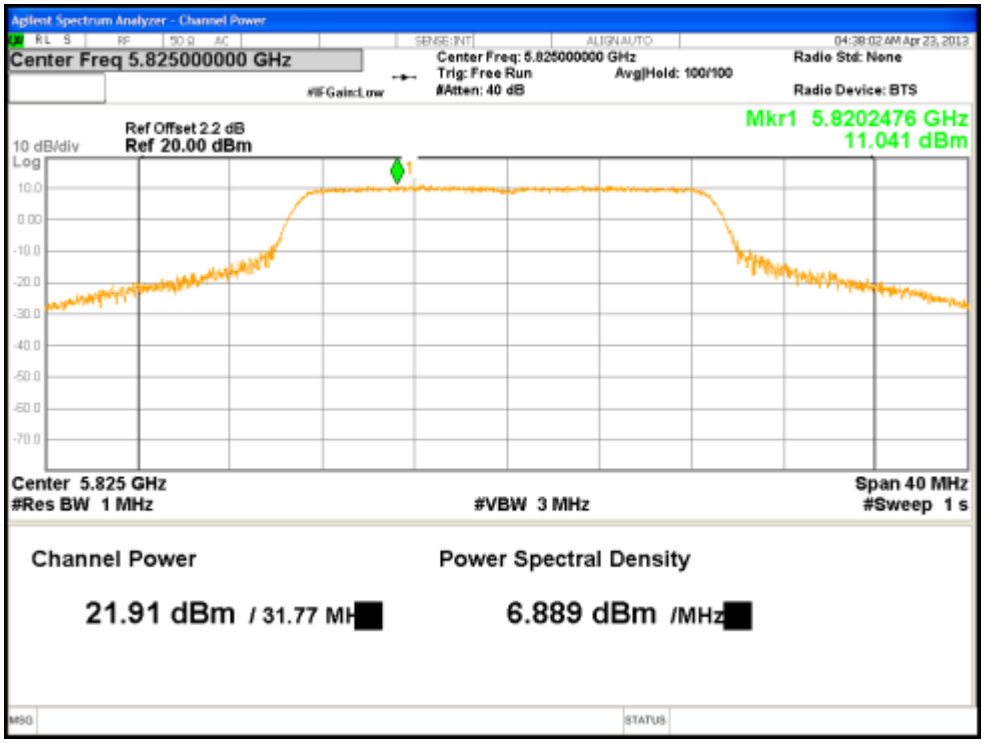


Figure 22: Maximum Transmitted Power, 5825 MHz at HT20, Chain 1

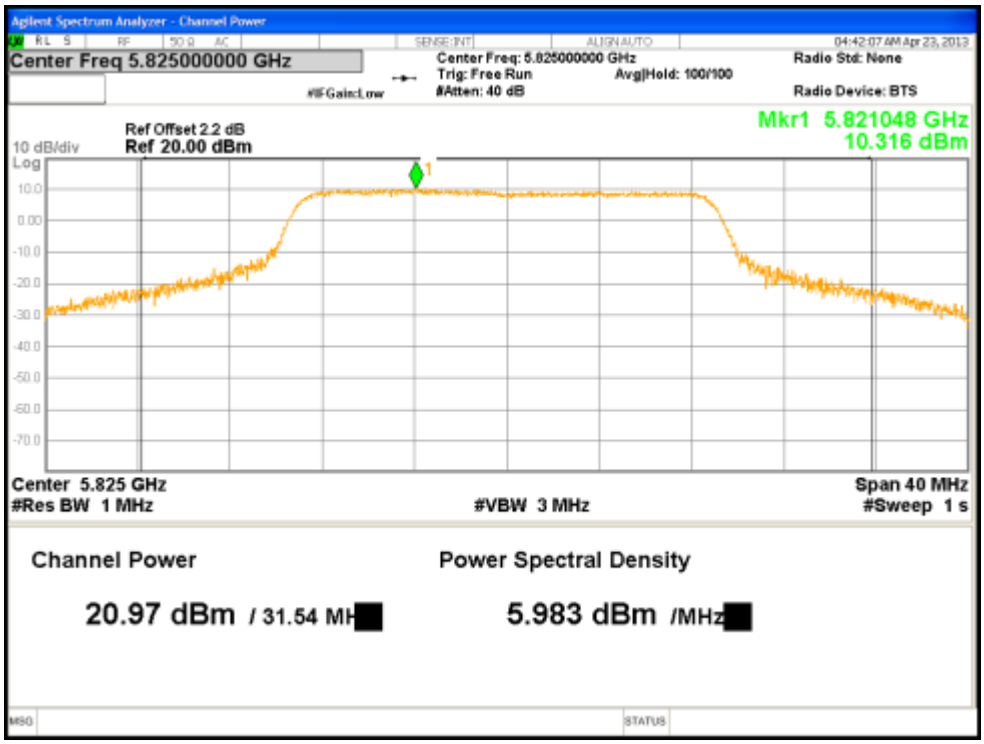


Figure 23: Maximum Transmitted Power, 5825 MHz at HT20, Chain 2

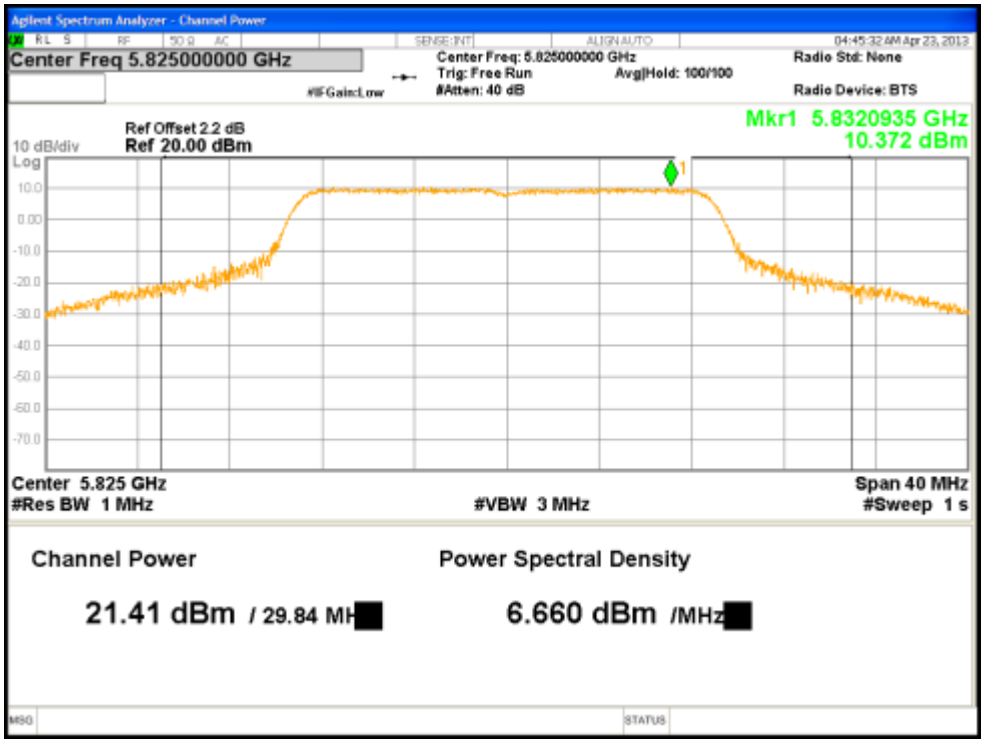


Figure 24: Maximum Transmitted Power, 5825 MHz at HT20, Chain 3

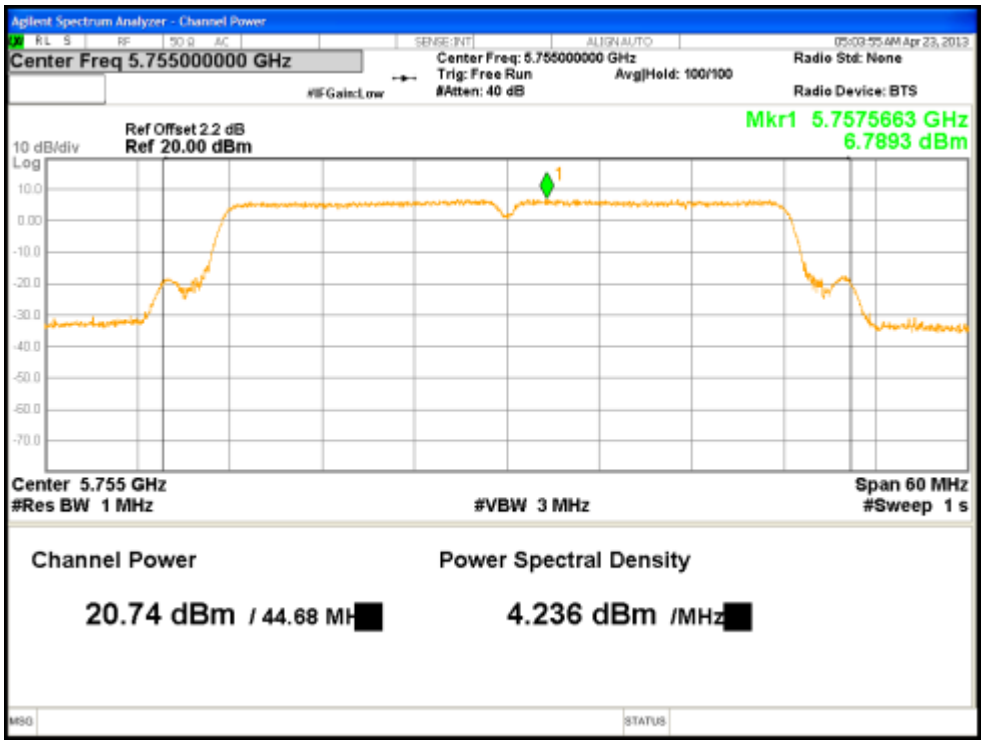


Figure 25: Maximum Transmitted Power, 5755 MHz at HT40, Chain 0

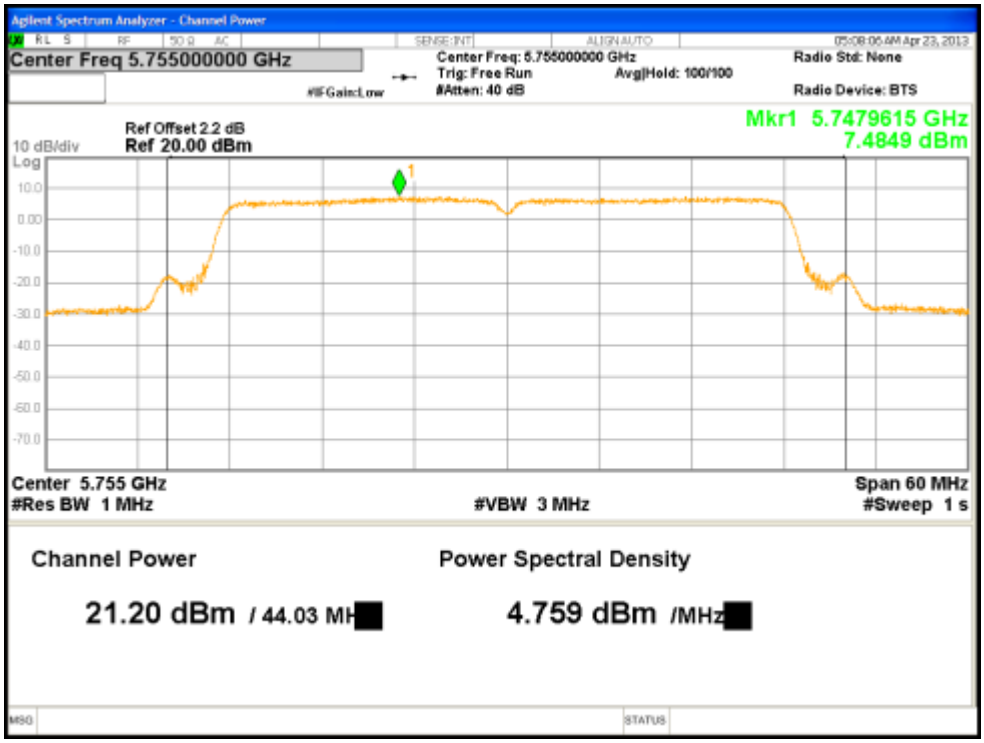


Figure 26: Maximum Transmitted Power, 5755 MHz at HT40, Chain 1

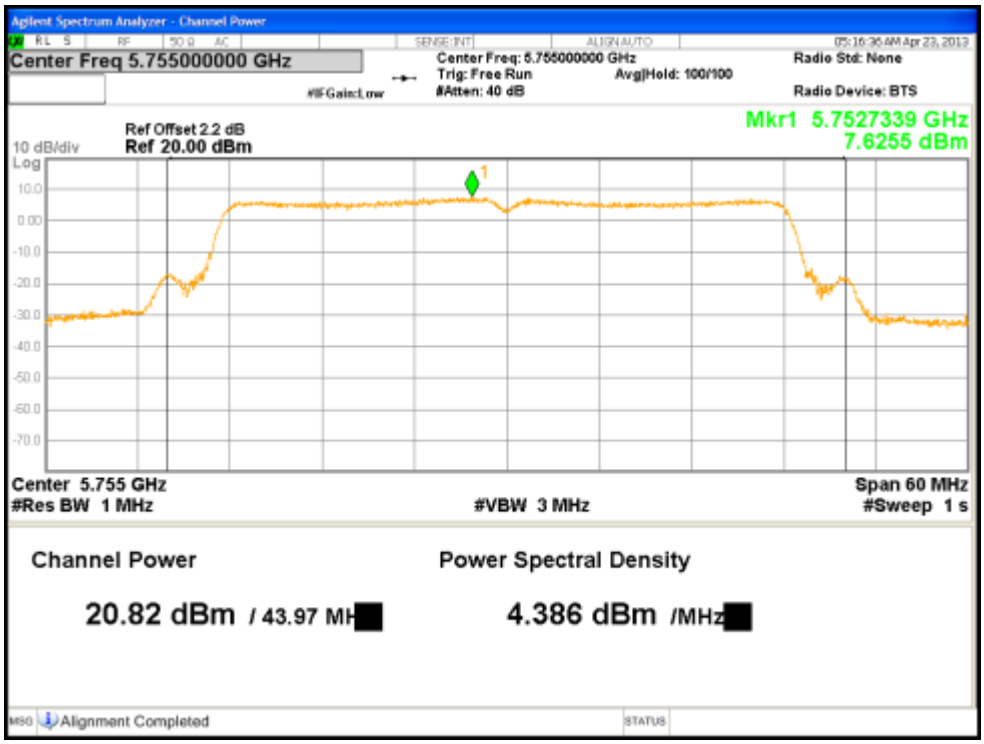


Figure 27: Maximum Transmitted Power, 5755 MHz at HT40, Chain 2

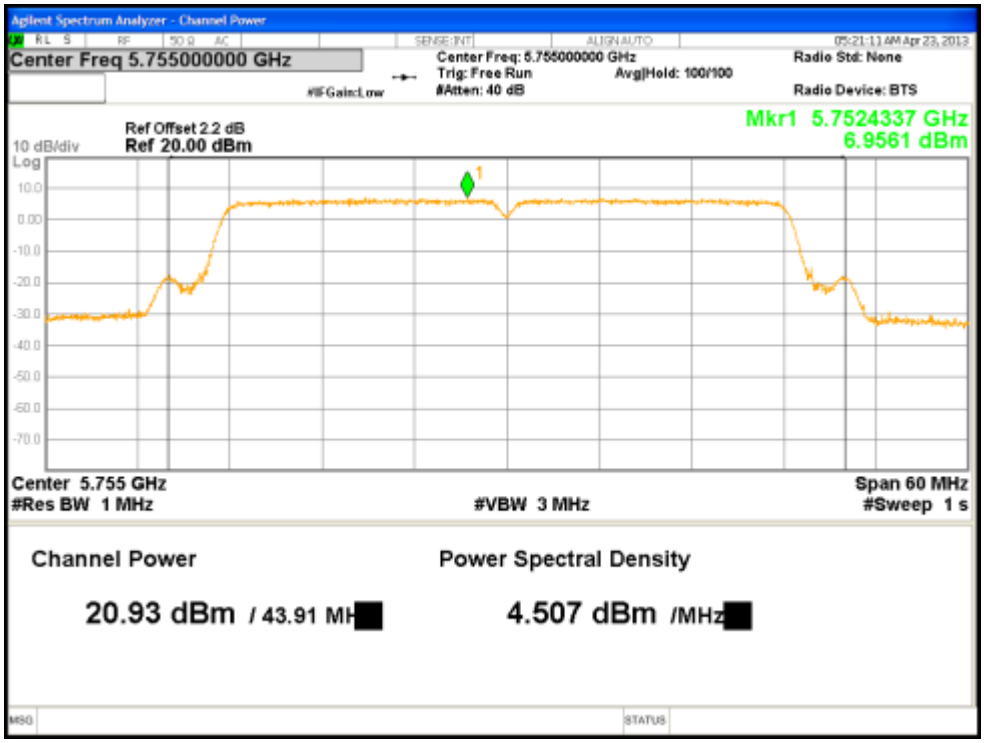


Figure 28: Maximum Transmitted Power, 5755 MHz at HT40, Chain 3

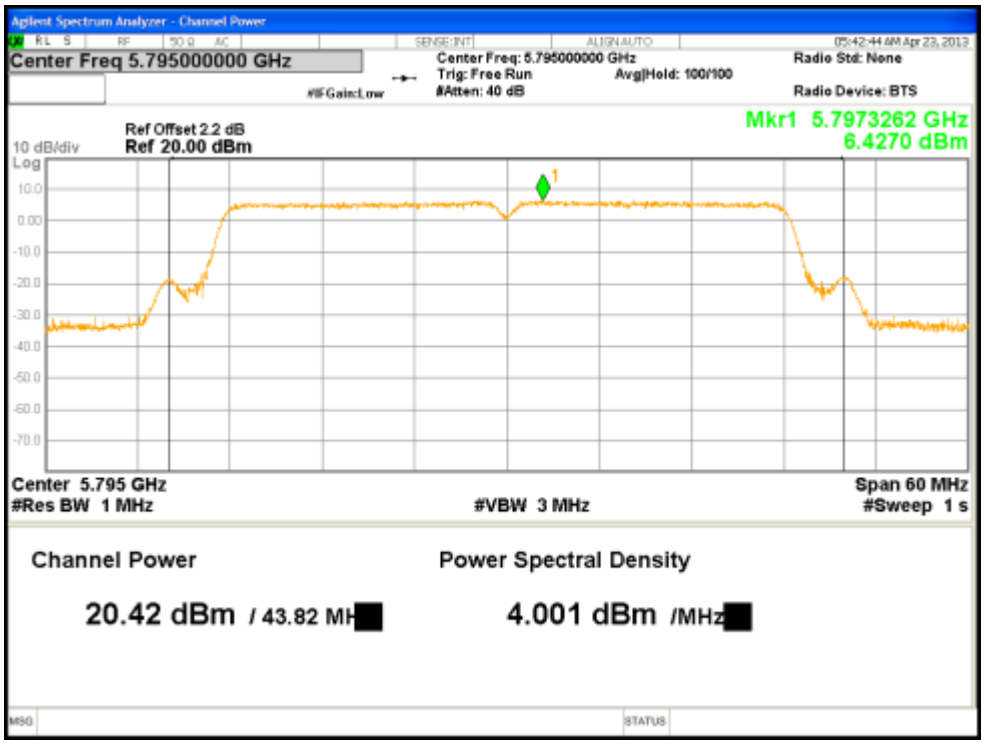


Figure 29: Maximum Transmitted Power, 5795 MHz at HT40, Chain 0

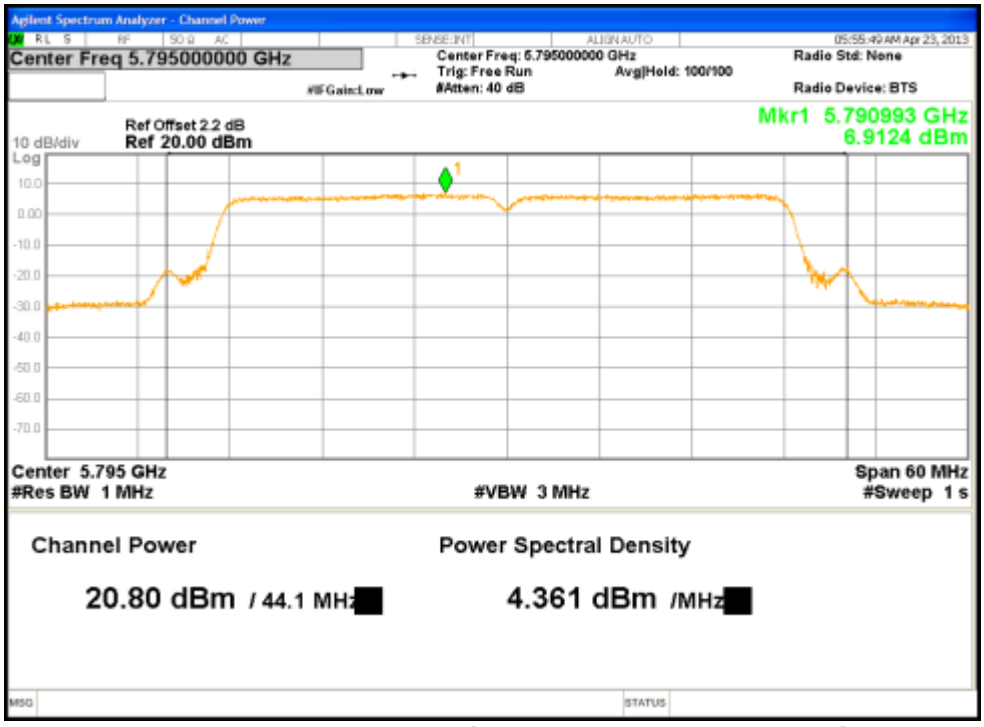


Figure 30: Maximum Transmitted Power, 5795 MHz at HT40, Chain 1

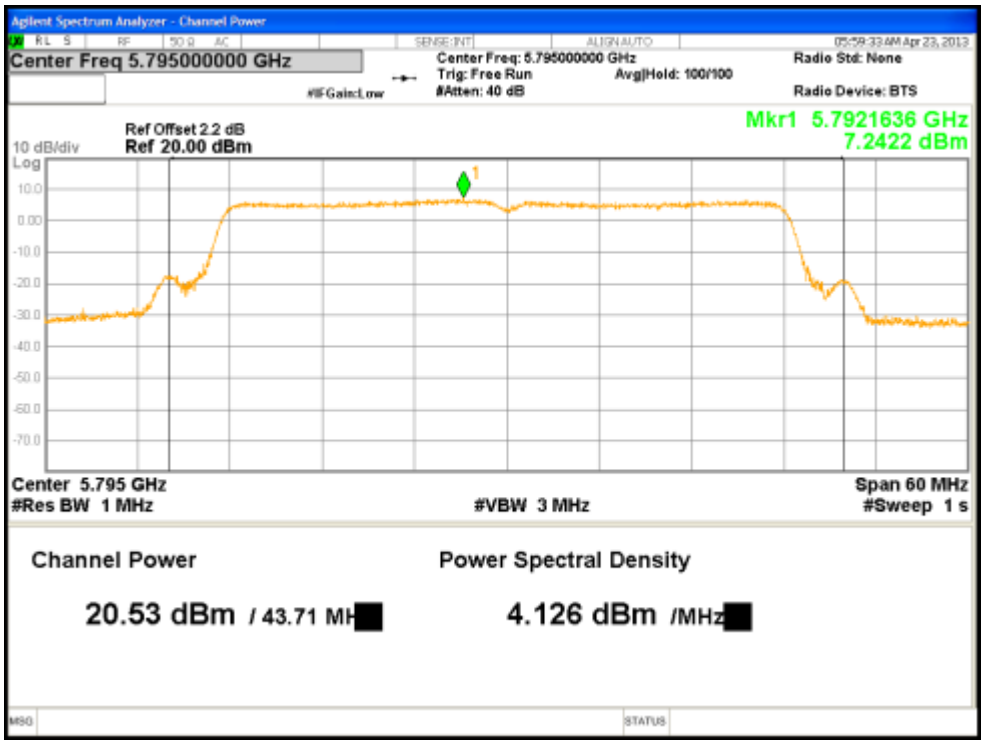


Figure 31: Maximum Transmitted Power, 5795 MHz at HT40, Chain 2

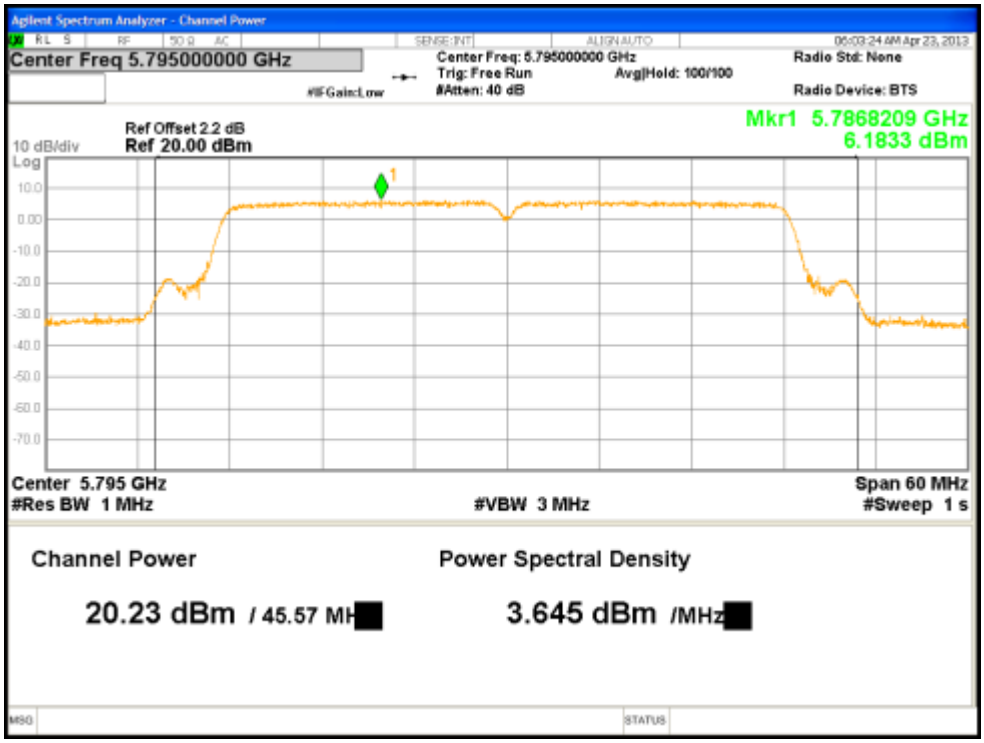


Figure 32: Maximum Transmitted Power, 5795 MHz at HT40, Chain 3

4.2 Occupied Bandwidth

The occupied bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency.

The 99% bandwidth is the bandwidth in which 99% of the transmitted power occupied.

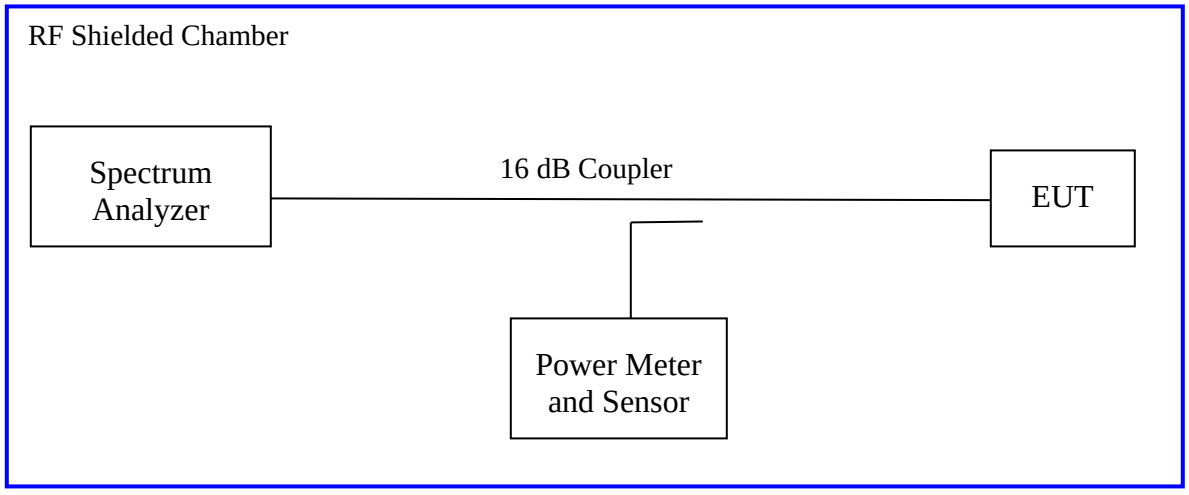
The DTS bandwidth is defined the bandwidth of 6 dBr from highest transmitted level of the fundamental frequency.

The bandwidth shall be at least 500 kHz per Section CFR47 15.247(a2) 2012 and RSS Gen Sect. 4.4.1: 2010.

4.2.1 Test Method

The conducted method was used to measure the occupied bandwidth. The measurement was performed with modulation per CFR47 15.247(a2) 2012 and RSS Gen Sect. 4.4.1:2010. The preliminary investigation was performed to find the narrowest 6 dB bandwidth for each operational mode at different data rates. This worst finding was performed on 3 channels in each operating frequency range; 5725 MHz to 5850 MHz on the sample, S/N 09130M000104. The results indicated below.

Test Setup:



4.2.2 Results

These occupied bandwidth measurements were taken for references only.

Table 4: Occupied Bandwidth – Test Results

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only						
Antenna Type: Integrated		**Power Setting:** See test plan				
Max. Directional Gain: + 8 dBi		**Signal State:** Modulated at 100%.				
Ambient Temp.: 22 °C		**Relative Humidity:**30%				
Bandwidth (MHz) for 802.11a						
Freq. (MHz)	**Limit (kHz)**	**DTS Bandwidth (MHz)**				
		Ch0	**Ch1**	**Ch2**	**Ch3**	**Results**
5745	500	16.373	16.373	16.358	16.388	Pass
5785	500	16.373	16.418	16.358	16.403	Pass
5825	500	16.328	16.388	16.358	16.373	Pass
Freq. (MHz)	**Limit (kHz)**	**99% Bandwidth (MHz)**				
		Ch0	**Ch1**	**Ch2**	**Ch3**	**Results**
5745		17.108	17.061	17.085	17.112	
5785		17.118	17.034	17.178	17.129	
5825		17.132	17.007	17.275	17.125	
Note: The narrowest bandwidth was observed at 802.11a, 6 Mbps						

Bandwidth (MHz) for 802.11n HT20						
Freq. (MHz)	**Limit (kHz)**	**DTS Bandwidth (MHz)**				
		Ch0	**Ch1**	**Ch2**	**Ch3**	**Results**
5745	500	17.604	17.679	17.574	17.634	Pass
5785	500	17.619	17.634	17.589	17.619	Pass
5825	500	17.559	17.604	17.634	17.619	Pass

Freq. (MHz)	Limit (kHz)	99% Bandwidth (MHz)				
		Ch0	Ch1	Ch2	Ch3	Results
5745		18.124	18.375	18.037	18.115	
5785		18.123	18.397	18.054	18.118	
5825		18.180	18.326	18.159	18.127	
Note: The narrowest bandwidth was observed at 802.11n HT20, 6.5 Mbps						
Bandwidth (MHz) for 802.11n HT40						
Freq. (MHz)	**Limit (kHz)**	**DTS Bandwidth (MHz)**				
		Ch0	**Ch1**	**Ch2**	**Ch3**	**Results**
5755	500	36.293	36.293	36.268	26.293	Pass
5795	500	36.293	36.143	36.293	36.293	Pass
Freq. (MHz)	**Limit (kHz)**	**99% Bandwidth (MHz)**				
		Ch0	**Ch1**	**Ch2**	**Ch3**	**Results**
5755		36.488	36.649	36.634	36.251	
5795		36.492	36.709	36.610	36.257	
Note: The bandwidth was observed at 802.11n HT40, 13.5 Mbps.						

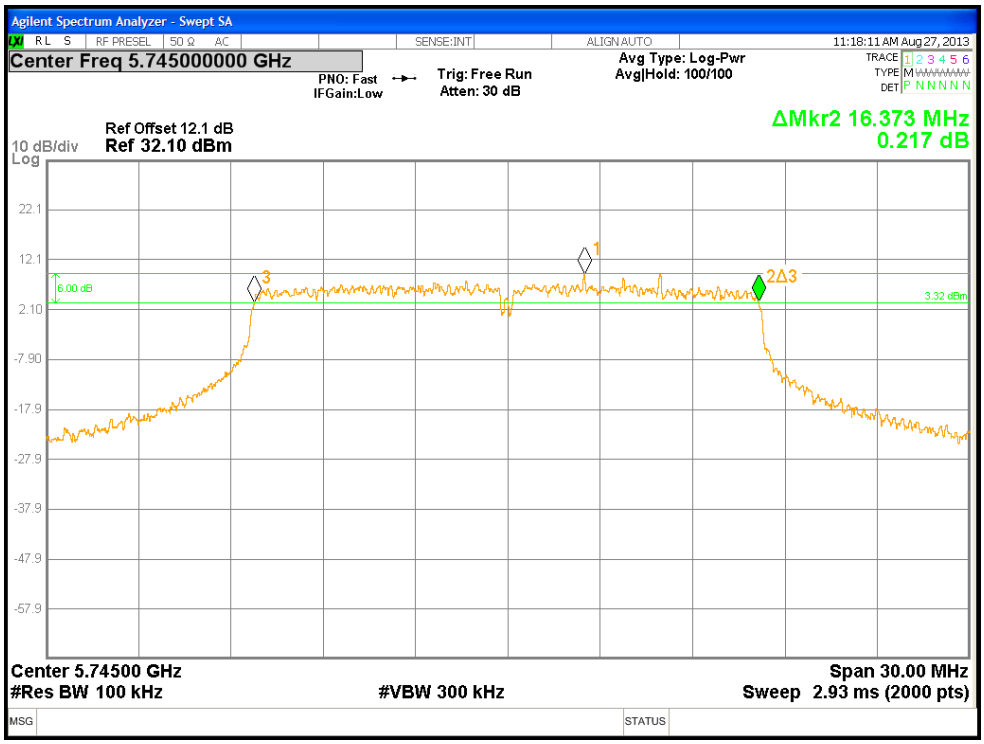


Figure 33: DTS Bandwidth at 5745 MHz, 802.11A, Chain 0

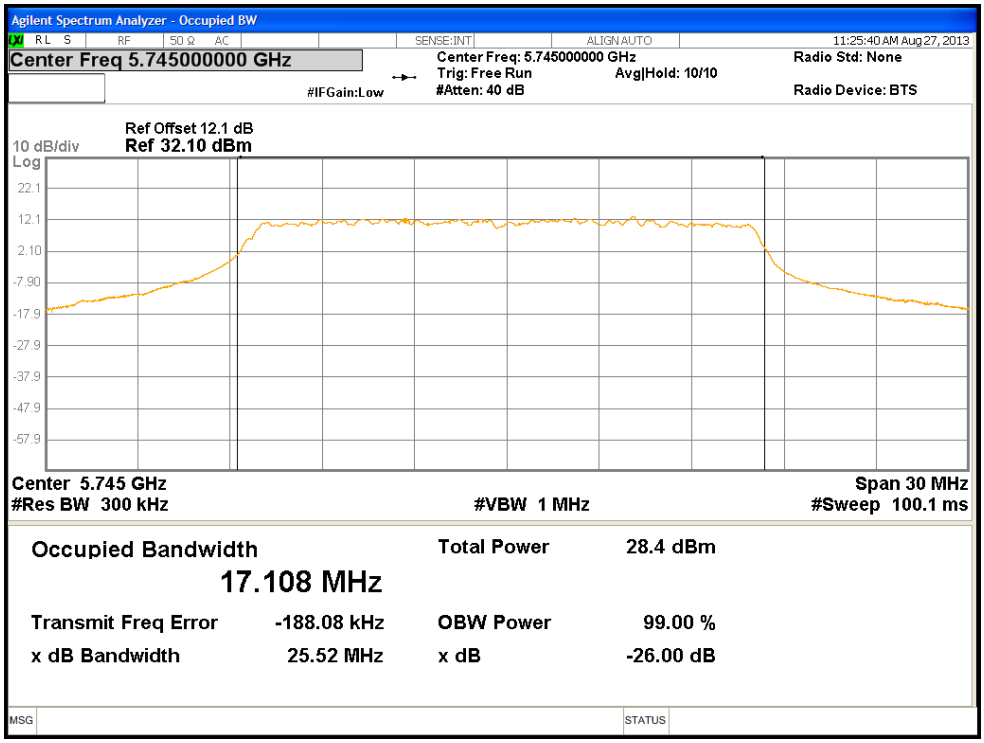


Figure 34: 99% Bandwidth at 5745 MHz, 802.11A, Chain 0

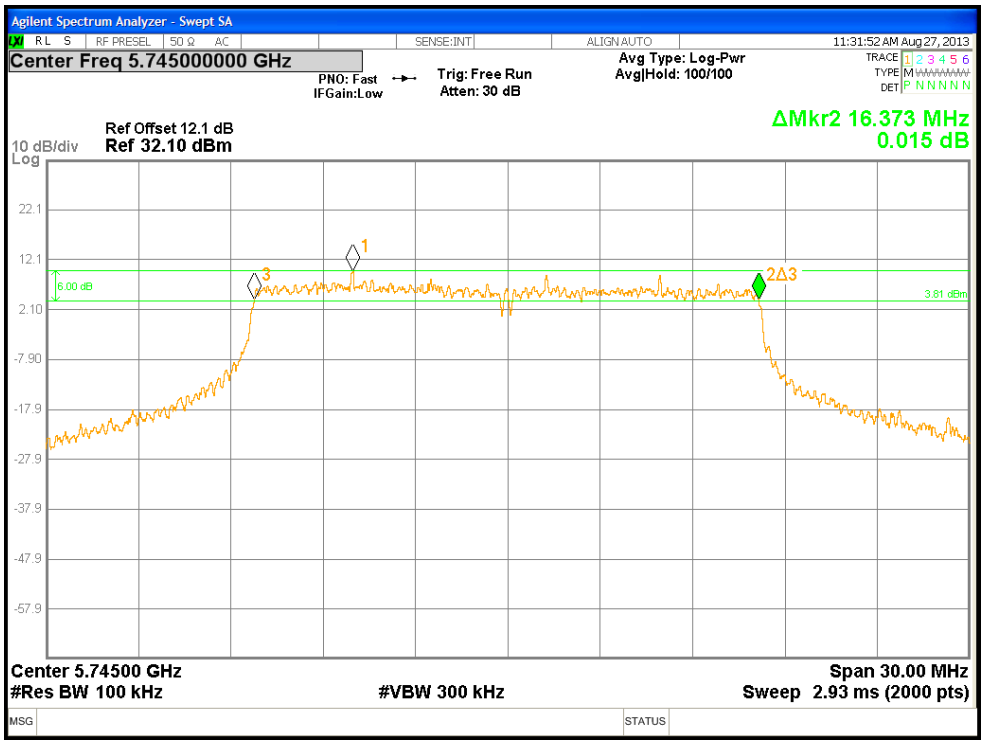


Figure 35: DTS Bandwidth at 5745 MHz, 802.11A, Chain 1

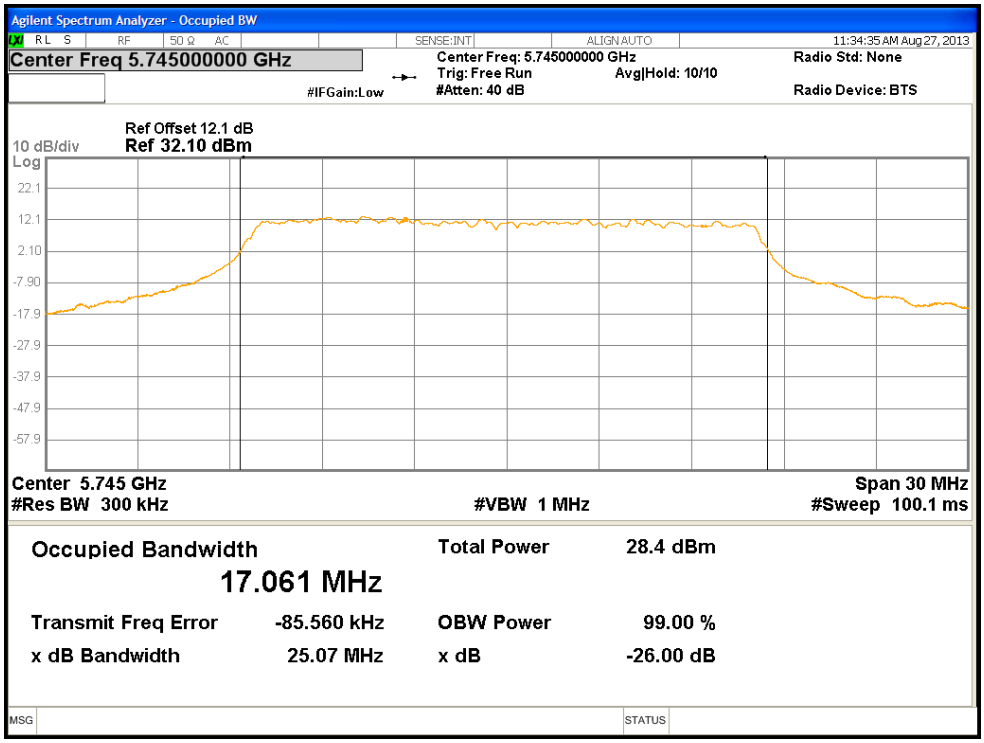


Figure 36: 99% Bandwidth at 5745 MHz, 802.11A, Chain 1

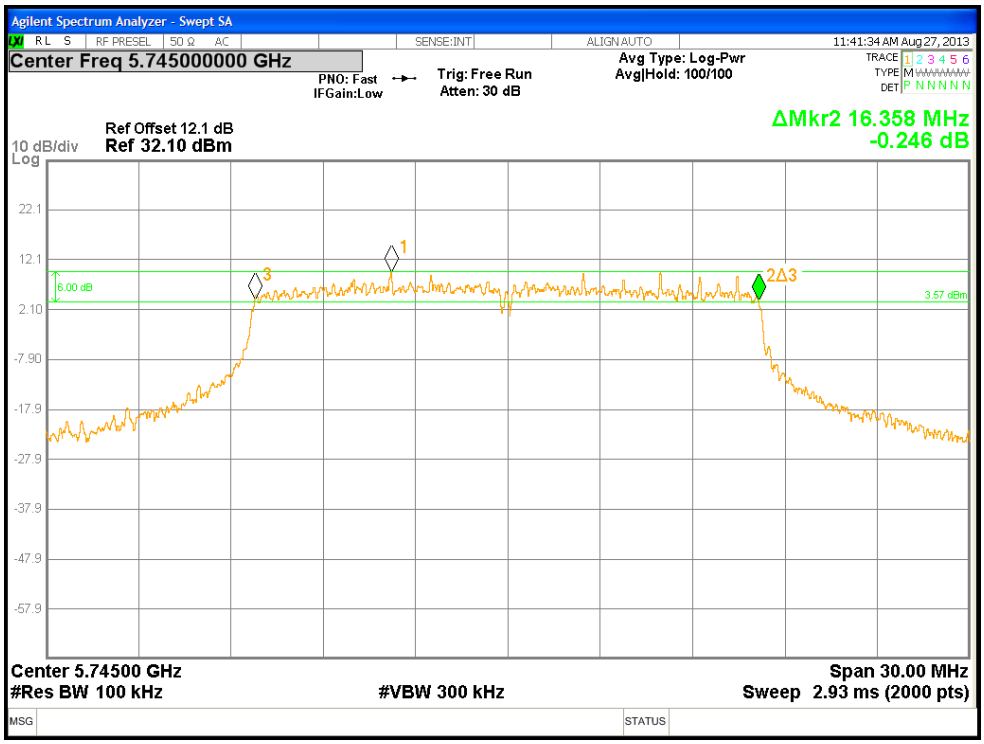


Figure 37: DTS Bandwidth at 5745 MHz, 802.11A, Chain 2

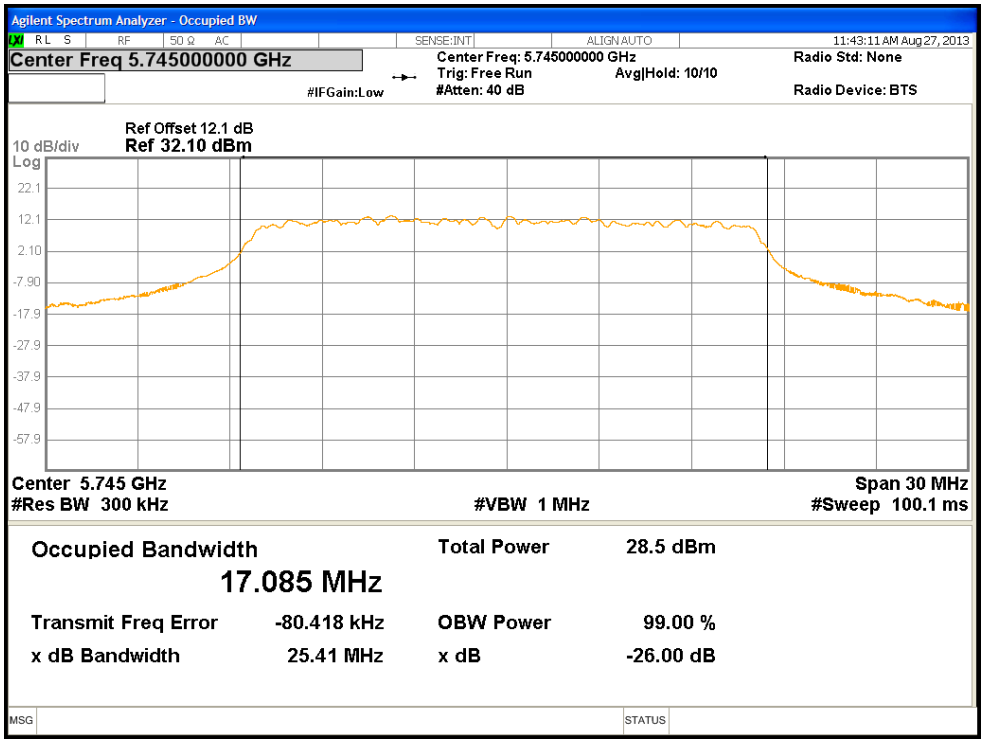


Figure 38: 99% Bandwidth at 5745 MHz, 802.11A, Chain 2

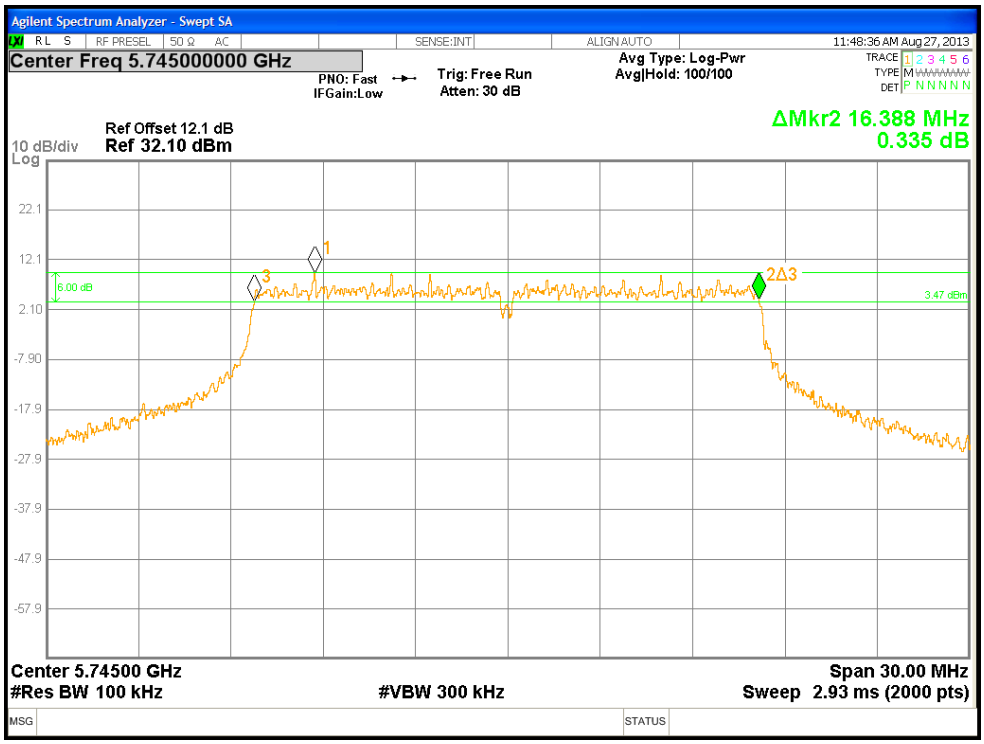


Figure 39: DTS Bandwidth at 5745 MHz, 802.11A, Chain 3

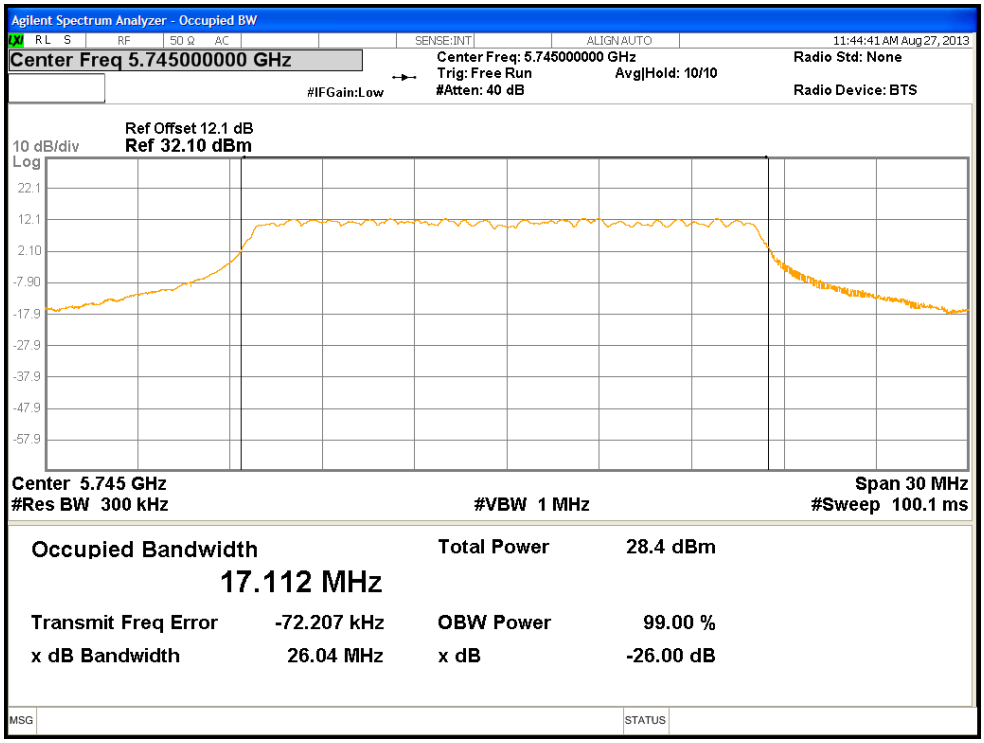


Figure 40: 99% Bandwidth at 5745 MHz, 802.11A, Chain 3

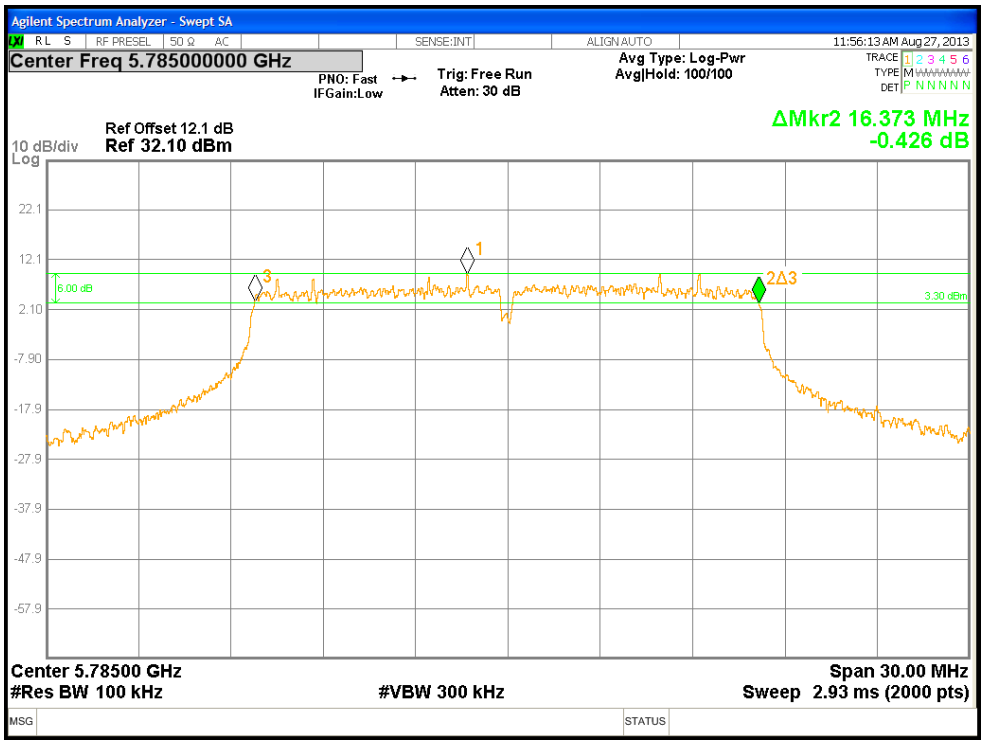


Figure 41: DTS Bandwidth at 5785 MHz, 802.11A, Chain 0

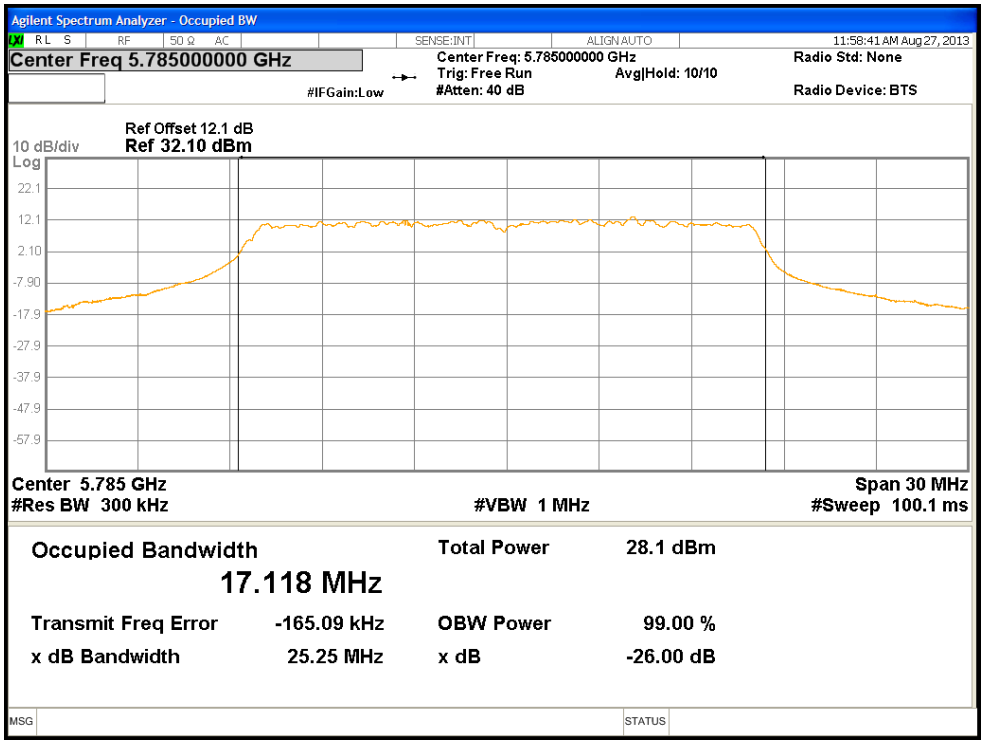


Figure 42: 99% Bandwidth at 5785 MHz, 802.11A, Chain 0

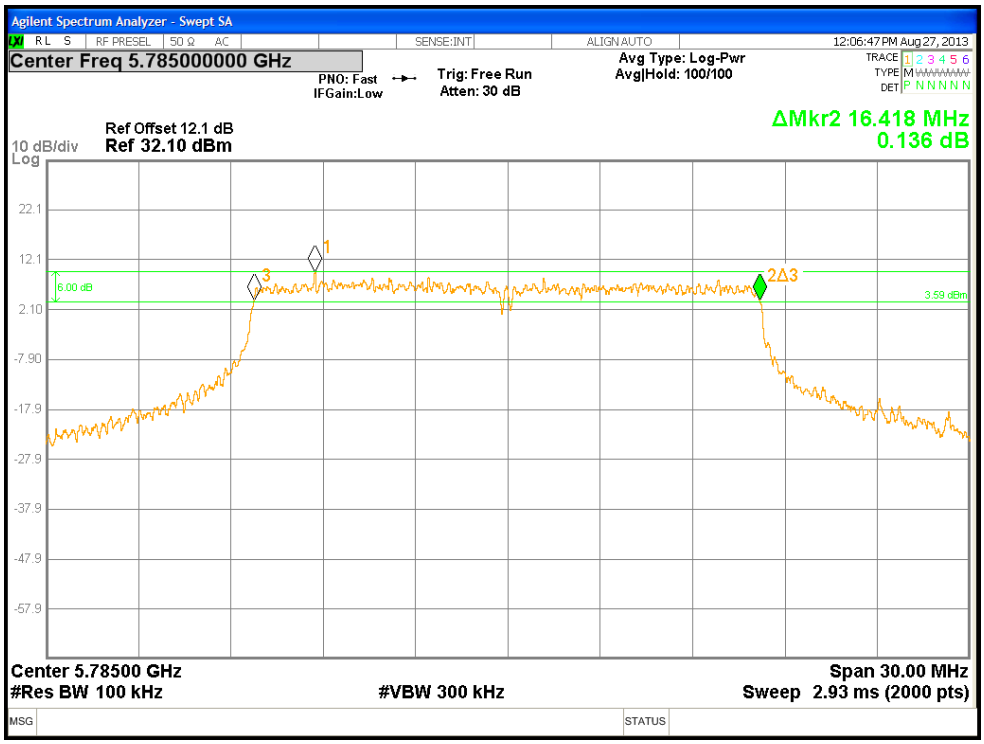


Figure 43: DTS Bandwidth at 5785 MHz, 802.11A, Chain 1

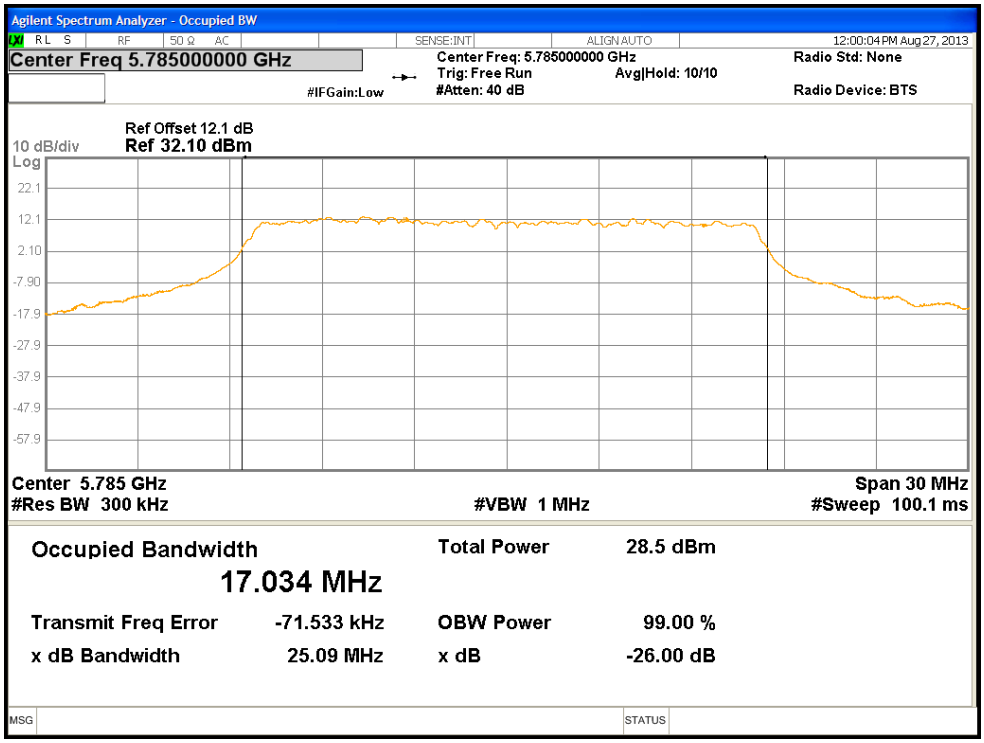


Figure 44: 99% Bandwidth at 5785 MHz, 802.11A, Chain 1

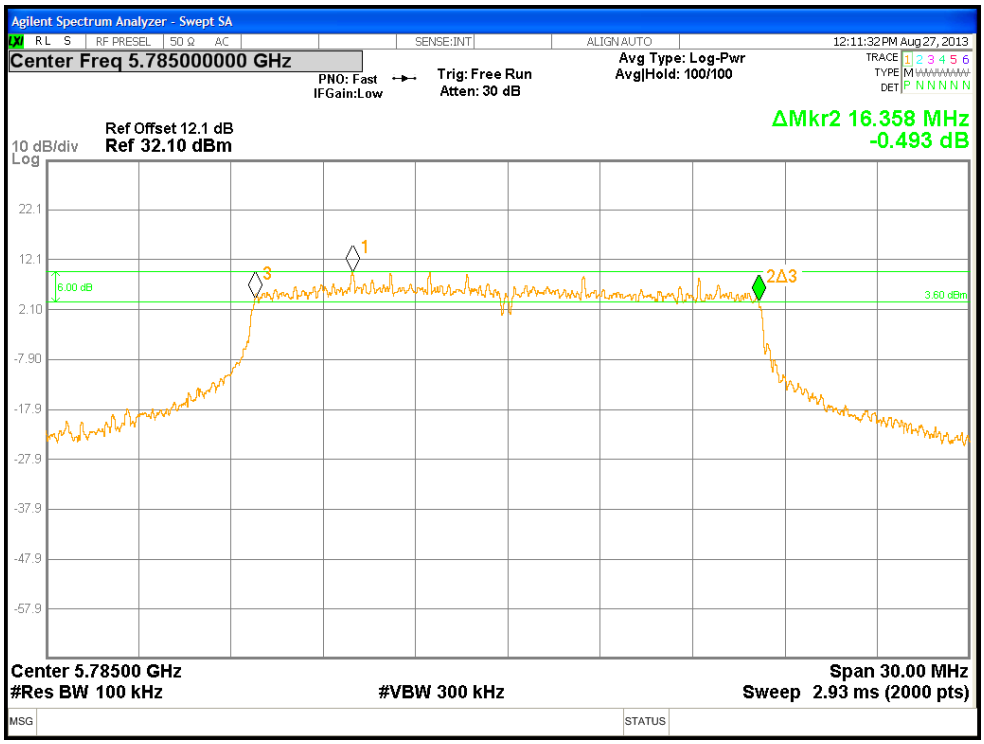


Figure 45: DTS Bandwidth at 5785 MHz, 802.11A, Chain 2

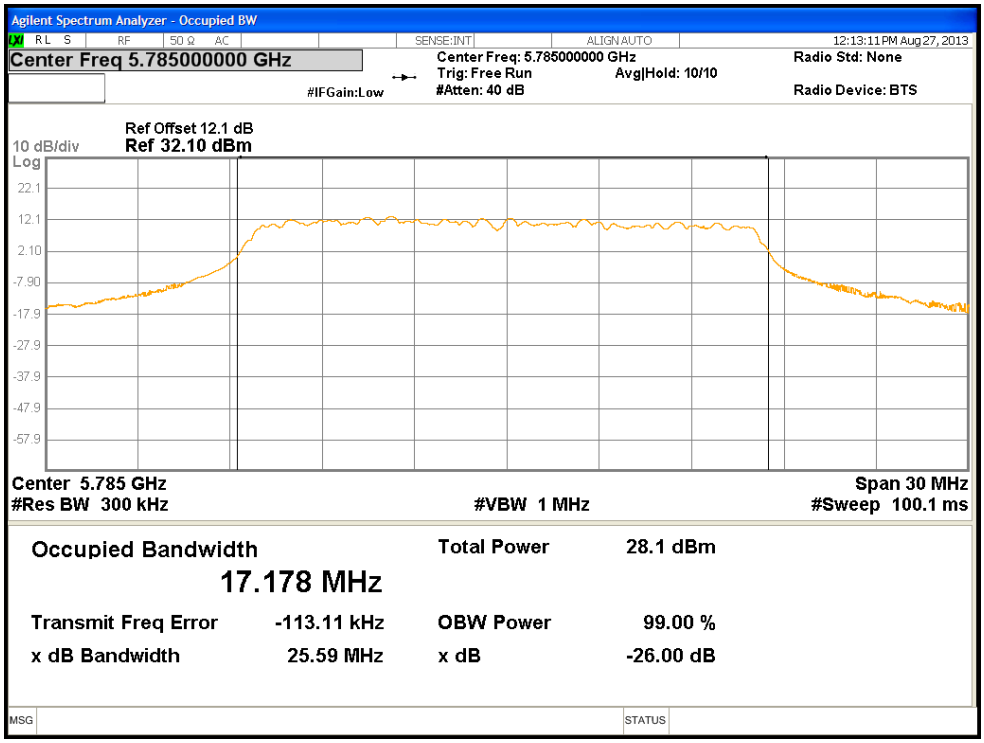


Figure 46: 99% Bandwidth at 5785 MHz, 802.11A, Chain 2

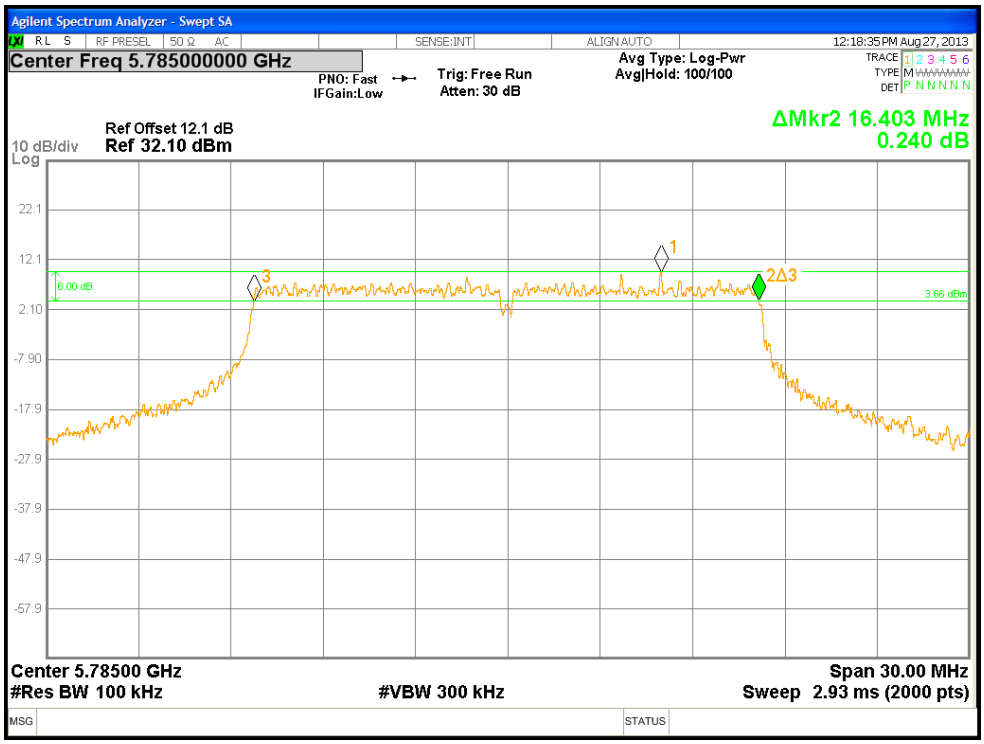


Figure 47: DTS Bandwidth at 5785 MHz, 802.11A, Chain 3

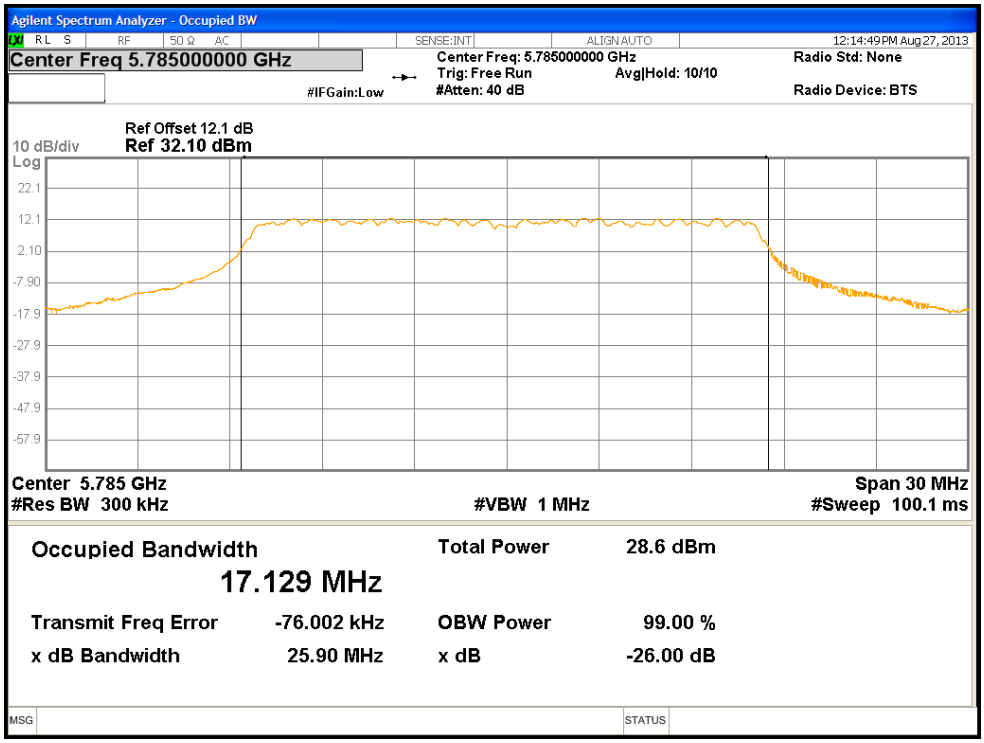


Figure 48: 99% Bandwidth at 5785 MHz, 802.11A, Chain 3

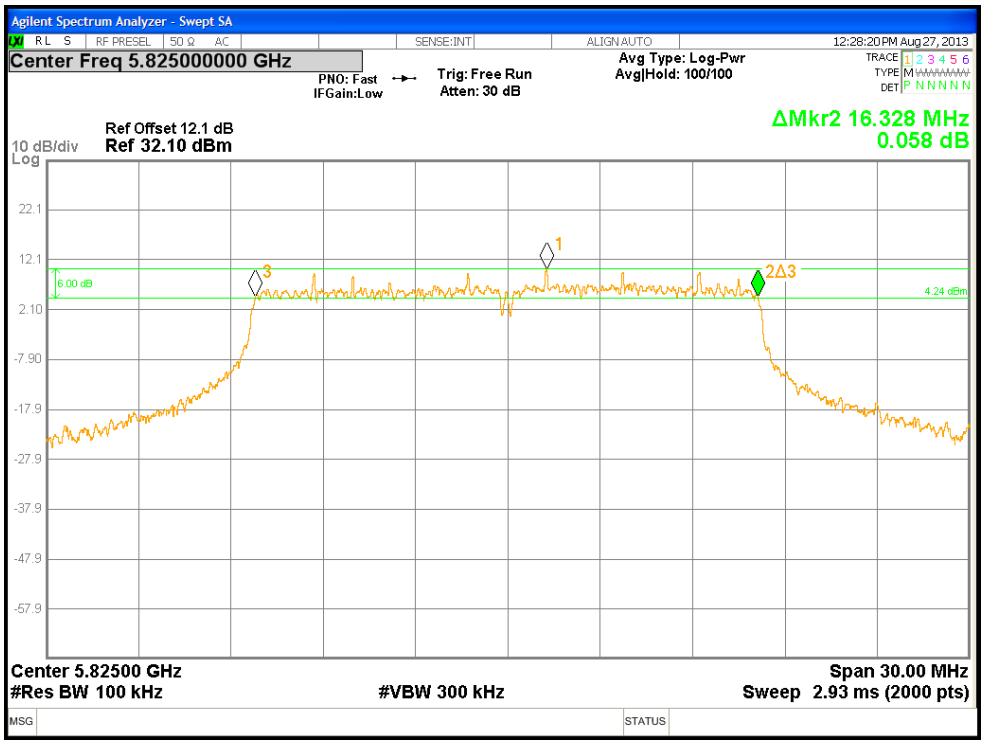


Figure 49: DTS Bandwidth at 5825 MHz, 802.11A, Chain 0

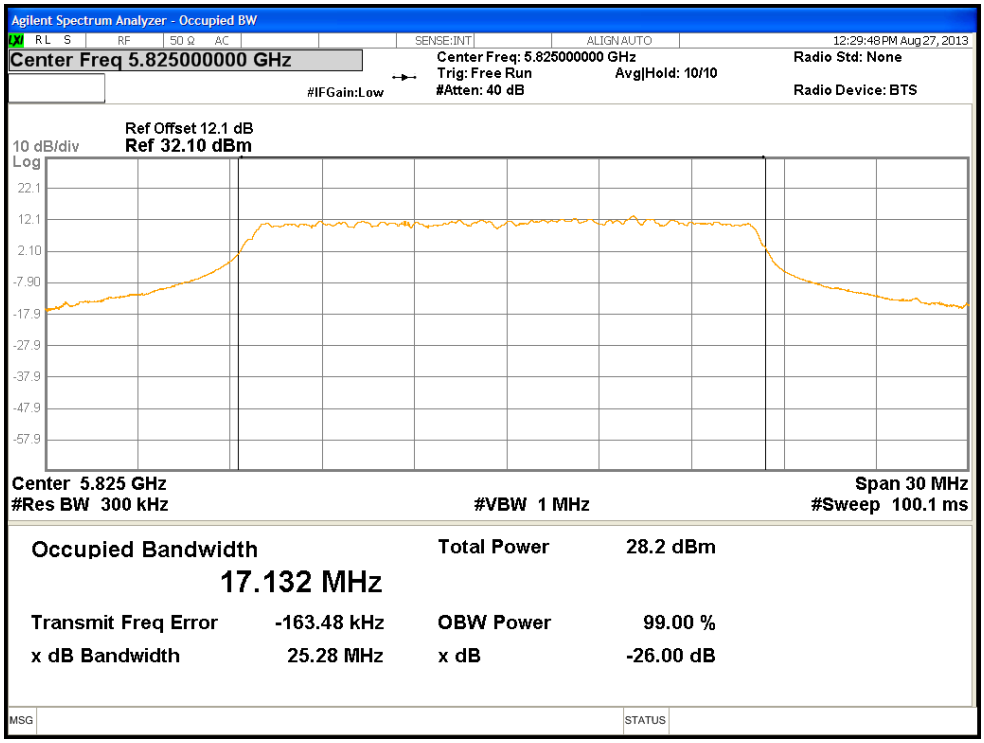


Figure 50: 99% Bandwidth at 5825 MHz, 802.11A, Chain 0

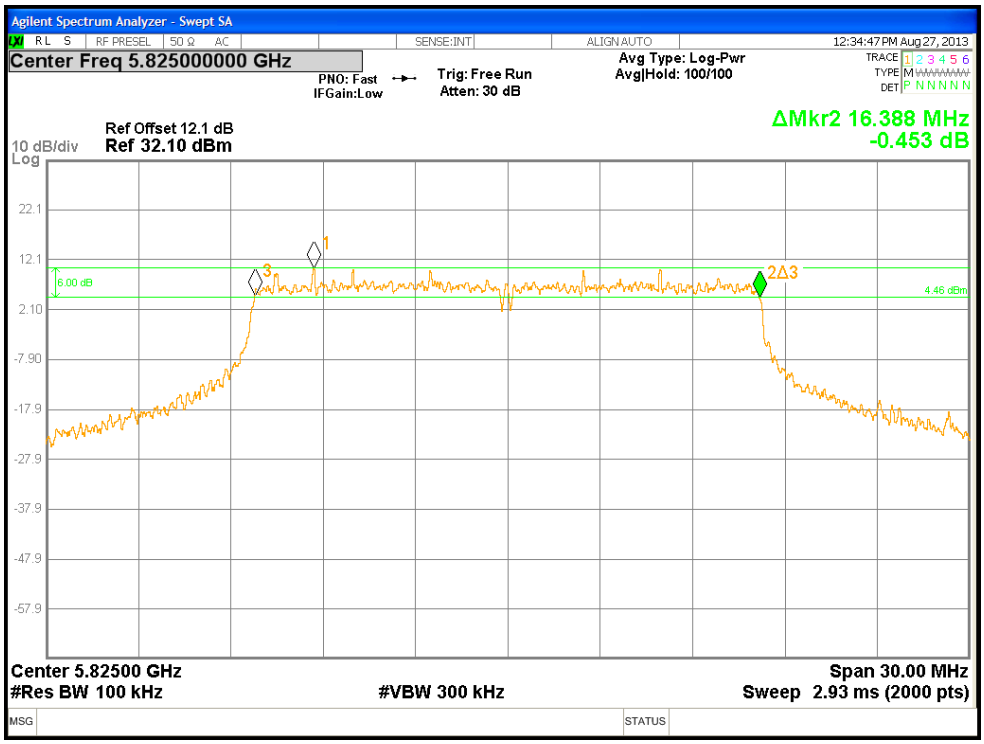


Figure 51: DTS Bandwidth at 5825 MHz, 802.11A, Chain 1

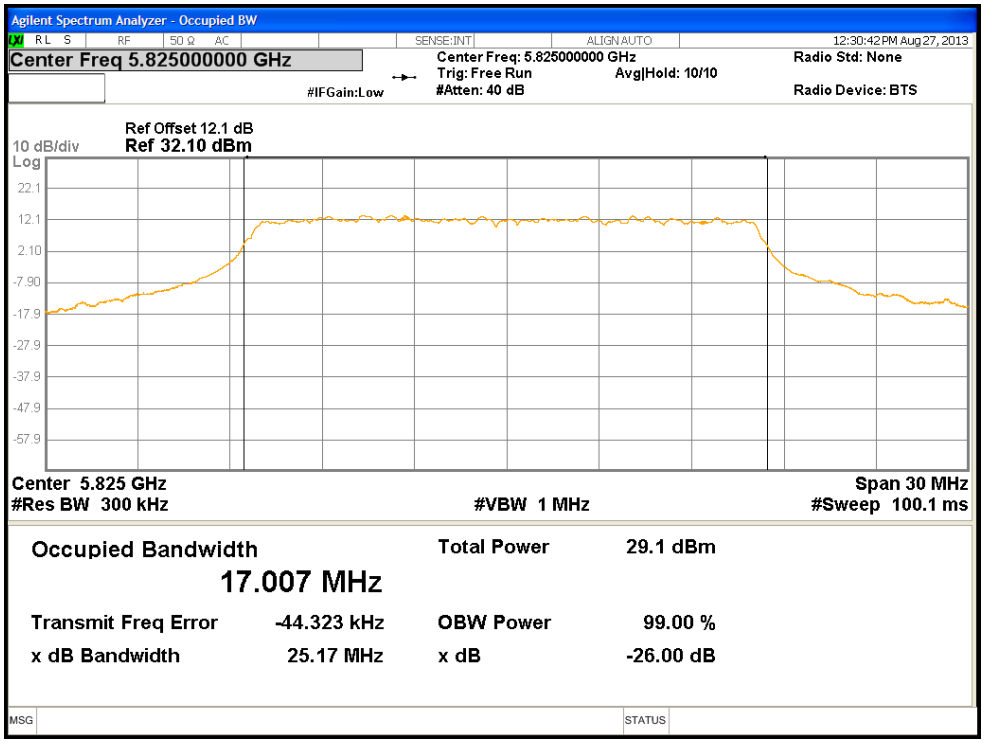


Figure 52: 99% Bandwidth at 5825 MHz, 802.11A, Chain 1

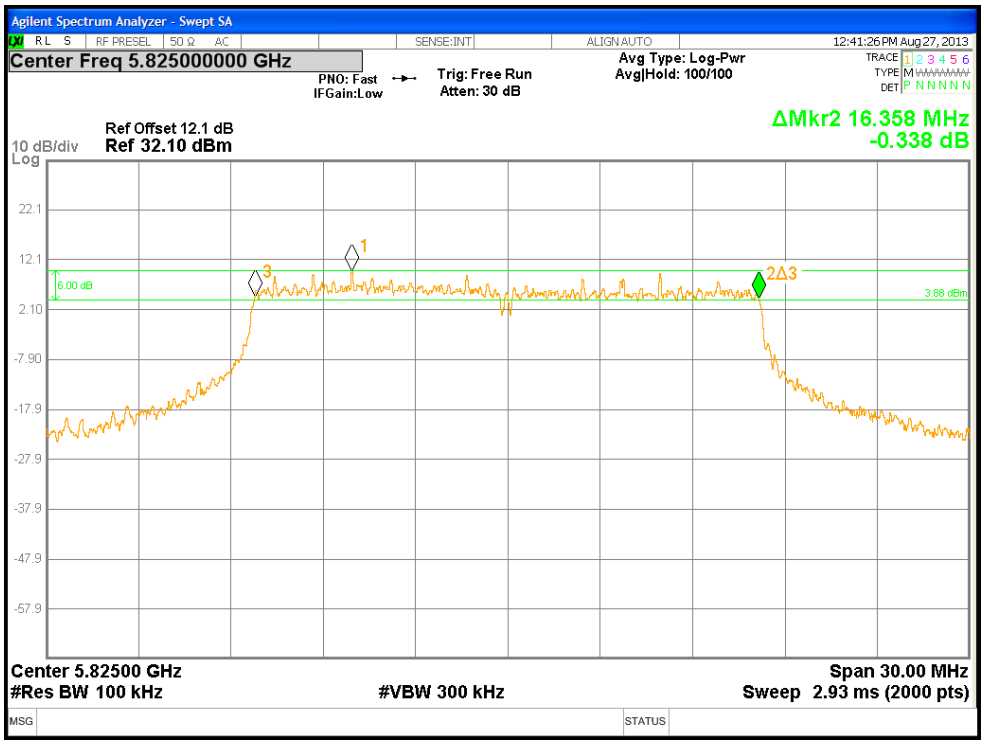


Figure 53: DTS Bandwidth at 5825 MHz, 802.11A, Chain 2

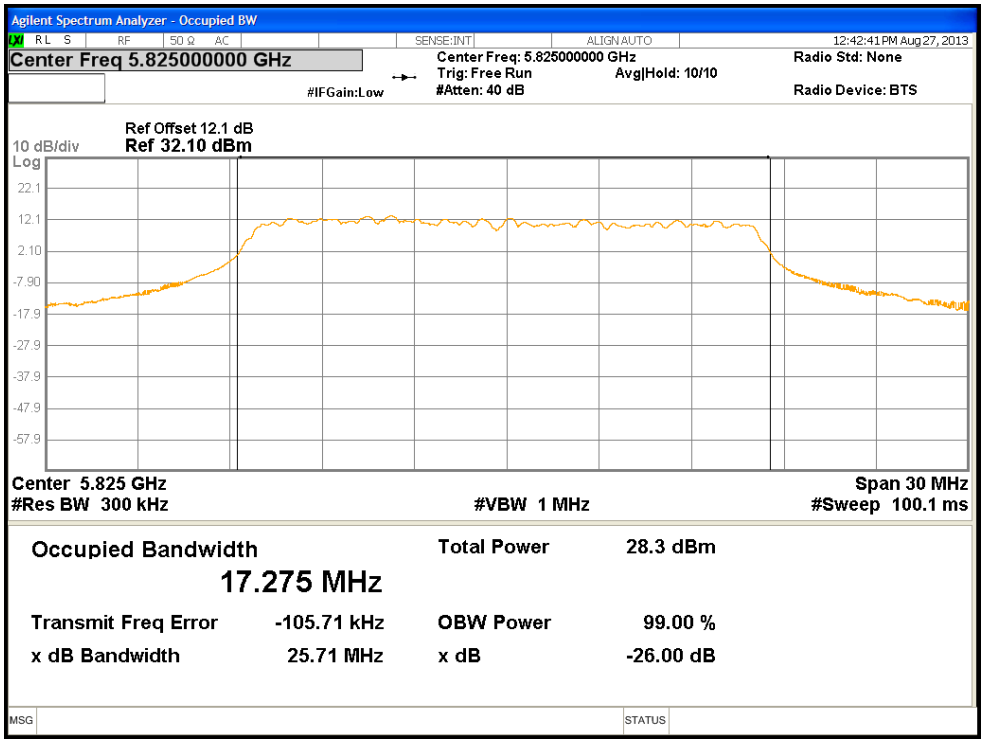


Figure 54: 99% Bandwidth at 5825 MHz, 802.11A, Chain 2

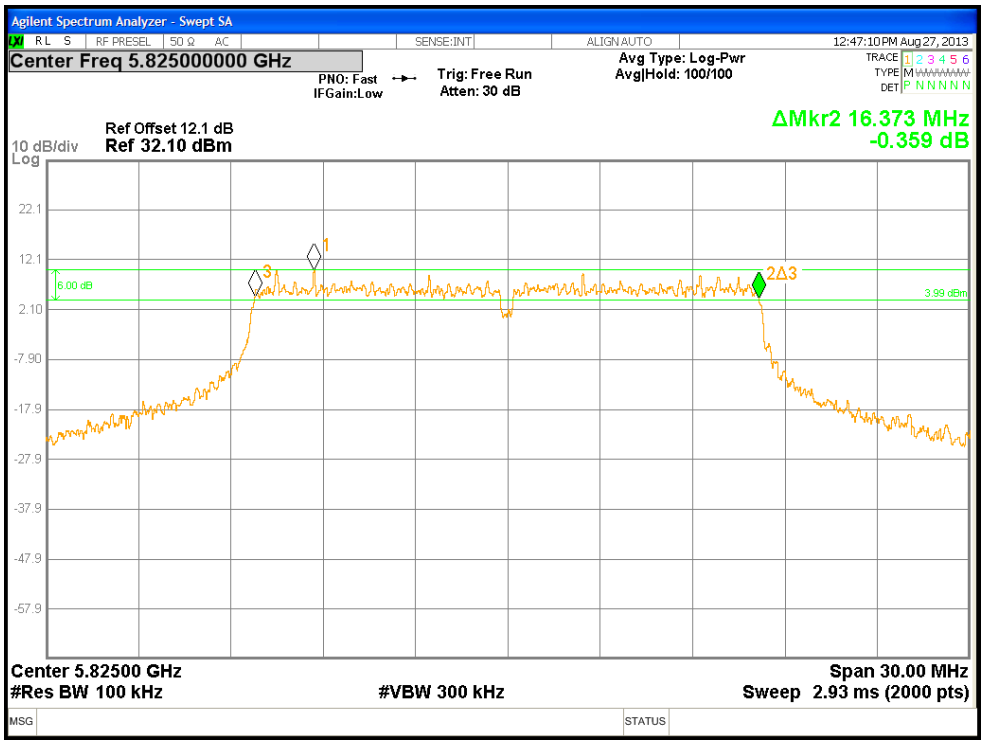


Figure 55: DTS Bandwidth at 5825 MHz, 802.11A, Chain 3

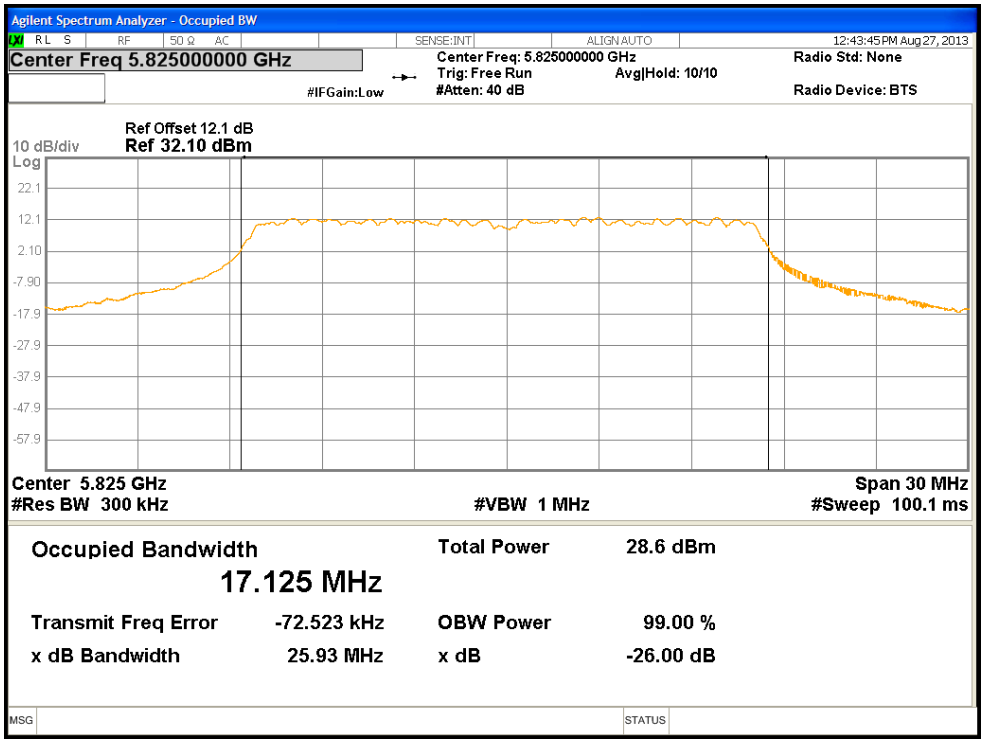


Figure 56: 99% Bandwidth at 5825 MHz, 802.11A, Chain 3

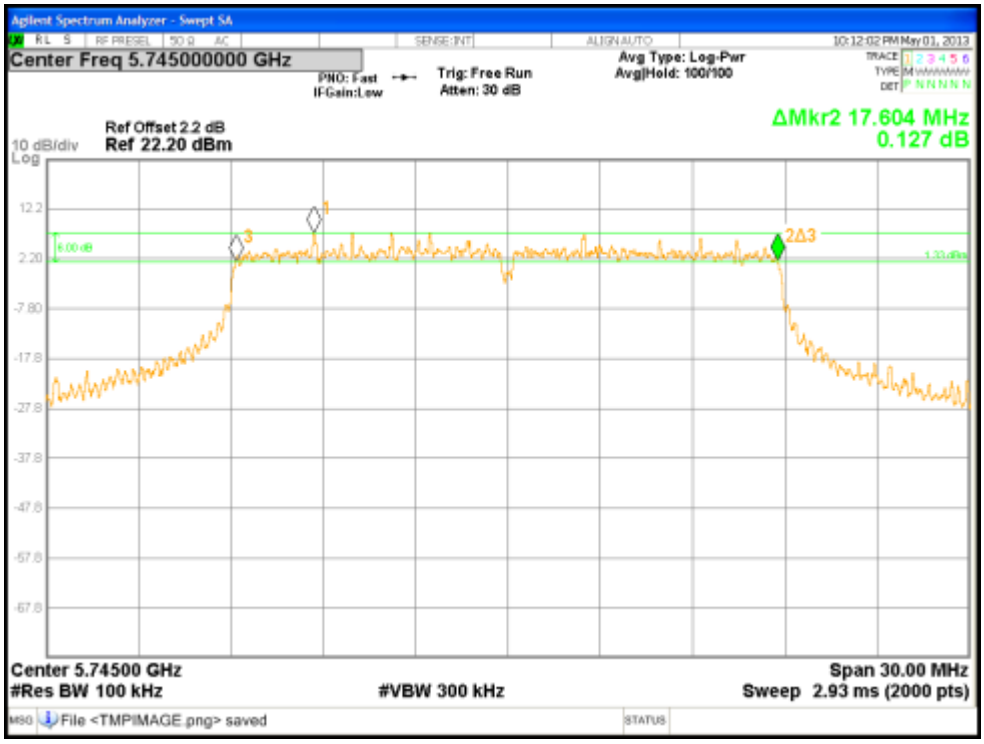


Figure 57: DTS Bandwidth at 5745 MHz, HT20, Chain 0

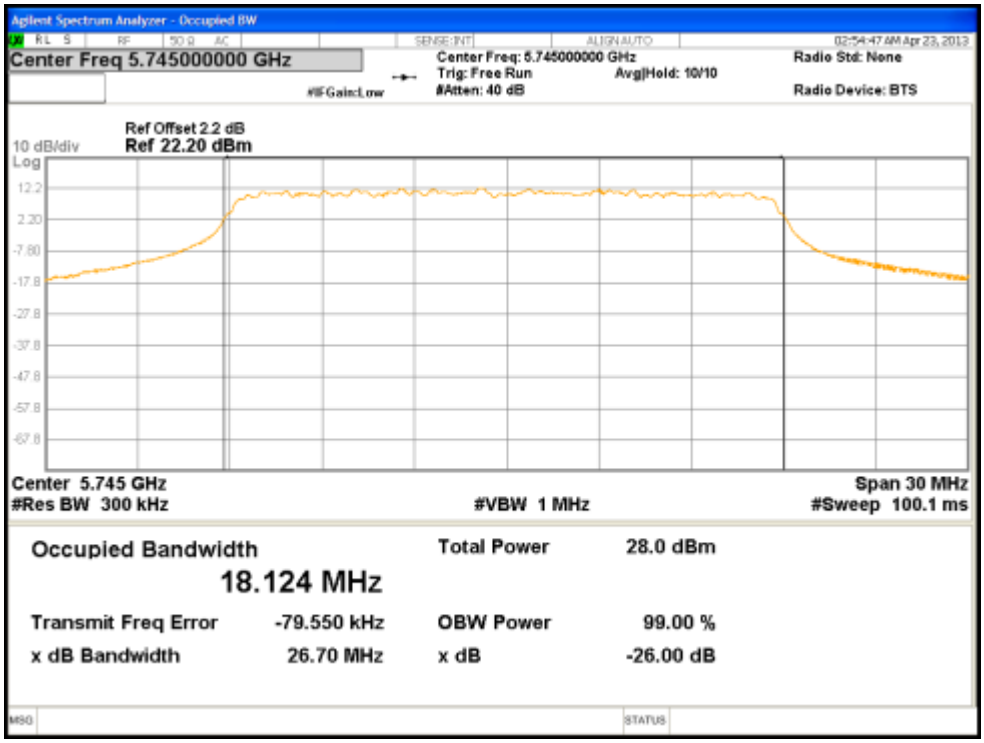


Figure 58: 99% Bandwidth at 5745 MHz, HT20, Chain 0

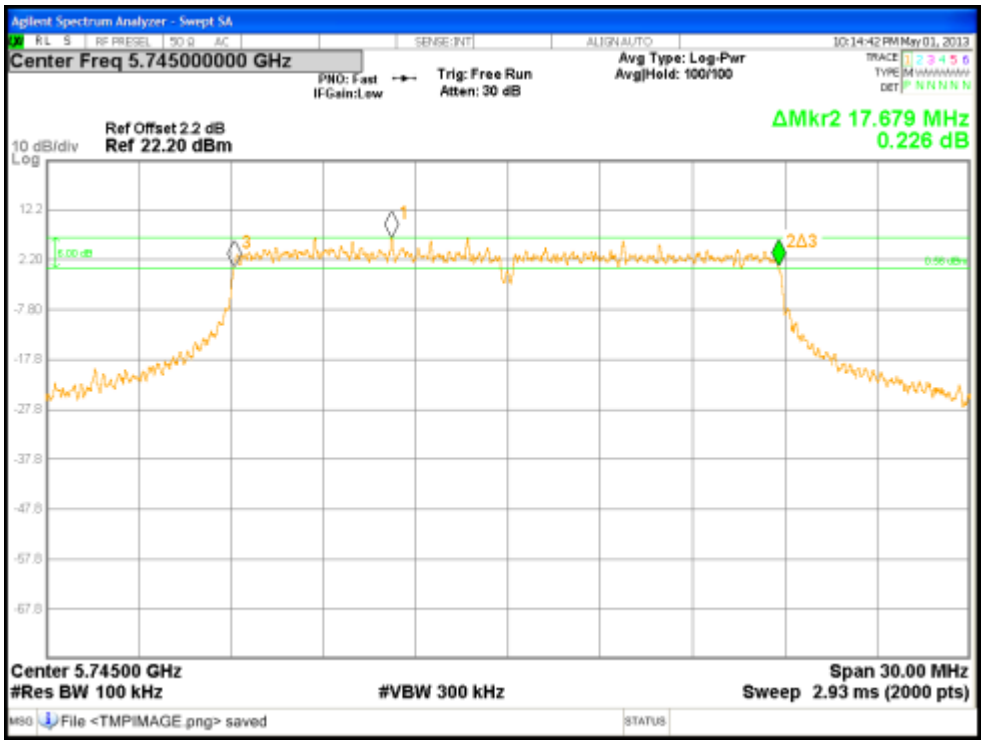


Figure 59: DTS Bandwidth at 5745 MHz, HT20, Chain 1

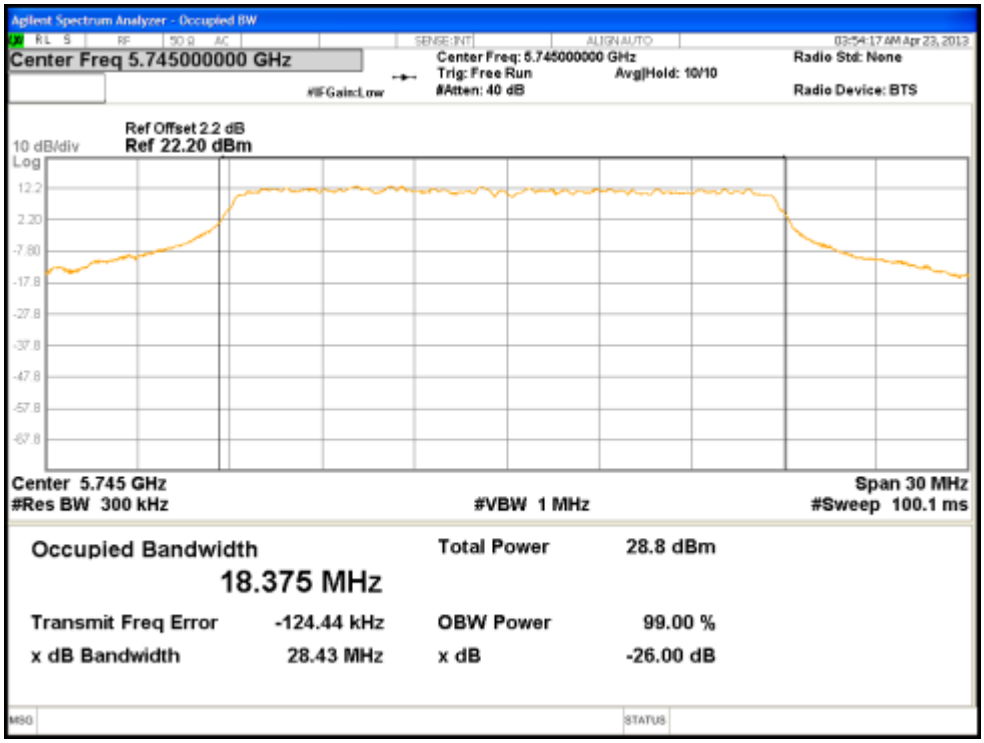


Figure 60: 99% Bandwidth at 5745 MHz, HT20, Chain 1

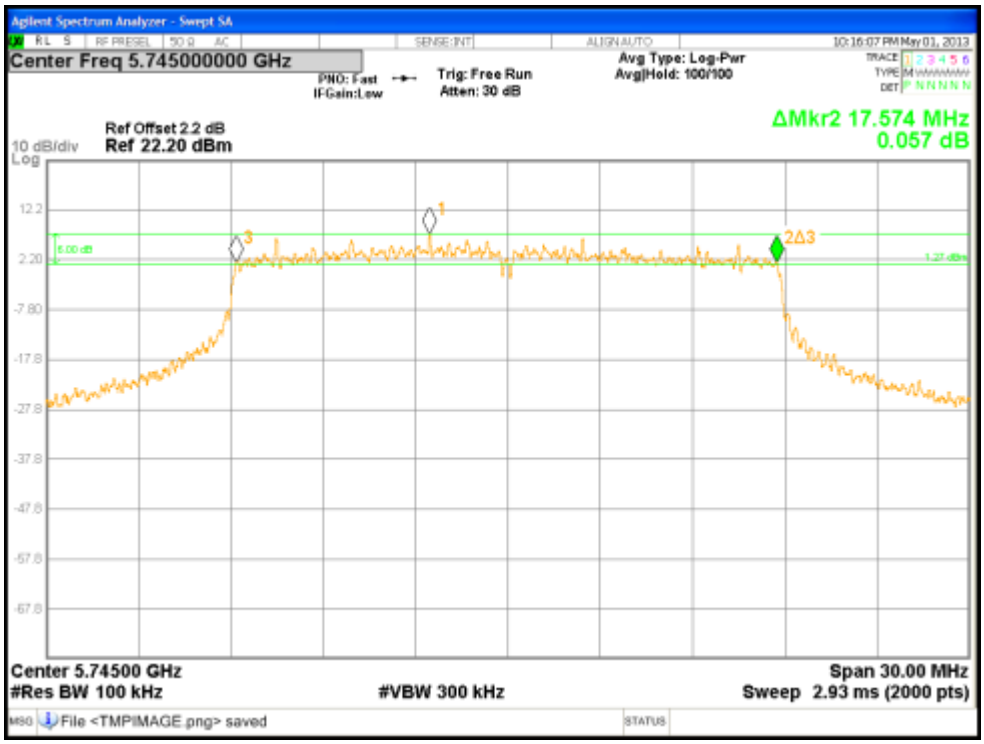


Figure 61: DTS Bandwidth at 5745 MHz, HT20, Chain 2

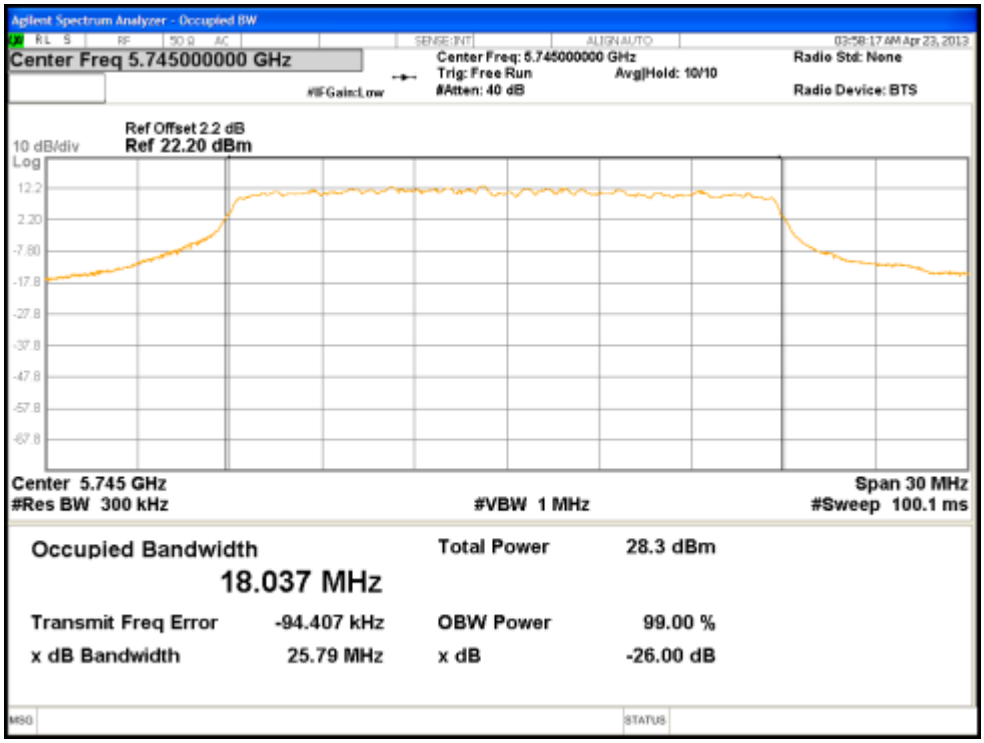


Figure 62: 99% Bandwidth at 5745 MHz, HT20, Chain 2

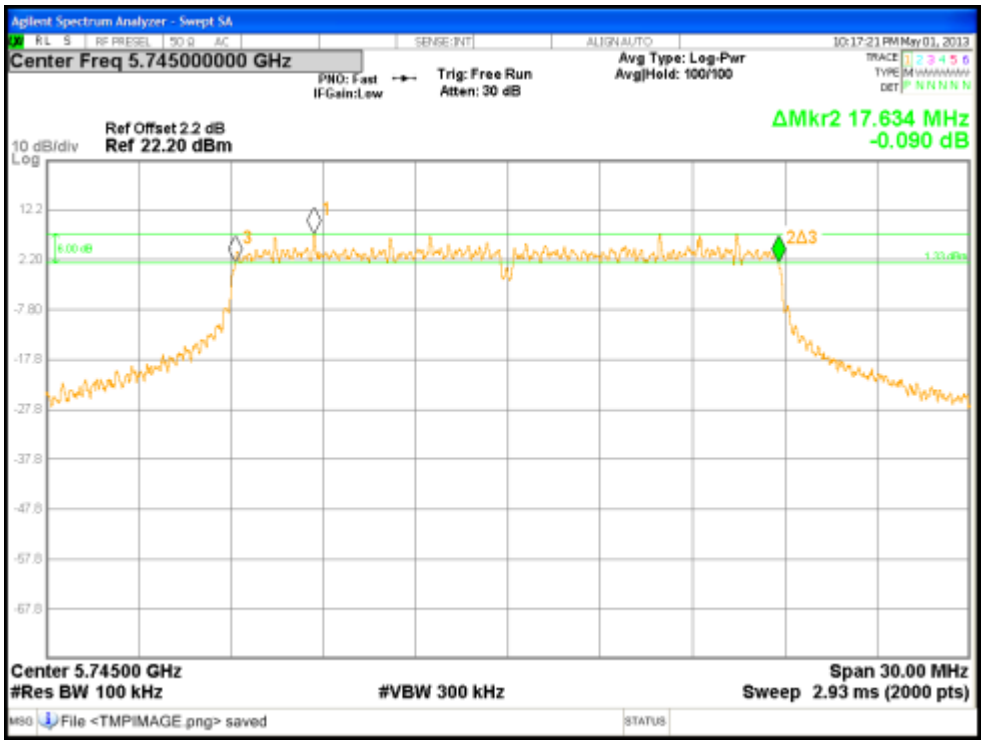


Figure 63: DTS Bandwidth at 5745 MHz, HT20, Chain 3

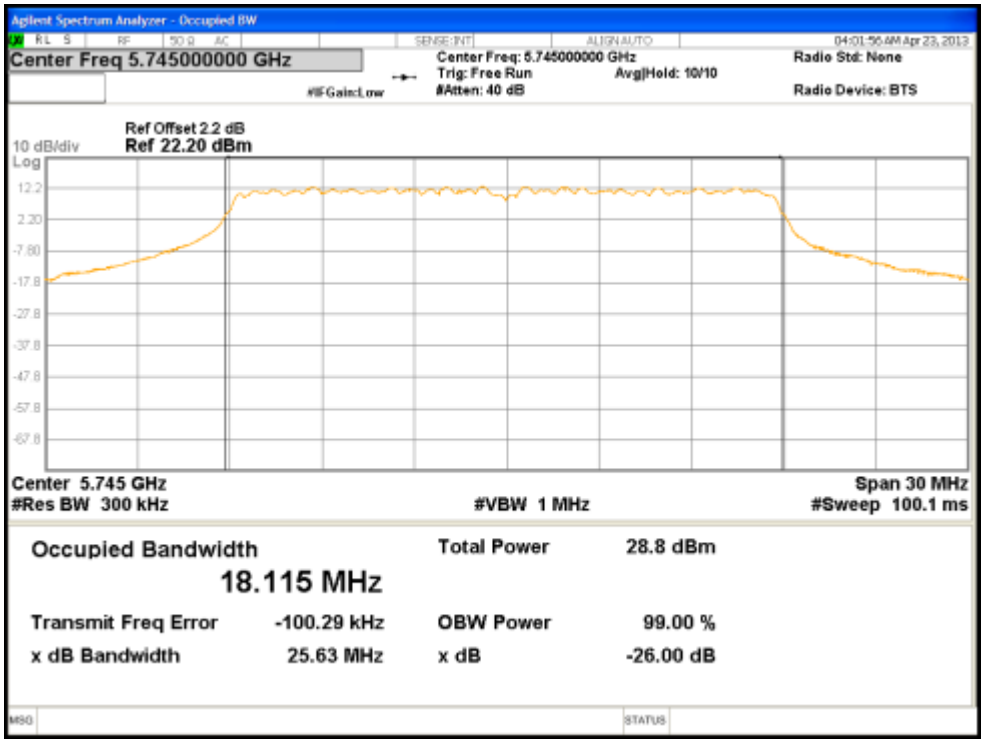


Figure 64: 99% Bandwidth at 5745 MHz, HT20, Chain 3

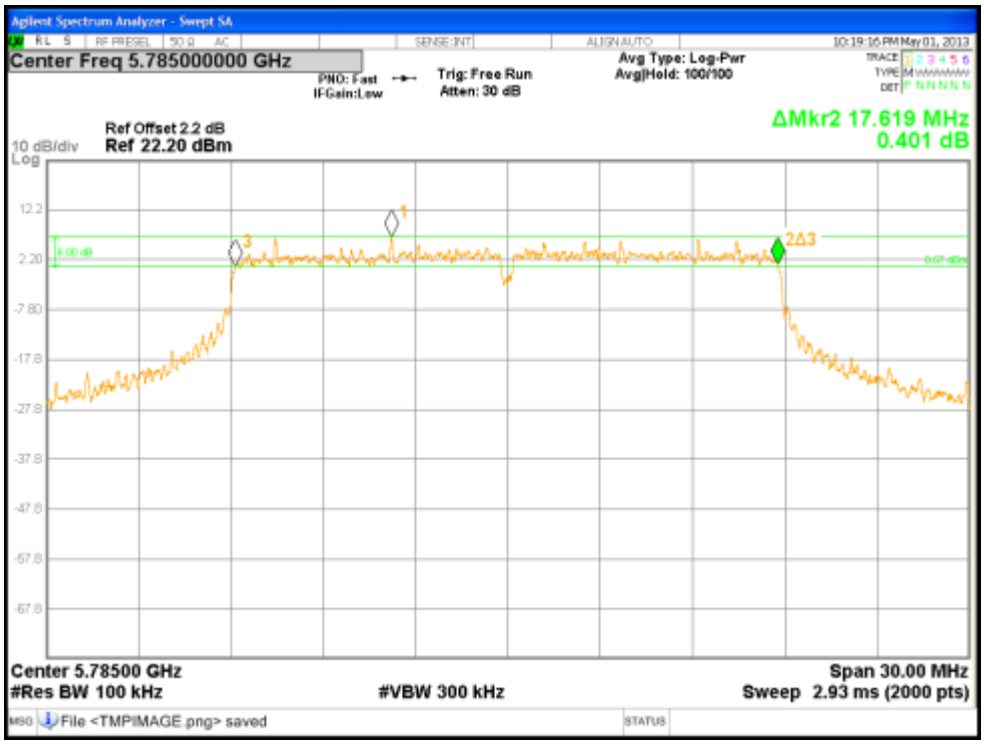


Figure 65: DTS Bandwidth at 5785 MHz, HT20, Chain 0

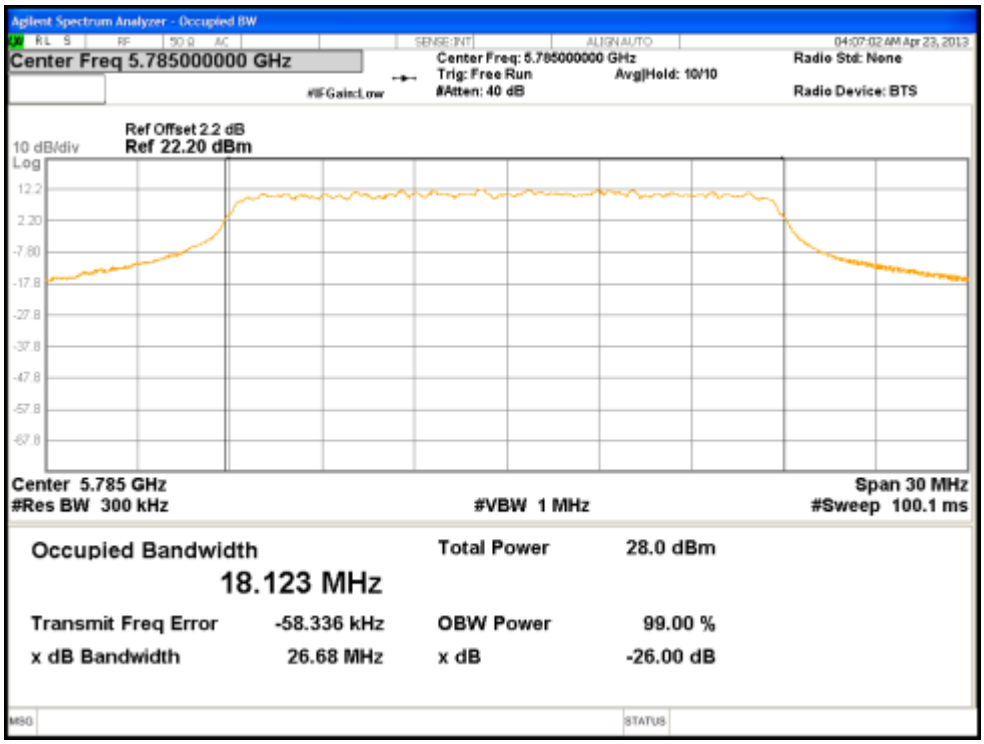


Figure 66: 99% Bandwidth at 5785 MHz, HT20, Chain 0

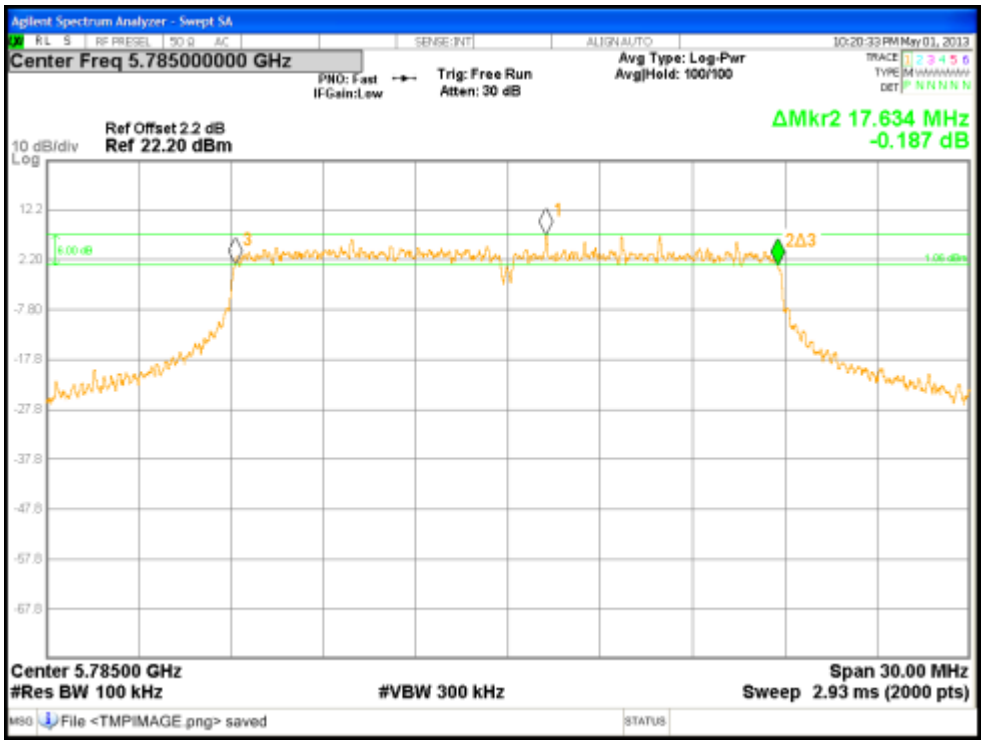


Figure 67: DTS Bandwidth at 5785 MHz, HT20, Chain 1

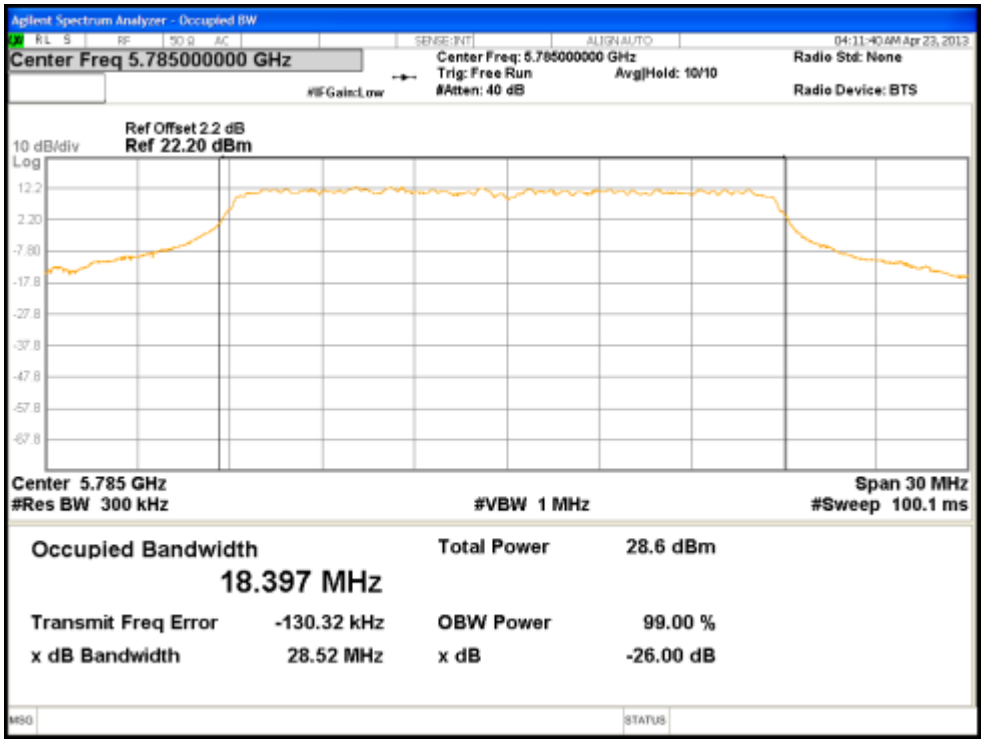


Figure 68: 99% Bandwidth at 5785 MHz, HT20, Chain 1

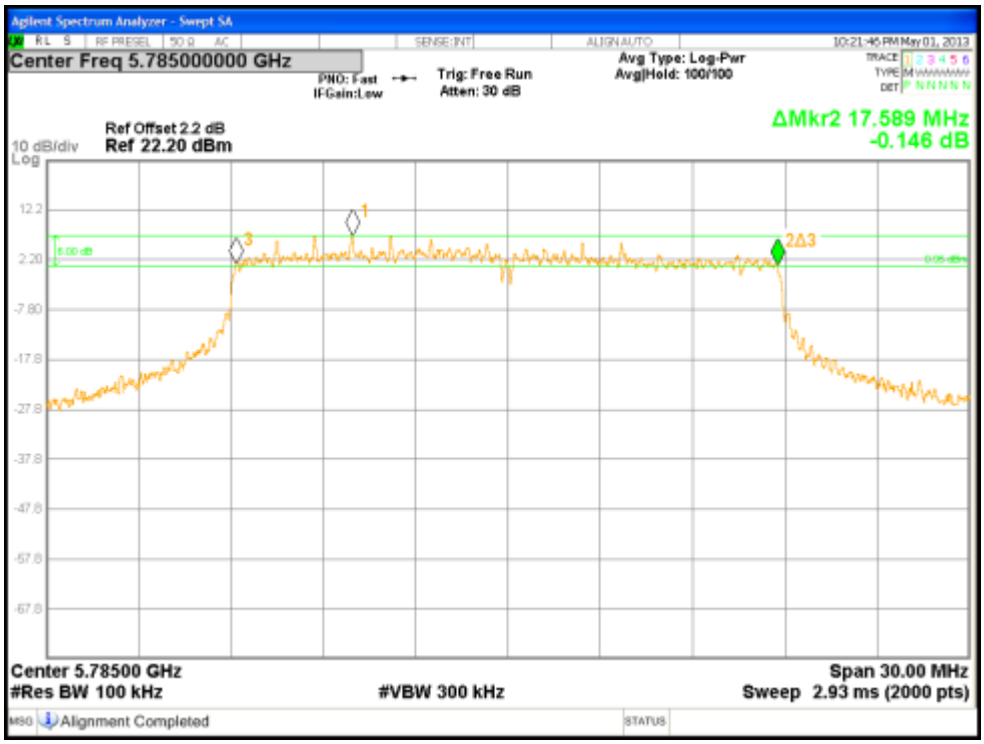


Figure 69: DTS Bandwidth at 5785 MHz, HT20, Chain 2

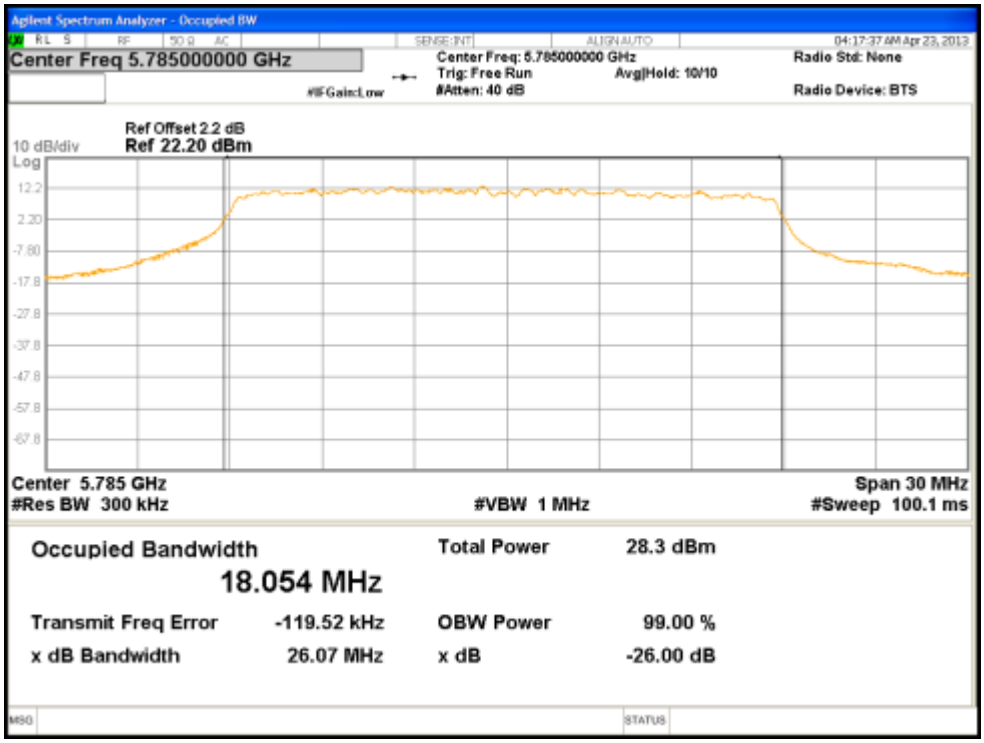


Figure 70: 99% Bandwidth at 5785 MHz, HT20, Chain 2

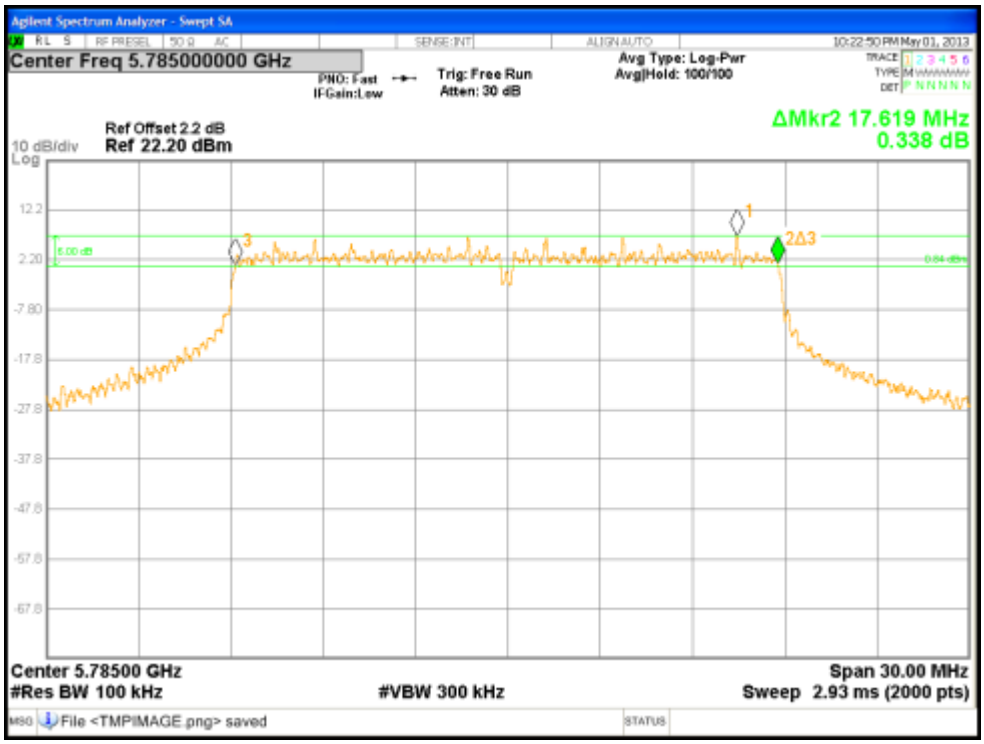


Figure 71: DTS Bandwidth at 5785 MHz, HT20, Chain 3

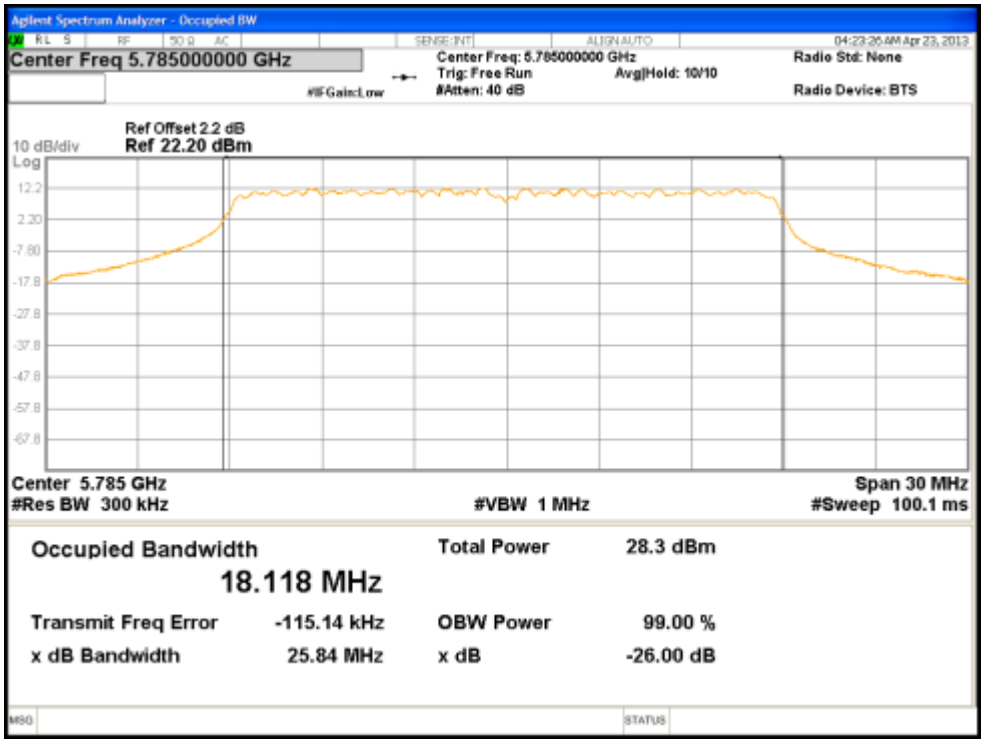


Figure 72: 99% Bandwidth at 5785 MHz, HT20, Chain 3

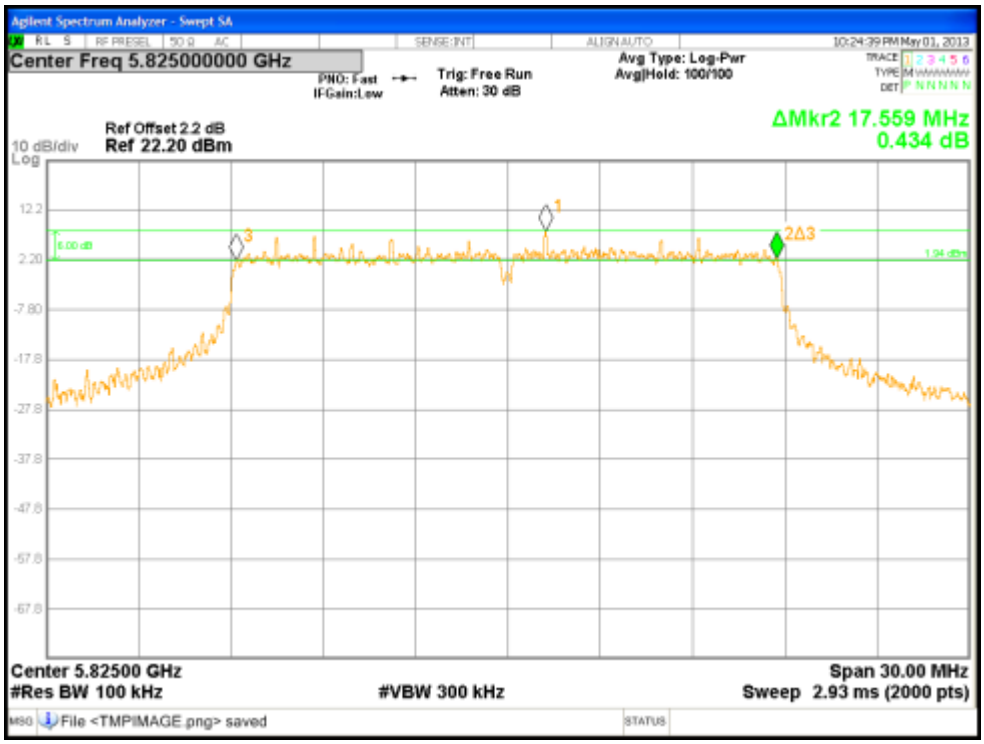


Figure 73: DTS Bandwidth at 5825 MHz, HT20, Chain 0

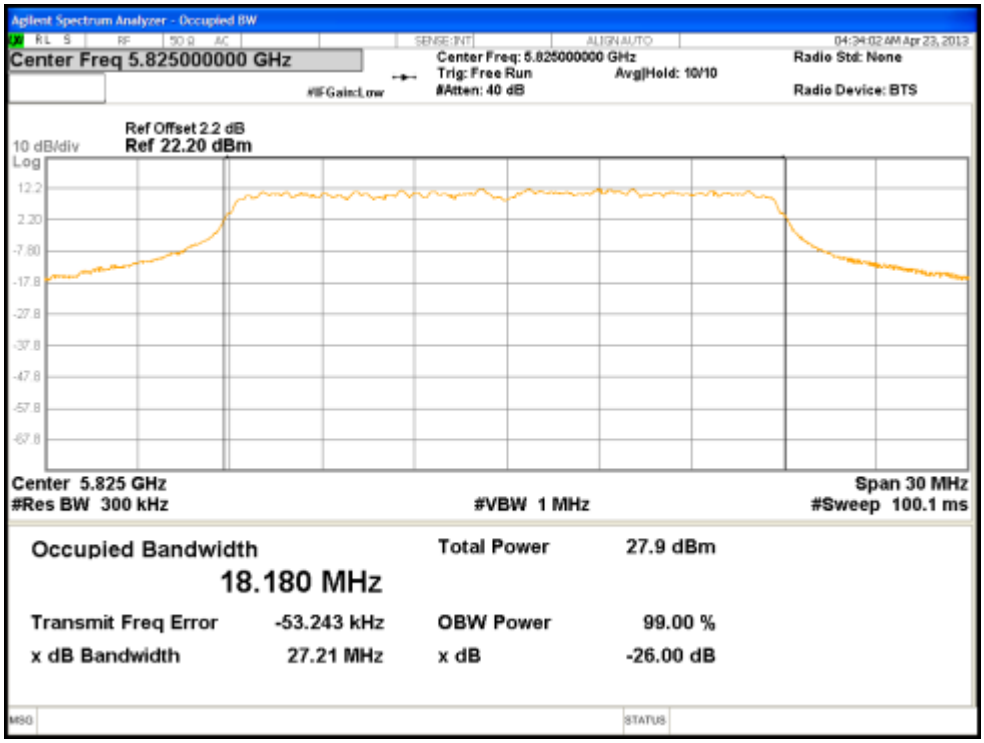


Figure 74: 99% Bandwidth at 5825 MHz, HT20, Chain 0

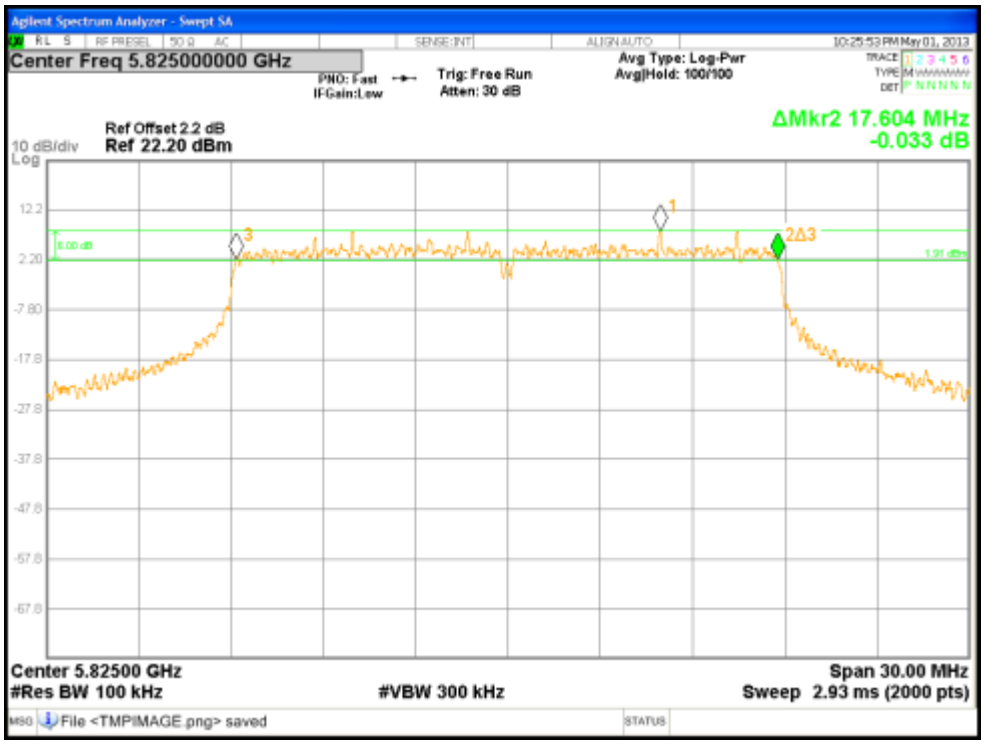


Figure 75: DTS Bandwidth at 5825 MHz, HT20, Chain 1

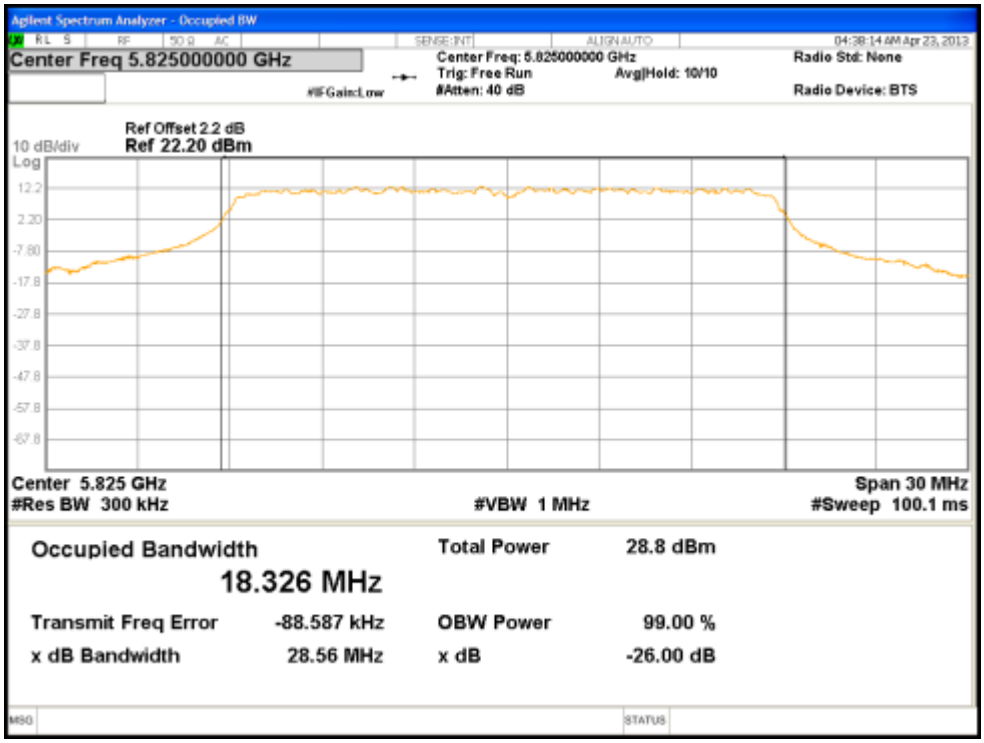


Figure 76: 99% Bandwidth at 5825 MHz, HT20, Chain 1

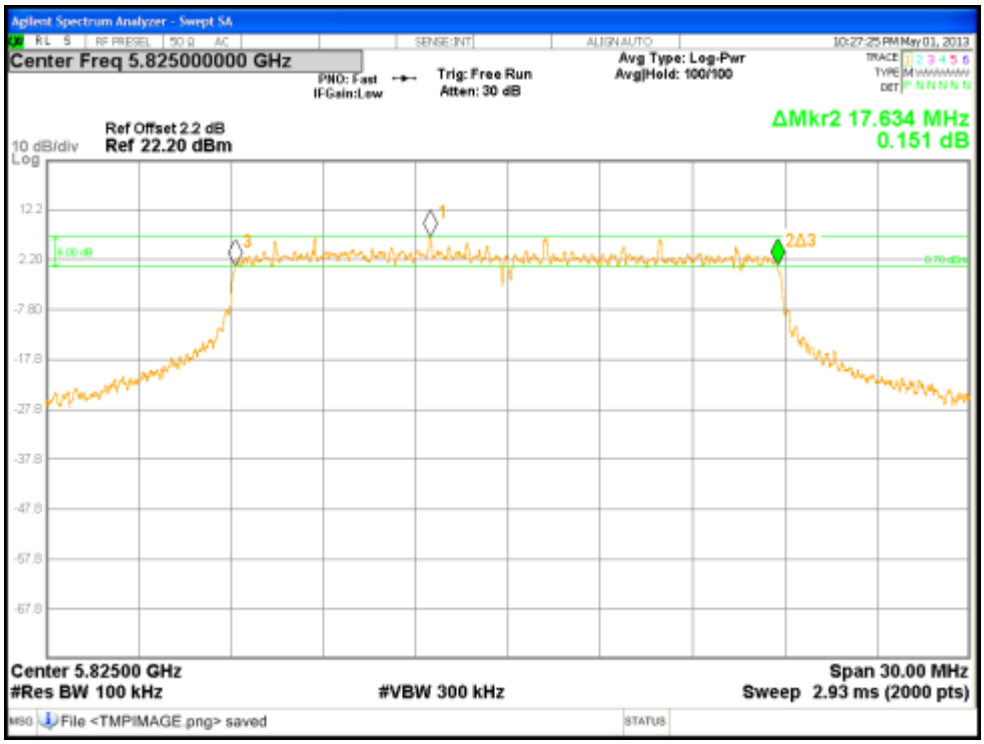


Figure 77: DTS Bandwidth at 5825 MHz, HT20, Chain 2

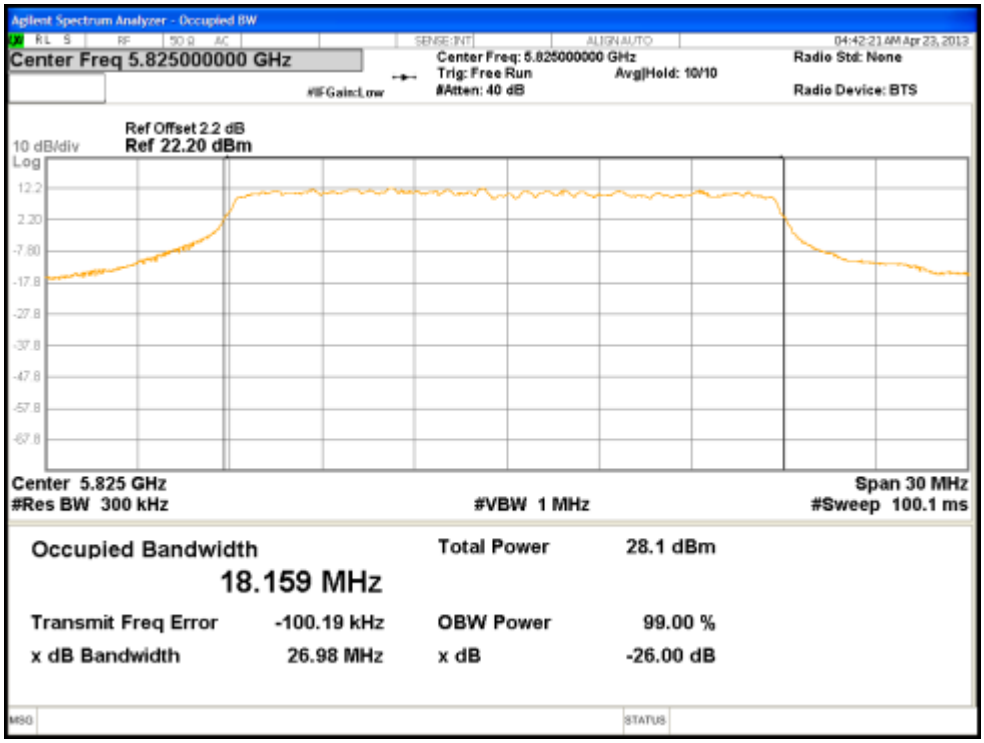


Figure 78: 99% Bandwidth at 5825 MHz, HT20, Chain 2

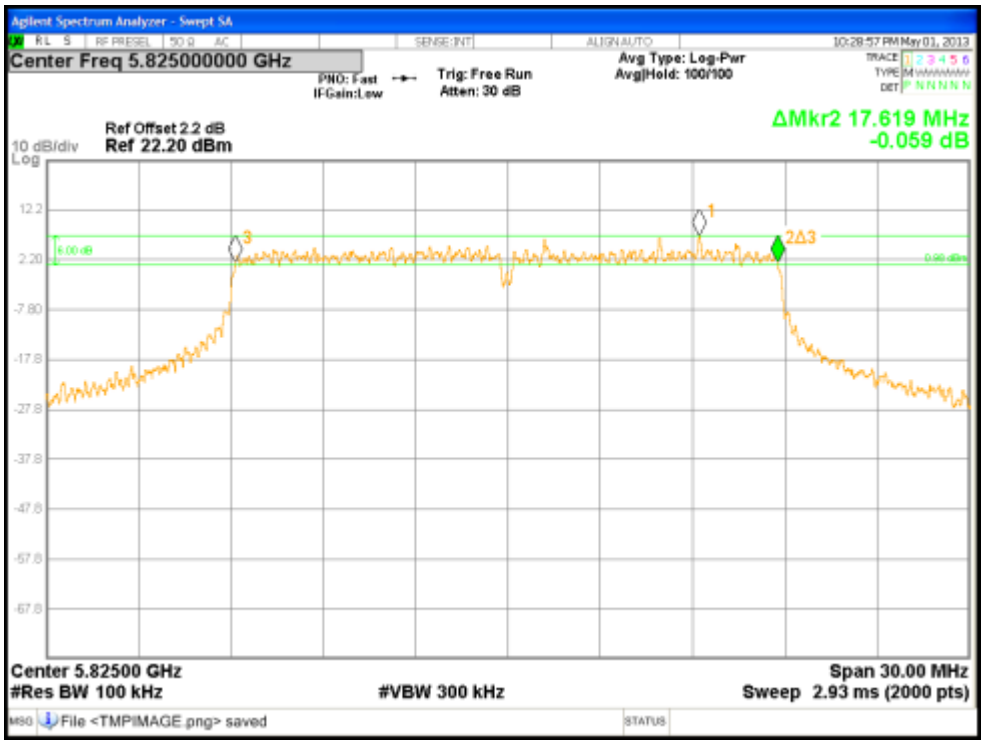


Figure 79: DTS Bandwidth at 5825 MHz, HT20, Chain 3

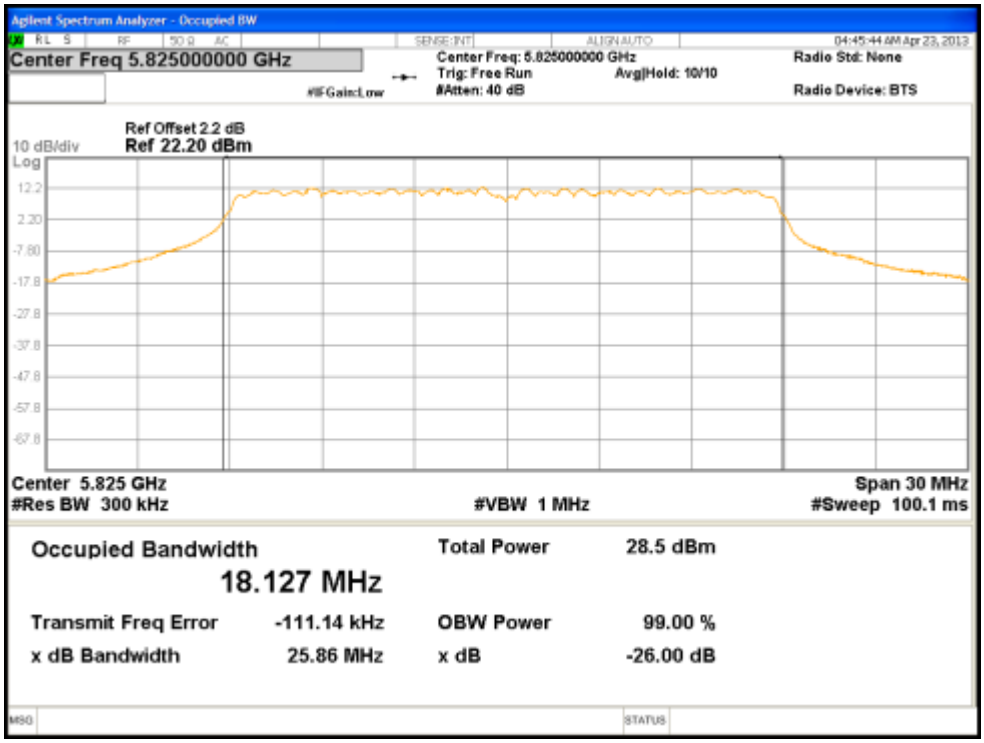


Figure 80: 99% Bandwidth at 5825 MHz, HT20, Chain 3

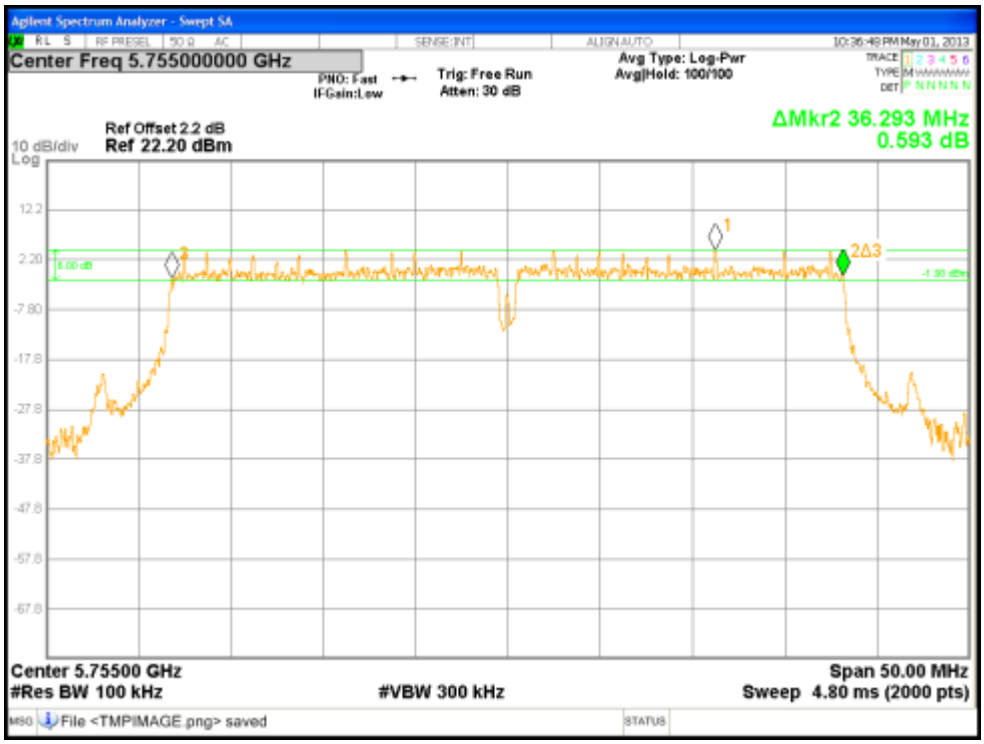


Figure 81: DTS Bandwidth at 5755 MHz, Chain 0

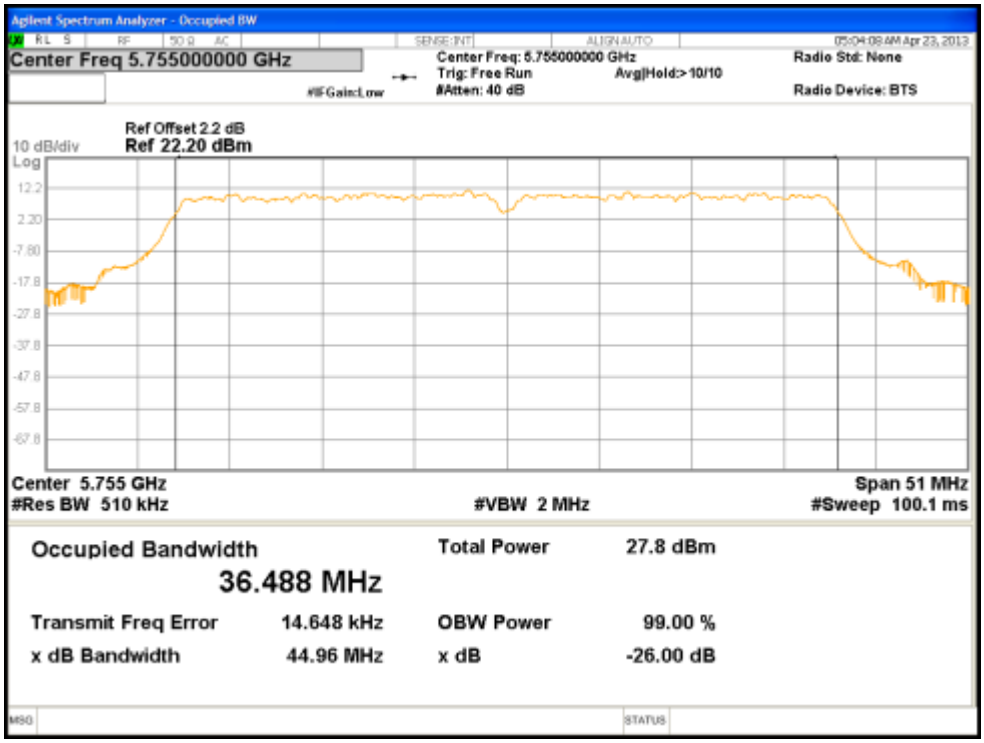


Figure 82: 99% Bandwidth at 5755 MHz, Chain 0

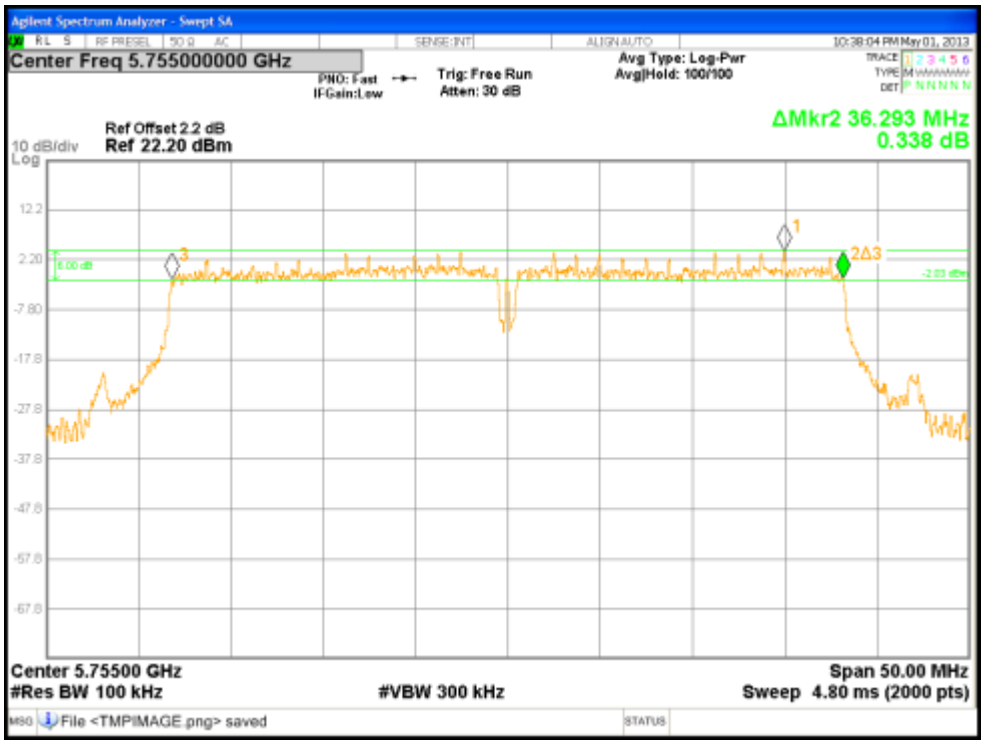


Figure 83: DTS Bandwidth at 5755 MHz, Chain 1

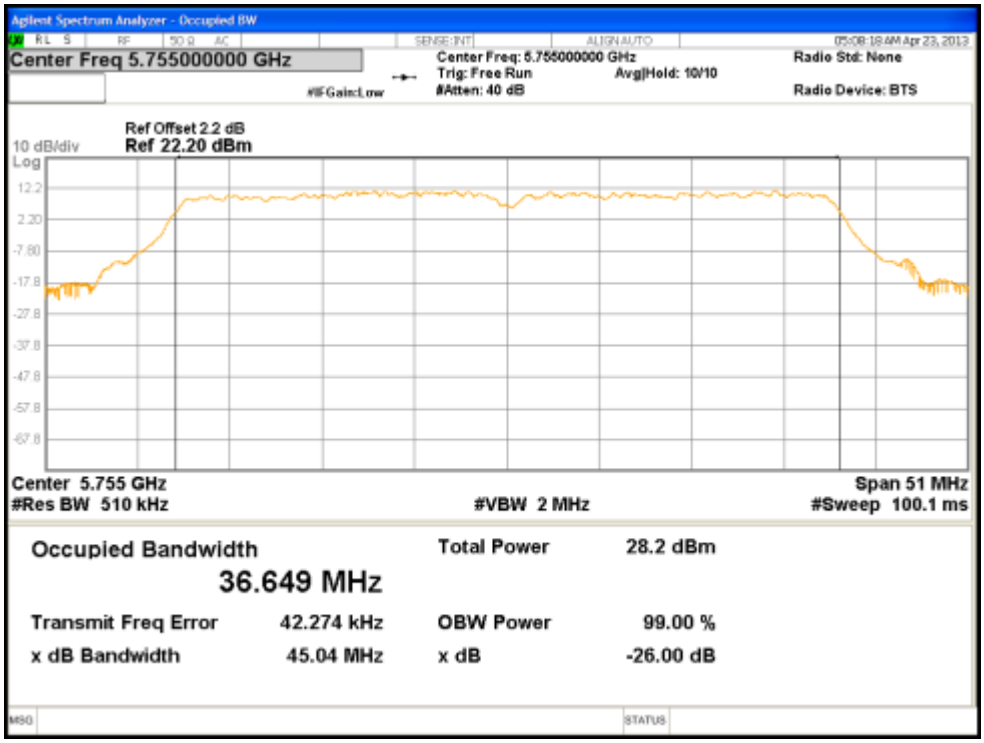


Figure 84: 99% Bandwidth at 5755 MHz, Chain 1

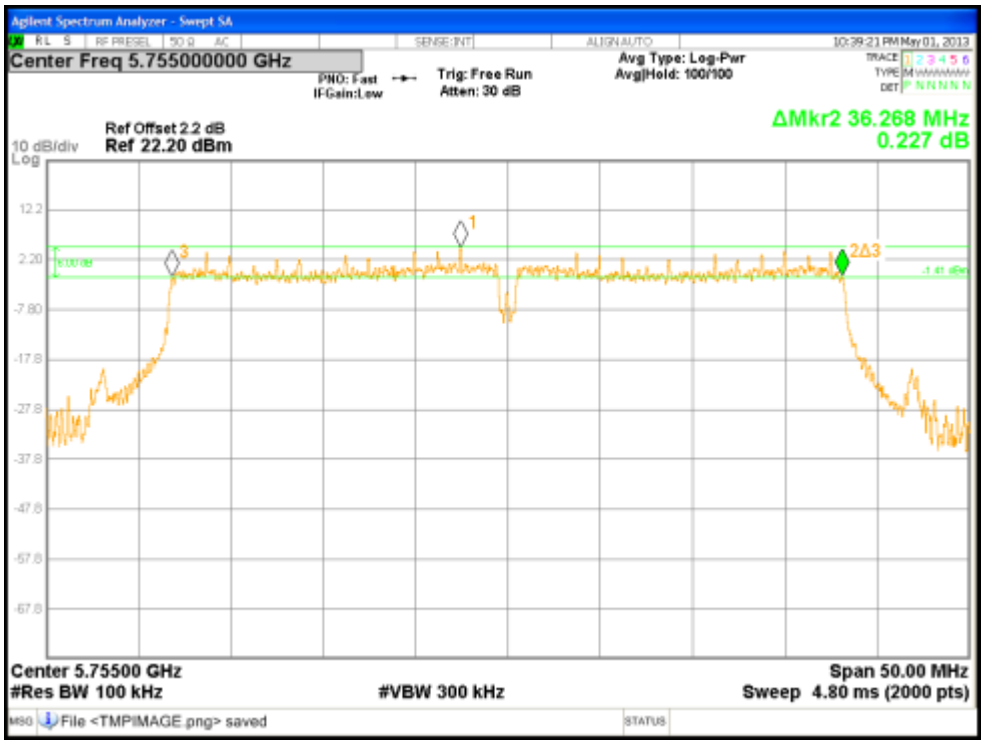


Figure 85: DTS Bandwidth at 5755 MHz, Chain 2

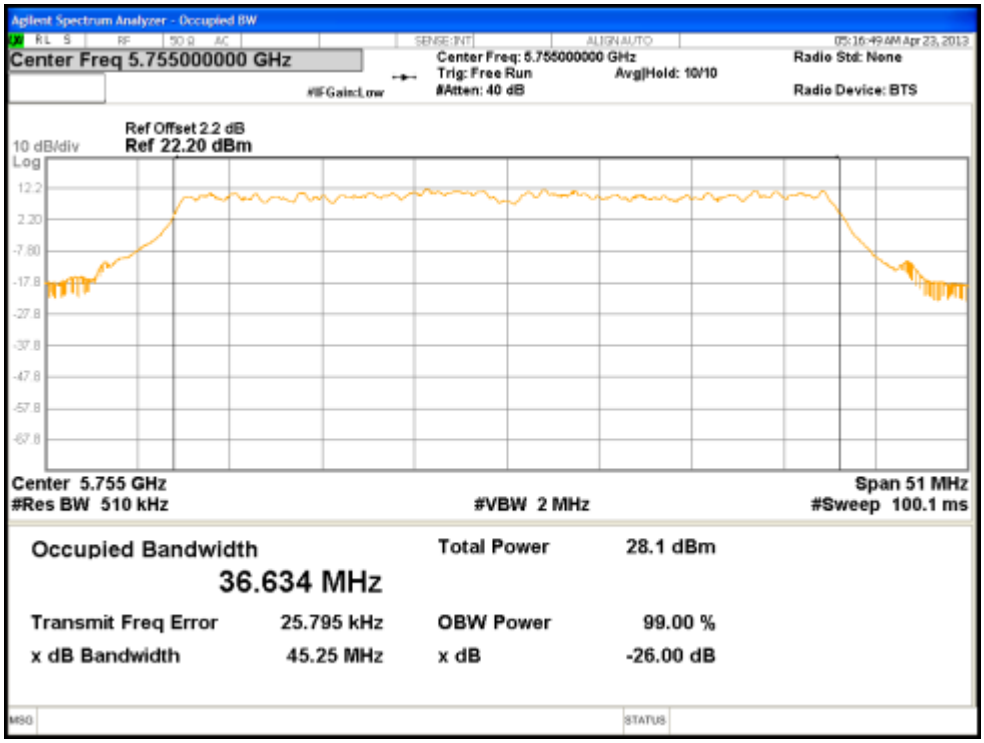


Figure 86: 99% Bandwidth at 5755 MHz, Chain 2

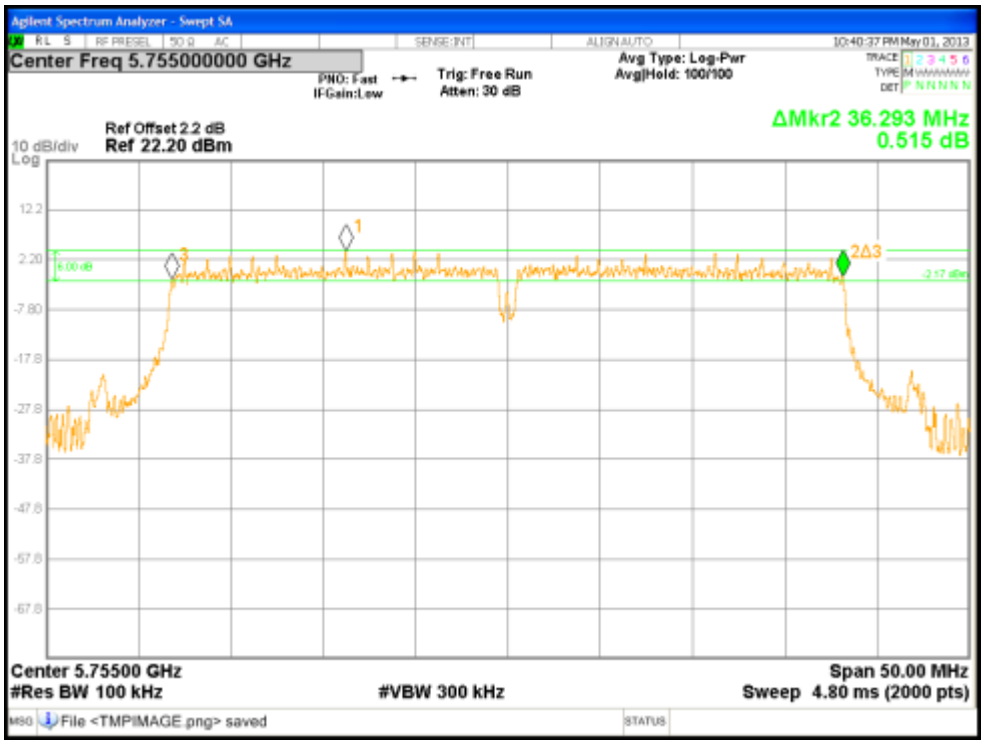


Figure 87: DTS Bandwidth at 5755 MHz, Chain 3

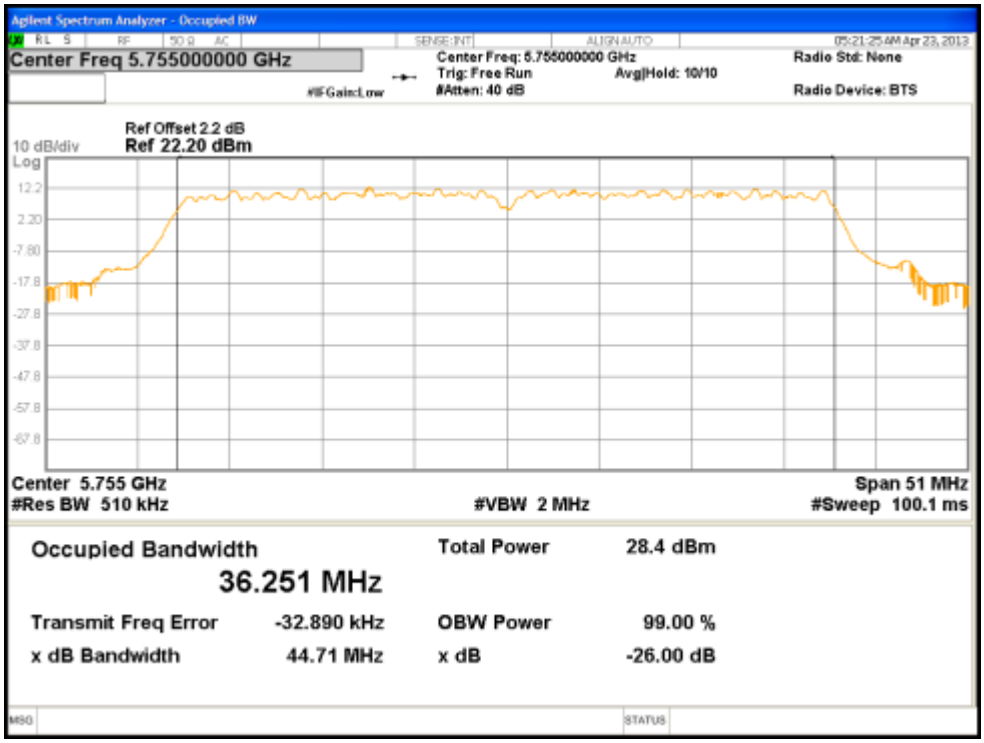


Figure 88: 99% Bandwidth at 5755 MHz, Chain 3

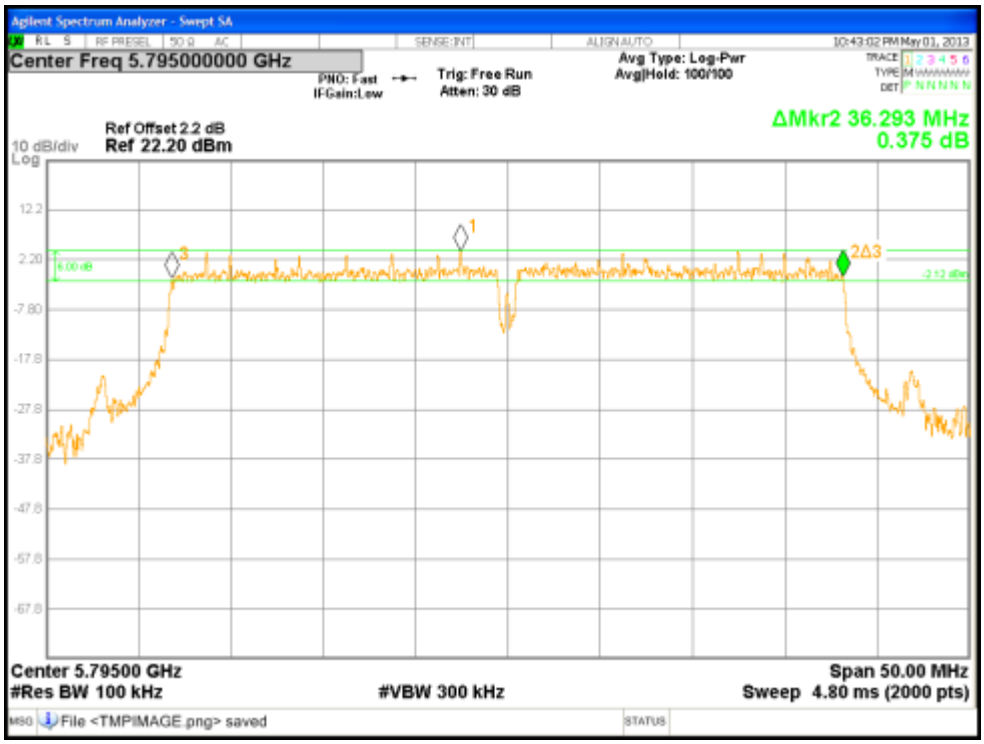


Figure 89: DTS Bandwidth at 5795 MHz, Chain 0

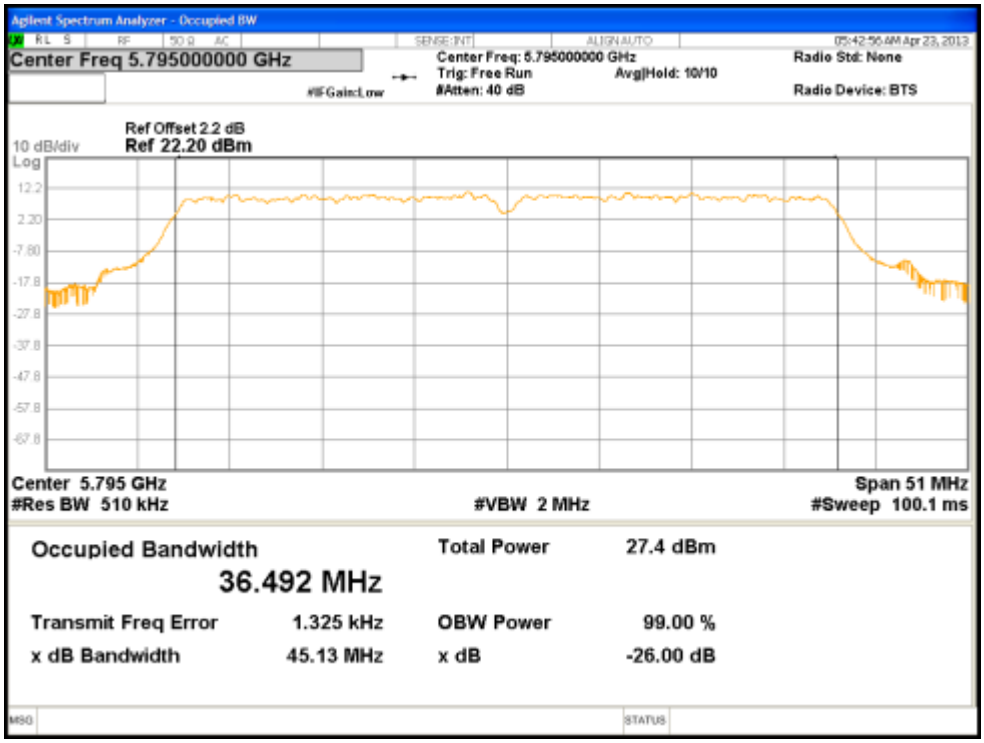


Figure 90: 99% Bandwidth at 5795 MHz, Chain 0

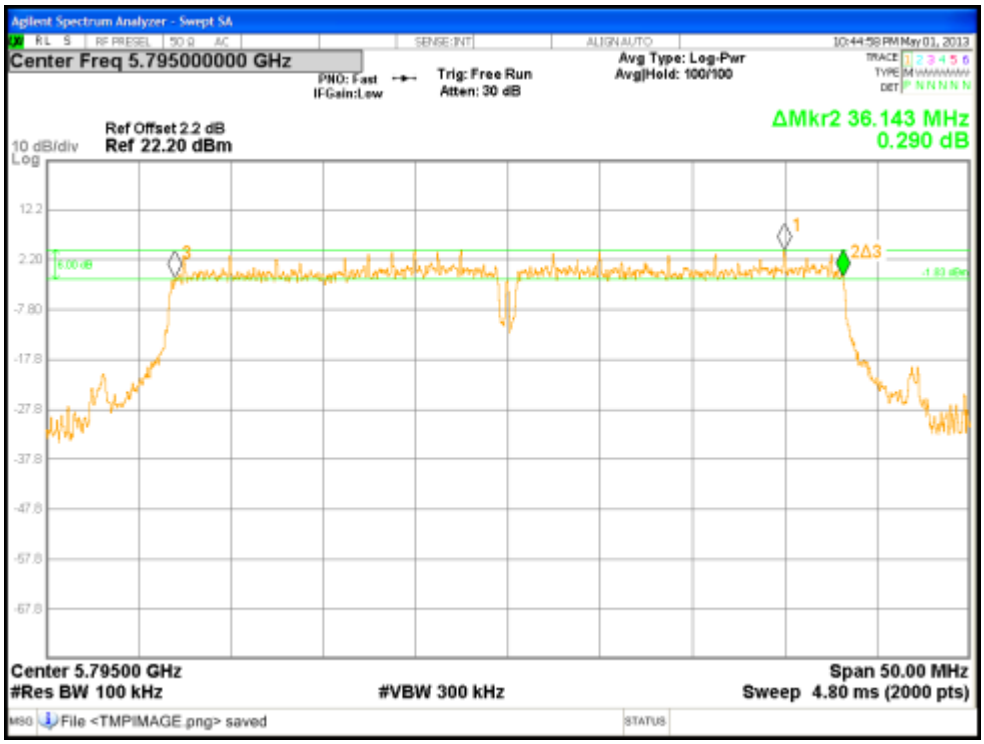


Figure 91: DTS Bandwidth at 5795 MHz, Chain 1

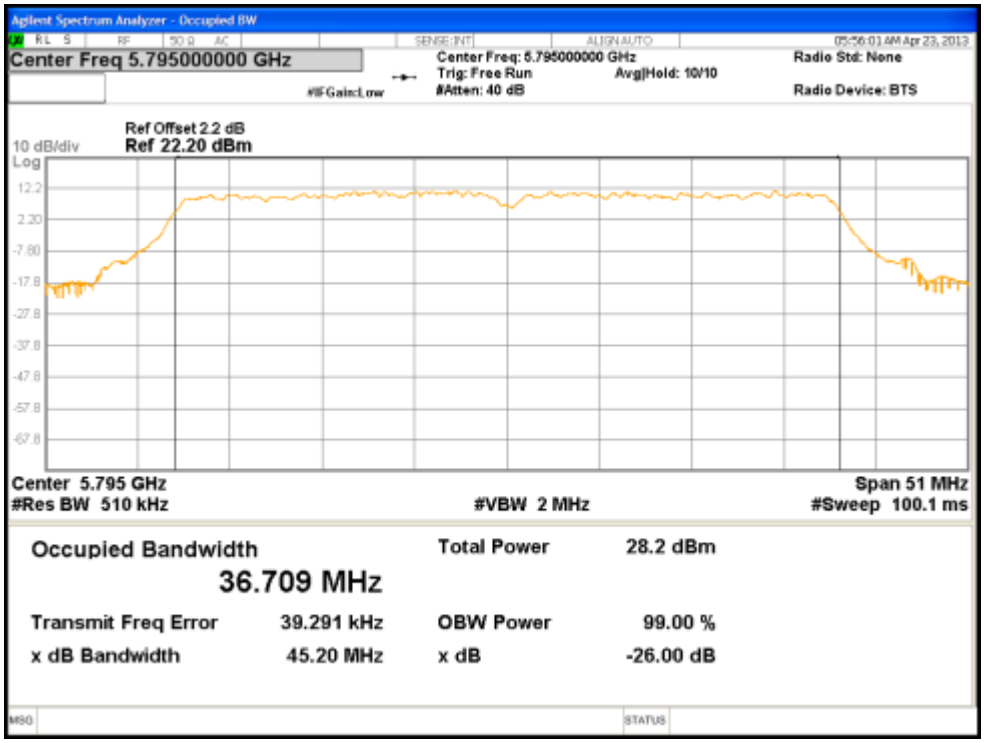


Figure 92: 99% Bandwidth at 5795 MHz, Chain 1

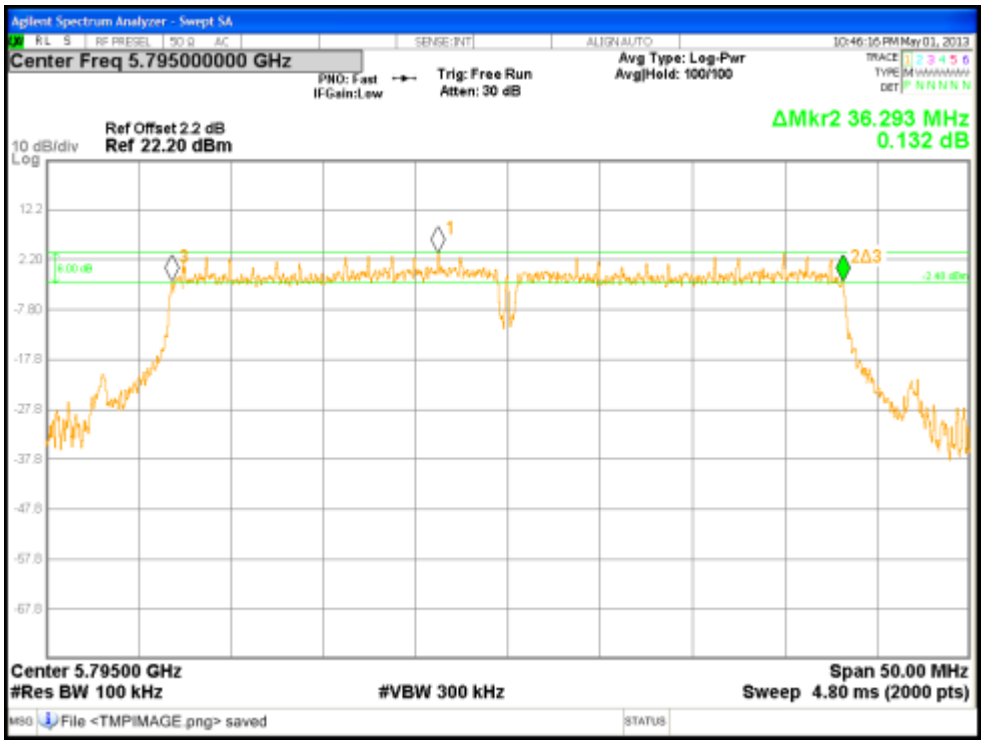


Figure 93: DTS Bandwidth at 5795 MHz, Chain 2

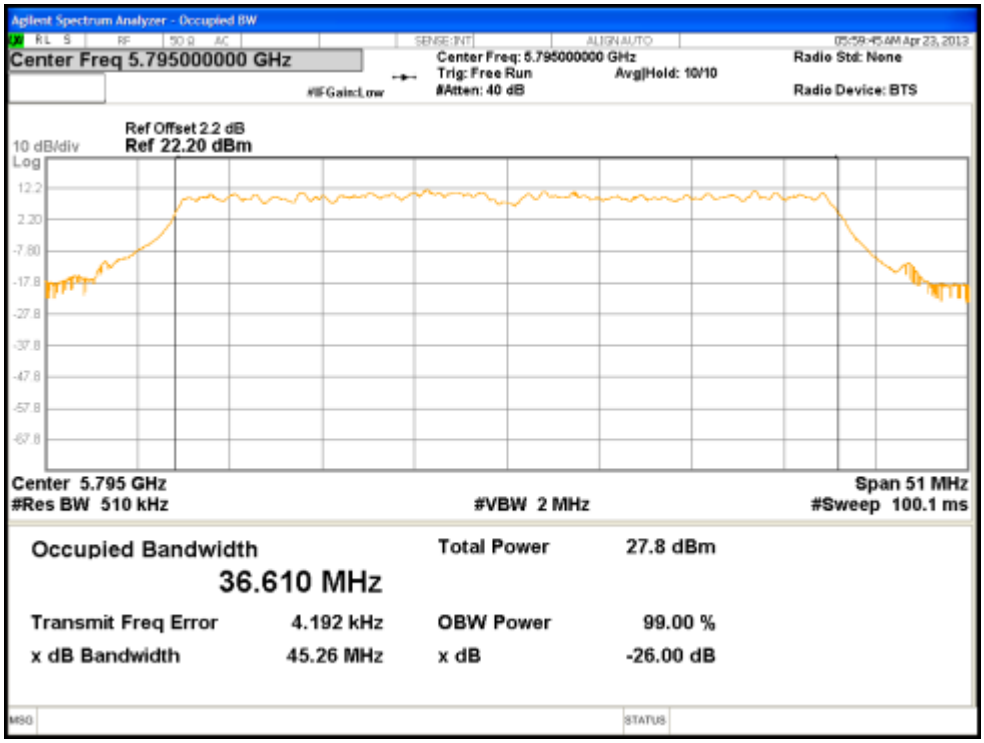


Figure 94: 99% Bandwidth at 5795 MHz, Chain 2

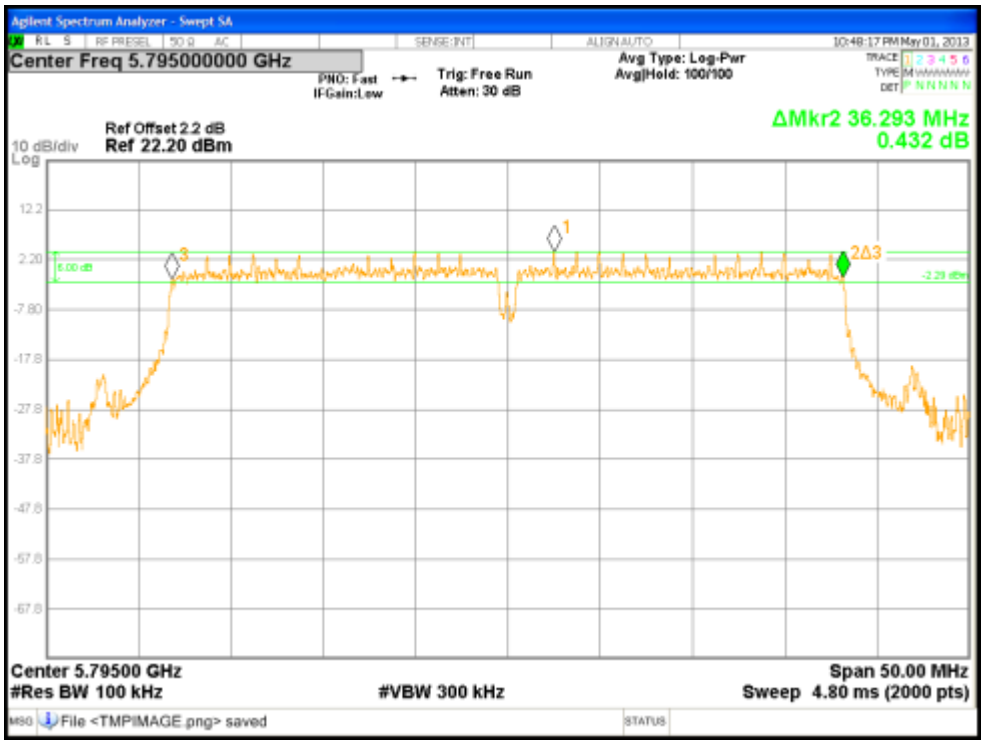


Figure 95: DTS Bandwidth at 5795 MHz, Chain 3

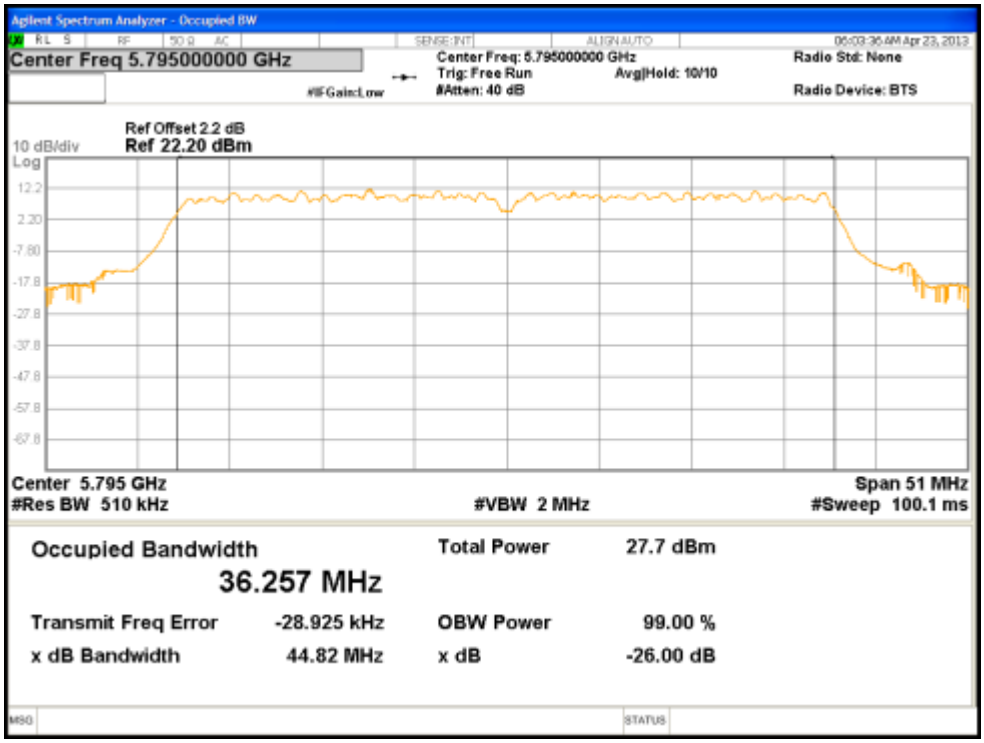


Figure 96: 99% Bandwidth at 5795 MHz, Chain 3

4.3 Unwanted Emissions into Non-Restricted Frequency Bands

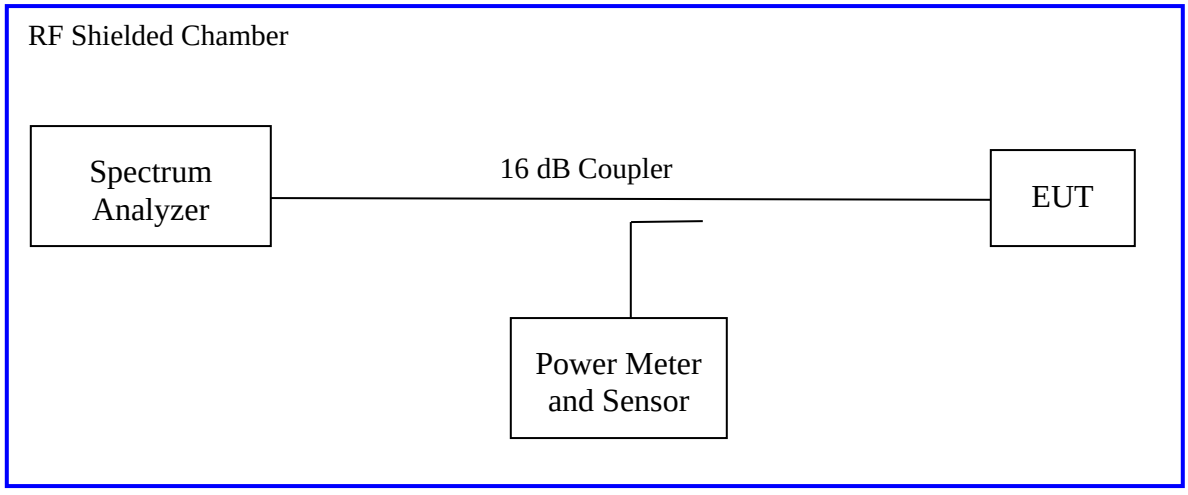
The setup was identical to RF output power measurement. Intentional radiators operating under the alternative provisions to the general emission limits, must be designed to ensure that the 20 dB or 30 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If the frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Since the transmitter complies with the conducted power limits base on the use of RMS averaging per CFR47 Part 15.247(b)(3), any frequency outside the band of 5725MHz to 5850 MHz, the power output level must be below 30 dB from the in-band transmitting signal; CFR 47 Part 15.215, 15.247(d) and RSS 210 A8.5

4.3.1 Test Method

The conducted method was used to measure the out-of-band emission requirement. The measurement was performed with modulation per CFR47 15.247(4)(d) 2010 and *RSS 210 A8.5: 2010*. This test was conducted on 3 channels of Sample in each mode on Sample, S/N 09130M000104. The worst sample result indicated below.

Test Setup:



Measurement Procedure AVG2 of KDB 558074

4.3.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 5: Emissions at the Band-Edge – Test Results

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only					
Antenna Type: Integrated			**Power Setting:** See test plan		
Max. Directional Gain: + 8 dBi			**Signal State:** Modulated at 100%.		
Ambient Temp.: 23 °C			**Relative Humidity:**30%		
Non-Restricted Frequency Band Emission					
Freq. (MHz)	**Mode**	**Chain**	**Ref. Level (dBm)**	**Plots**	**Results**
5745	6Mbps	0	-21.14	Fig. 97, 98, 99	Pass
5745	6Mbps	1	-20.77	Fig. 100, 101, 102	Pass
5745	6Mbps	2	-21.67	Fig. 103, 104, 105	Pass
5745	6Mbps	3	-21.19	Fig. 106, 107, 108	Pass
5785	6Mbps	0	-21.45	Fig. 109, 110,111	Pass
5785	6Mbps	1	-21.47	Fig. 112, 113, 114	Pass
5785	6Mbps	2	-21.18	Fig. 115, 116, 117	Pass
5785	6Mbps	3	-21.40	Fig. 118, 119, 120	Pass
5825	6Mbps	0	-21.02	Fig. 121, 122, 123	Pass
5825	6Mbps	1	-20.89	Fig. 124, 125 126	Pass
5825	6Mbps	2	-21.42	Fig. 127, 128, 129	Pass
5825	6Mbps	3	-21.82	Fig. 130, 131, 132	Pass
5745	6.5Mbps	0	-20.73	Fig. 133, 134, 135	Pass
5745	6.5Mbps	1	-19.99	Fig. 136, 137, 138	Pass
5745	6.5Mbps	2	-21.89	Fig. 139, 140, 141,	Pass
5745	6.5Mbps	3	-21.29	Fig. 142, 143, 144	Pass
5785	6.5Mbps	0	-20.97	Fig. 145, 146, 147	Pass

5785	6.5Mbps	1	-20.70	Fig. 148, 149, 150	Pass
5785	6.5Mbps	2	-21.56	Fig. 151, 152, 153	Pass
5785	6.5Mbps	3	-21.15	Fig. 154, 155, 156	Pass
5825	6.5Mbps	0	-21.00	Fig. 157, 158, 159	Pass
5825	6.5Mbps	1	-20.05	Fig. 160, 161, 162	Pass
5825	6.5Mbps	2	-21.17	Fig. 163, 164, 165	Pass
5825	6.5Mbps	3	-22.58	Fig. 166, 167, 168	Pass
5755	13.5 Mbps	0	-23.14	Fig. 169, 170	Pass
5755	13.5 Mbps	1	-22.72	Fig. 171, 172	Pass
5755	13.5 Mbps	2	-22.40	Fig. 173, 174	Pass
5755	13.5 Mbps	3	-23.13	Fig. 175, 176	Pass
5795	13.5 Mbps	0	-23.05	Fig. 177, 178	Pass
5795	13.5 Mbps	1	-22.58	Fig. 179, 180	Pass
5795	13.5 Mbps	2	-22.49	Fig. 181, 182	Pass
5795	13.5 Mbps	3	-22.92	Fig. 183, 184	Pass

Note: All out of band emissions are lower than the 30 dBr level.

The maximum out of band emission on each individual output put is at least 30 dB below the maximum in-band PSD on that output per KDB 662911.

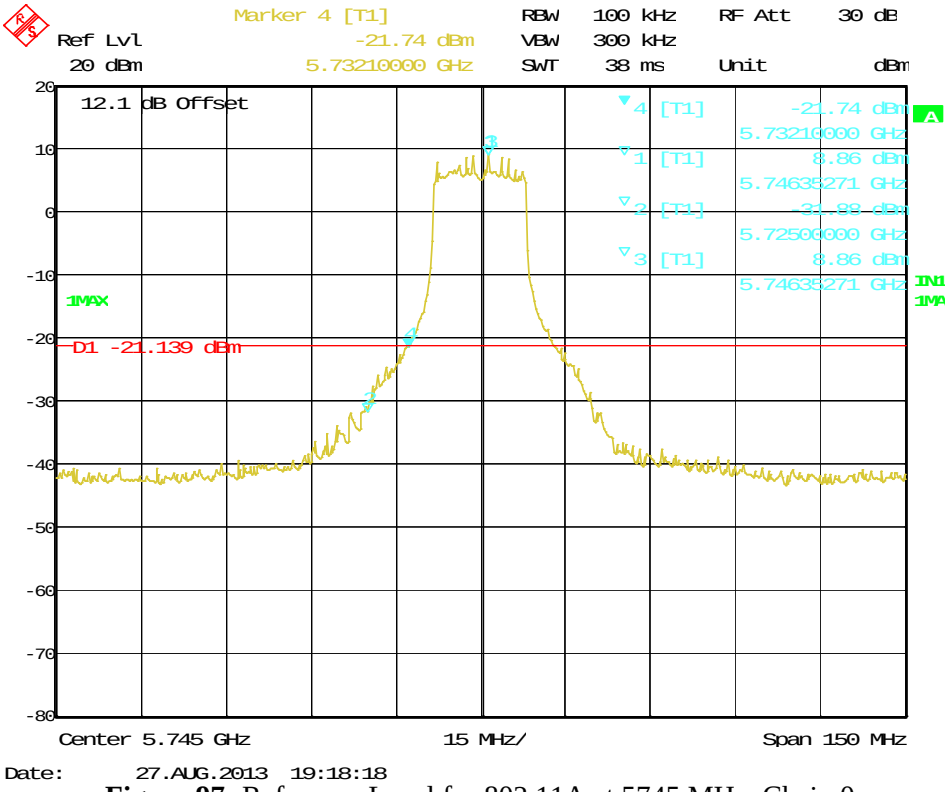


Figure 97: Reference Level for 802.11A at 5745 MHz, Chain 0

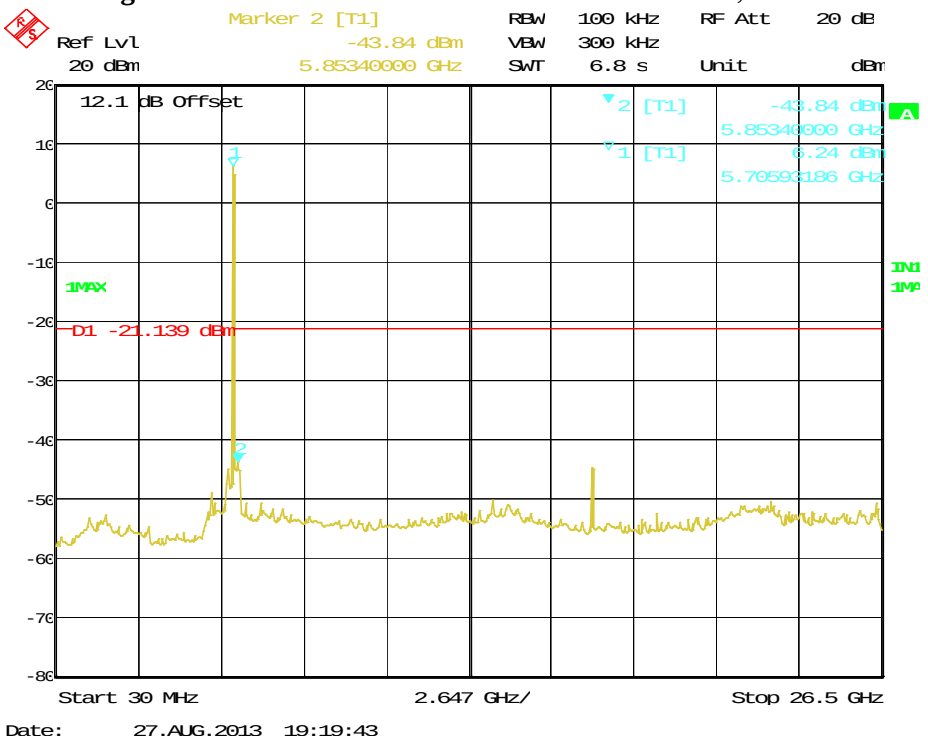


Figure 98: Out of Band Emission for 802.11A at 5745 MHz, Chain 0

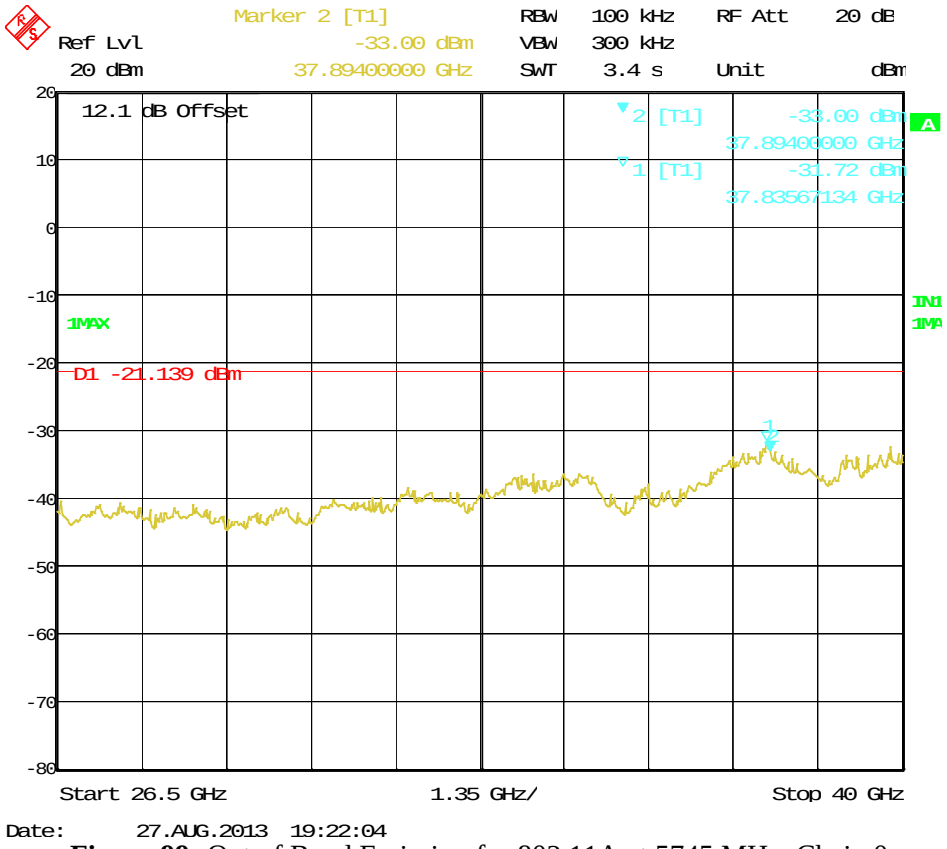


Figure 99: Out of Band Emission for 802.11A at 5745 MHz, Chain 0

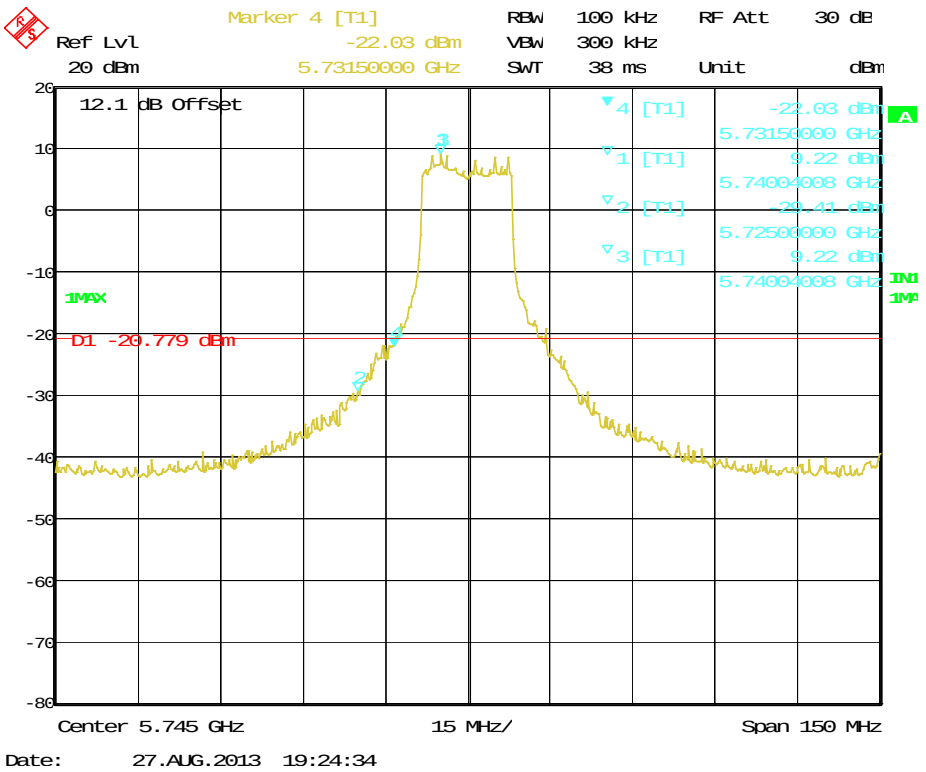


Figure 100: Reference Level for 802.11A at 5745 MHz, Chain 1

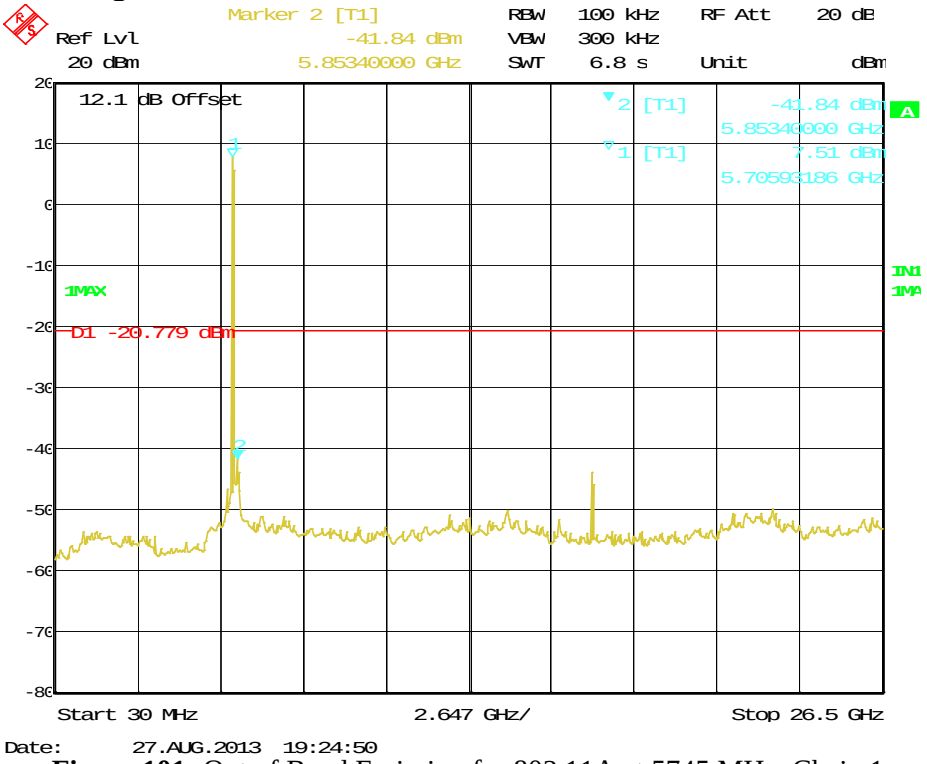


Figure 101: Out of Band Emission for 802.11A at 5745 MHz, Chain 1

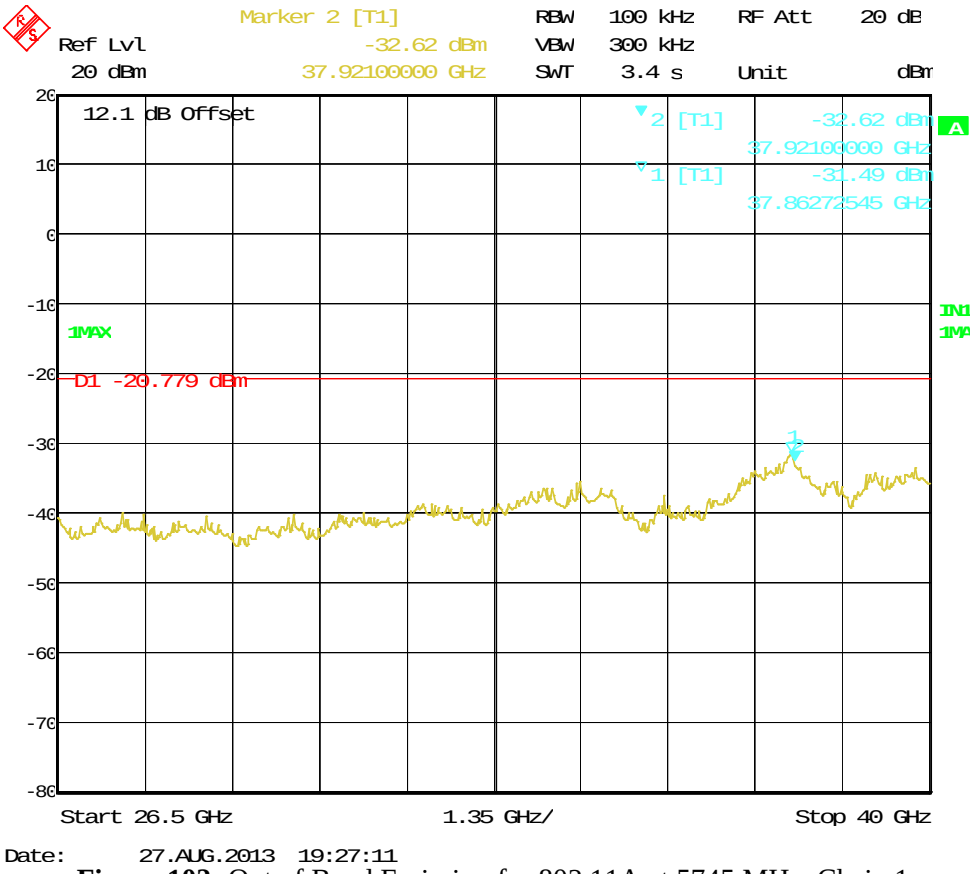


Figure 102: Out of Band Emission for 802.11A at 5745 MHz, Chain 1

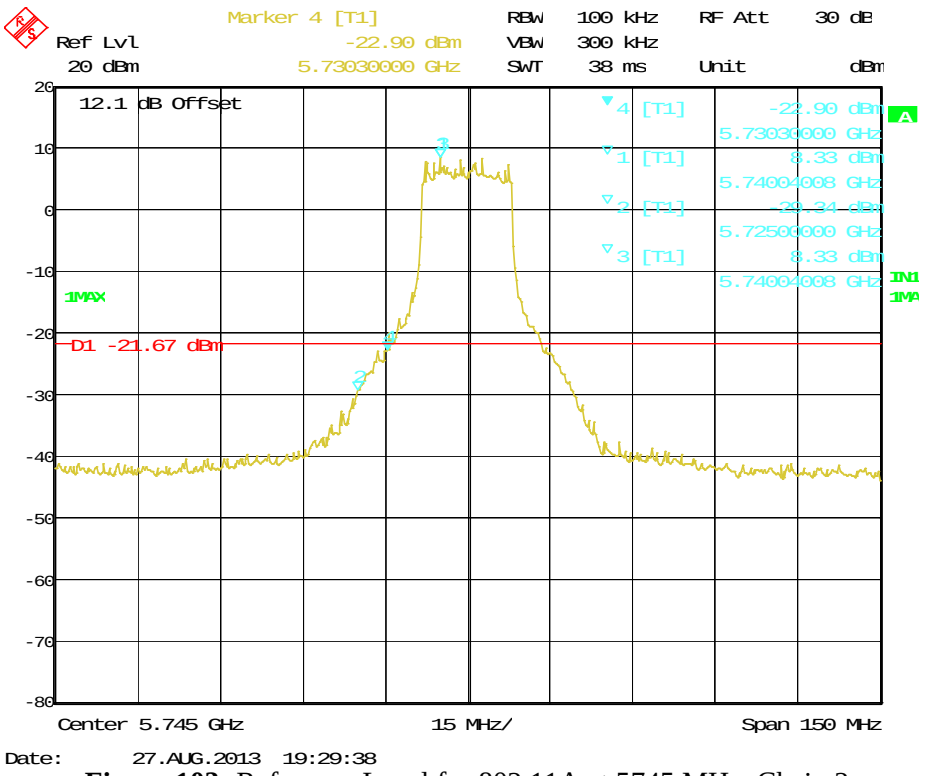


Figure 103: Reference Level for 802.11A at 5745 MHz, Chain 2

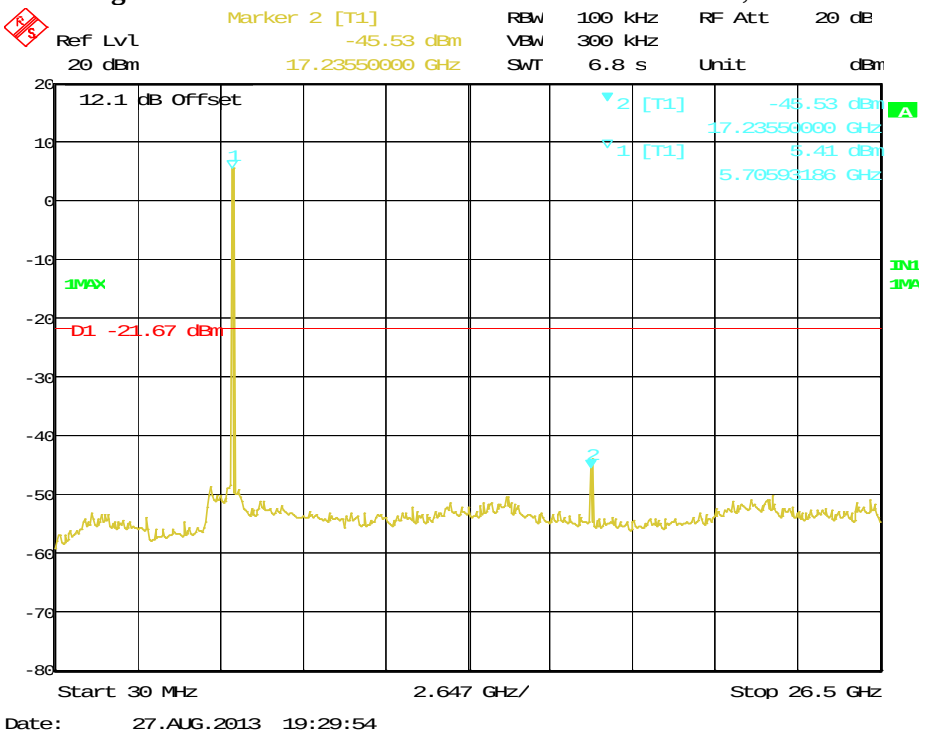


Figure 104: Out of Band Emission for 802.11A at 5745 MHz, Chain 2

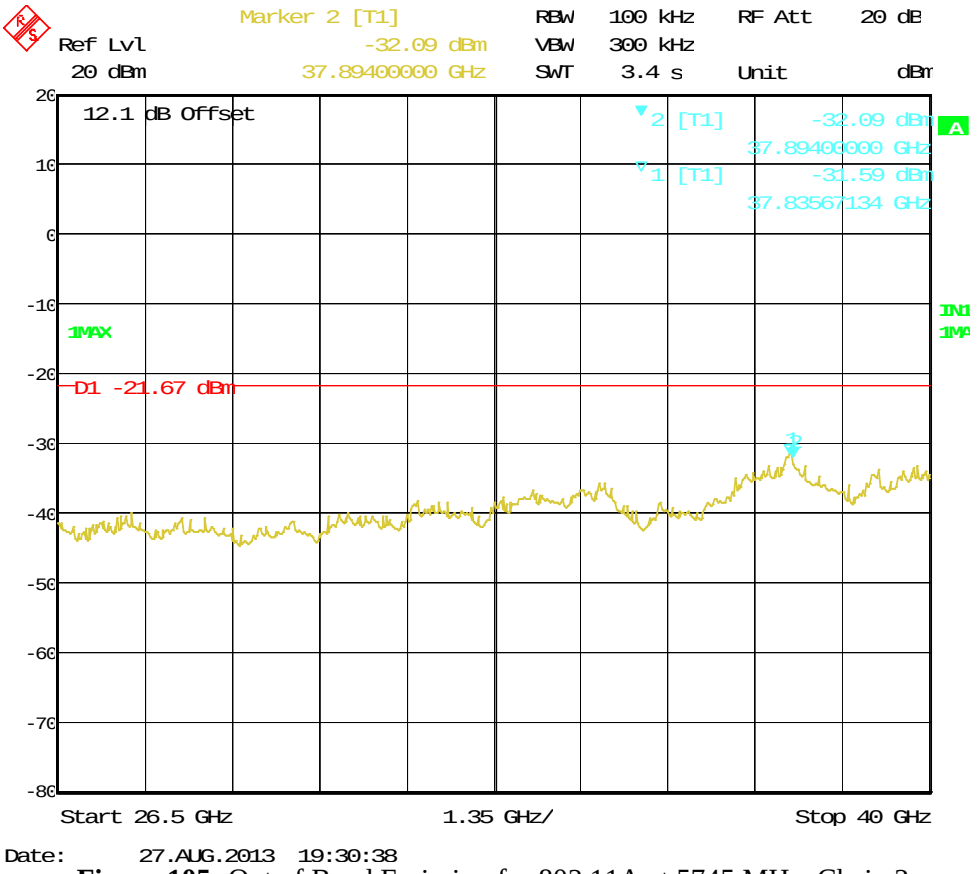


Figure 105: Out of Band Emission for 802.11A at 5745 MHz, Chain 2

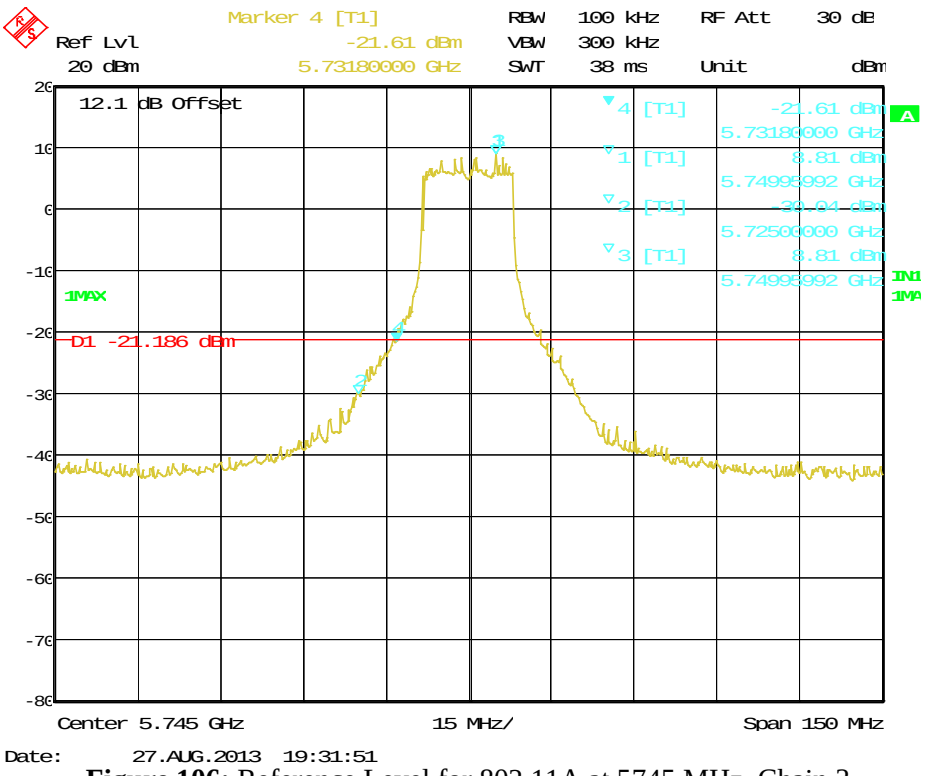


Figure 106: Reference Level for 802.11A at 5745 MHz, Chain 3

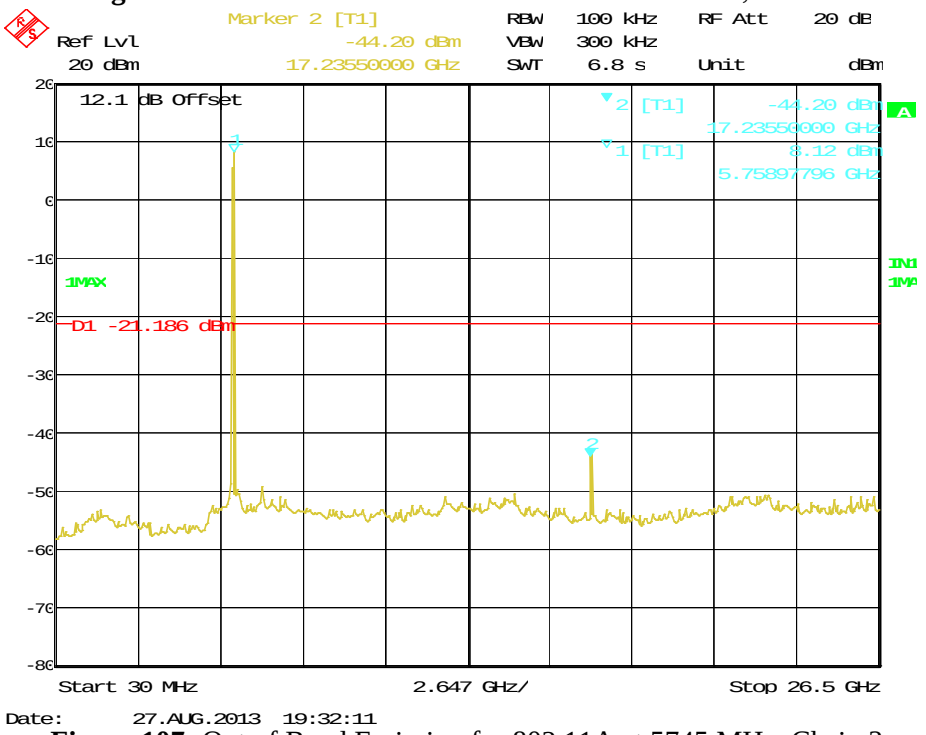


Figure 107: Out of Band Emission for 802.11A at 5745 MHz, Chain 3

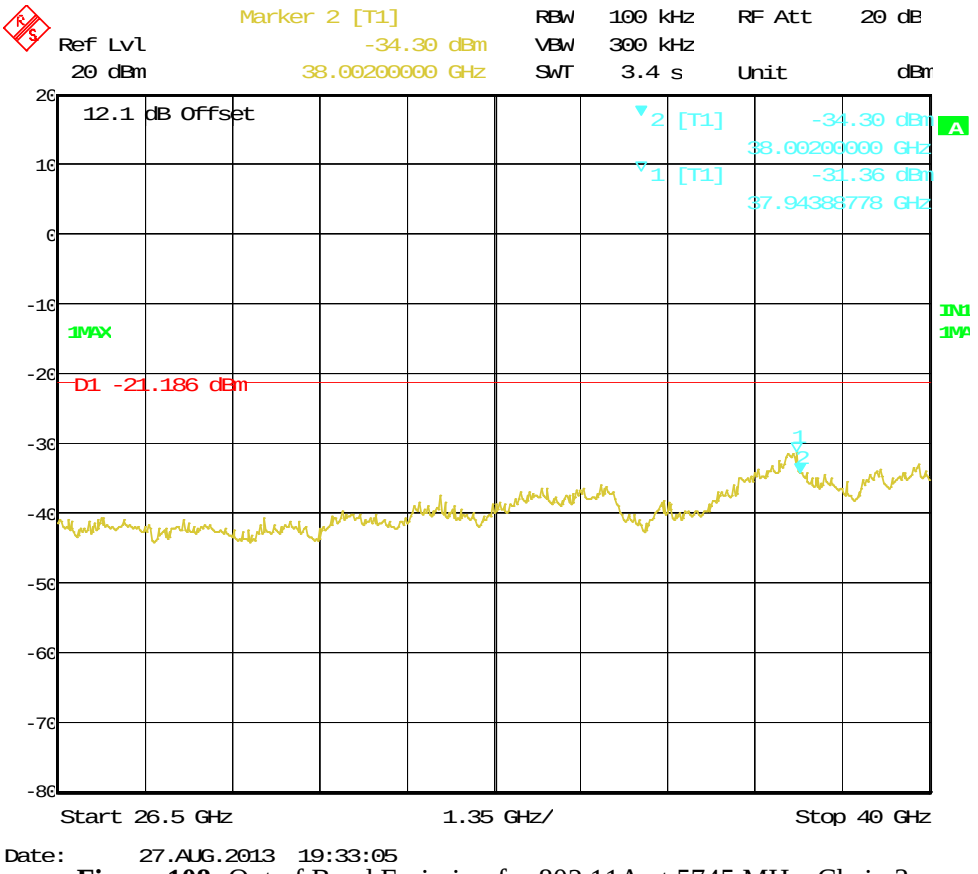


Figure 108: Out of Band Emission for 802.11A at 5745 MHz, Chain 3

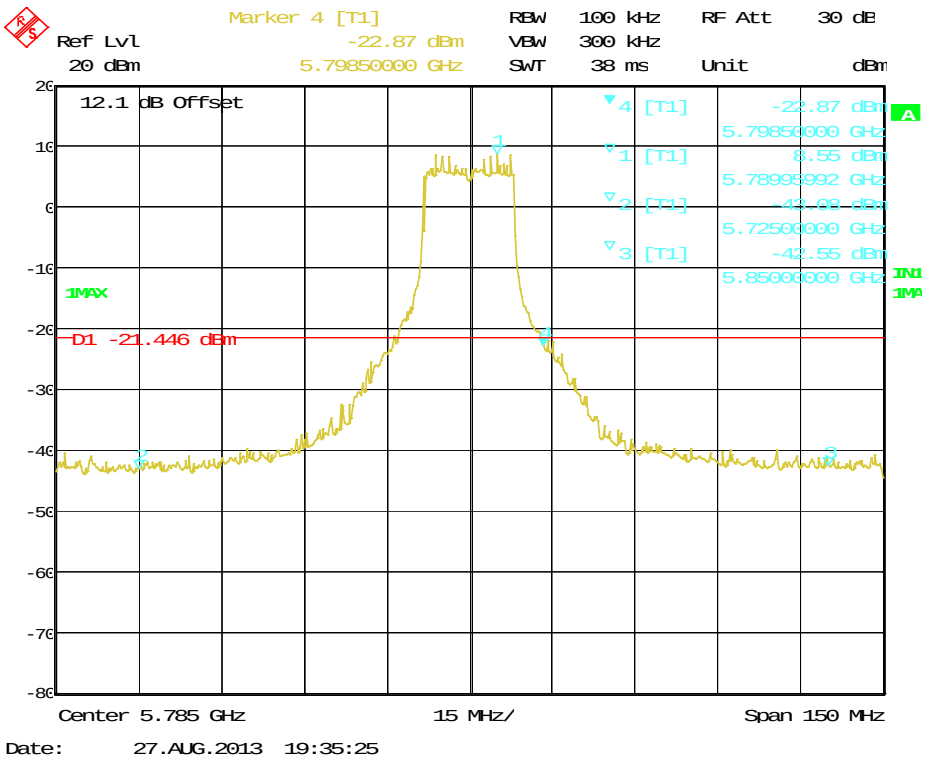


Figure 109: Reference Level for 802.11A at 5785 MHz, Chain 0

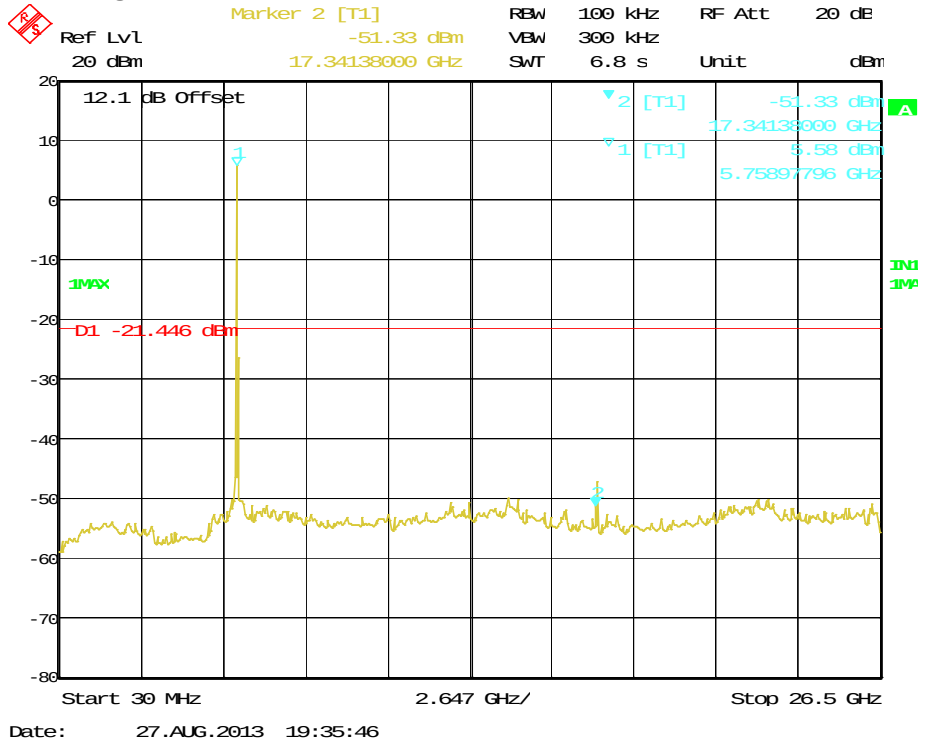


Figure 110: Out of Band Emission for 802.11A at 5785 MHz, Chain 0

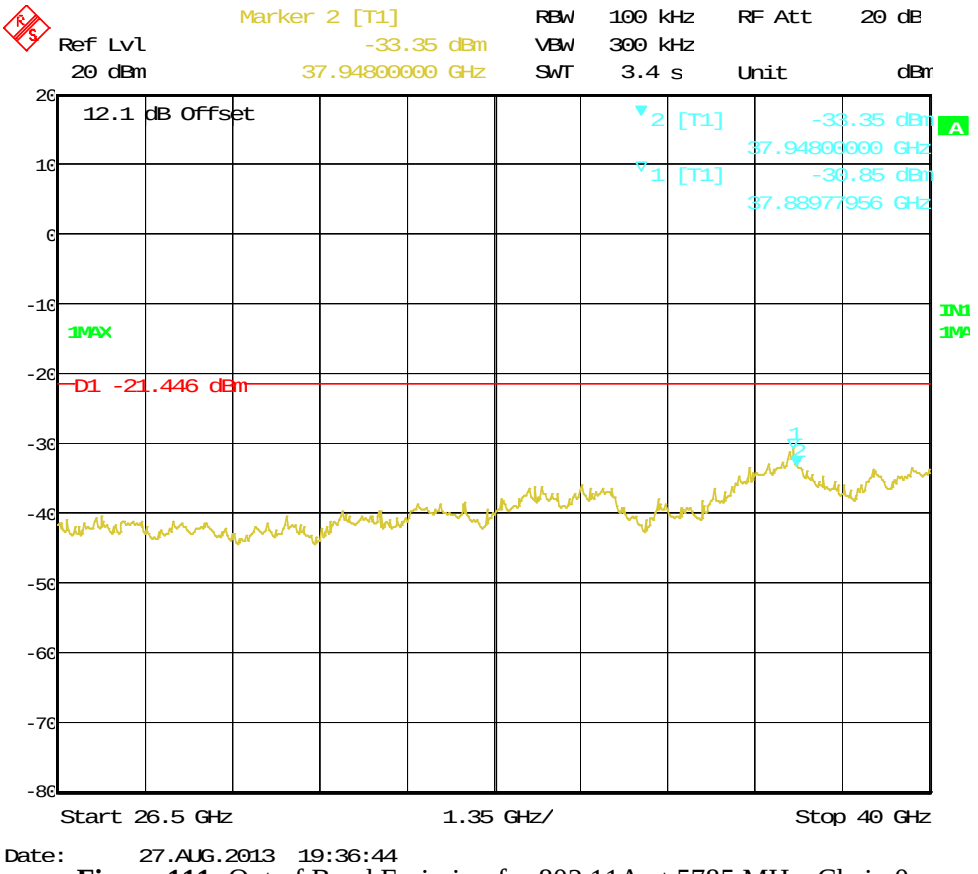


Figure 111: Out of Band Emission for 802.11A at 5785 MHz, Chain 0

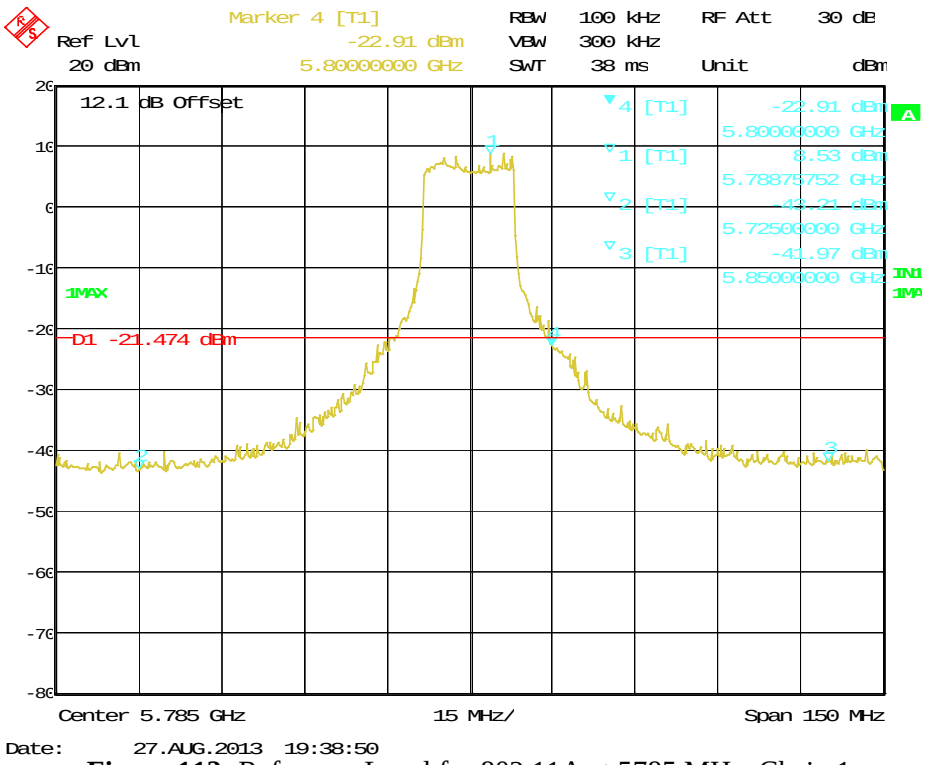


Figure 112: Reference Level for 802.11A at 5785 MHz, Chain 1

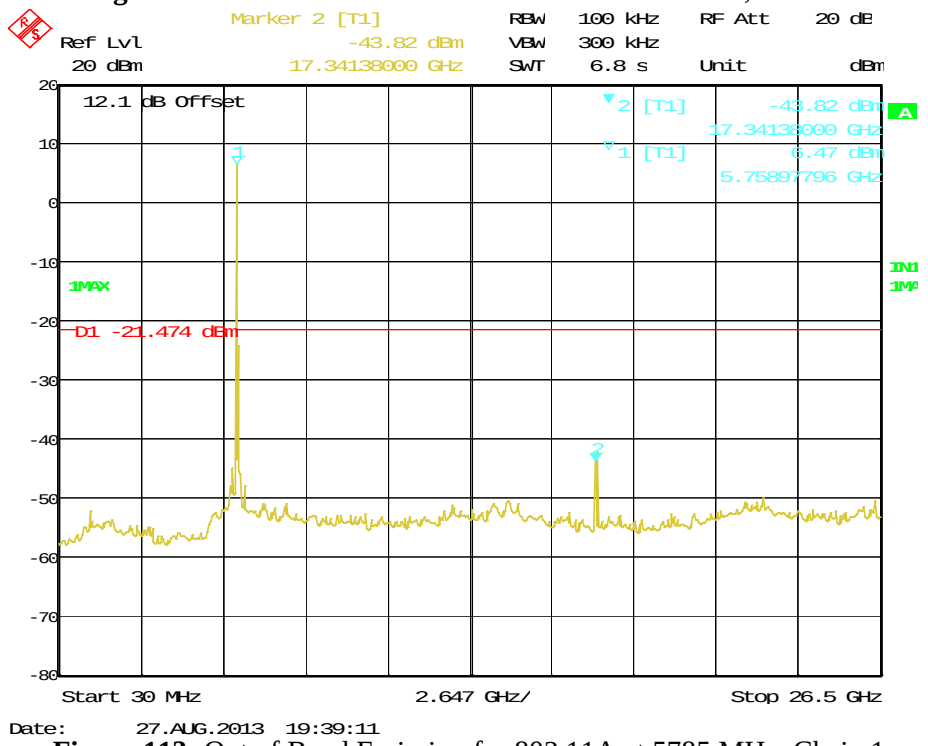


Figure 113: Out of Band Emission for 802.11A at 5785 MHz, Chain 1

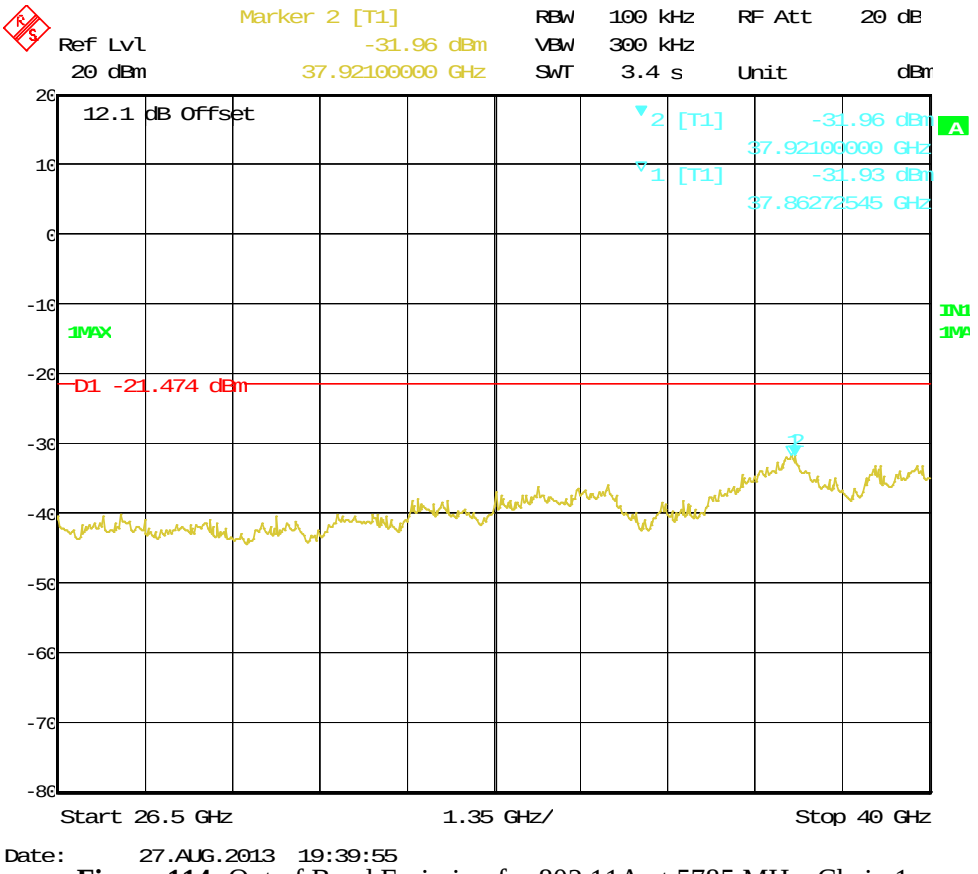


Figure 114: Out of Band Emission for 802.11A at 5785 MHz, Chain 1

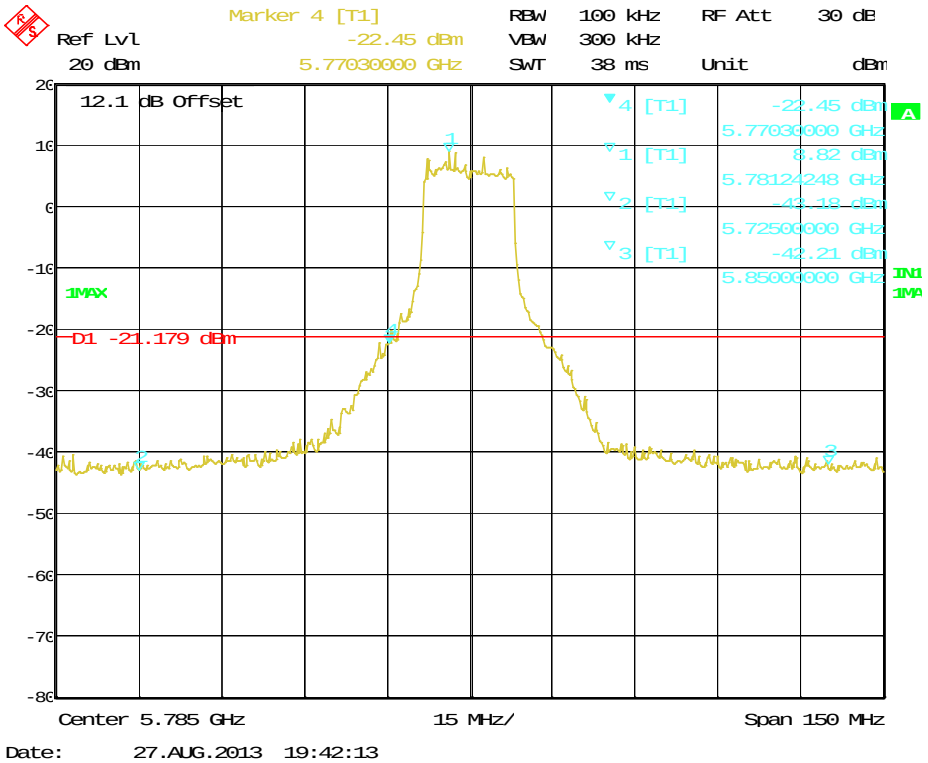


Figure 115: Reference Level for 802.11A at 5785 MHz, Chain 2

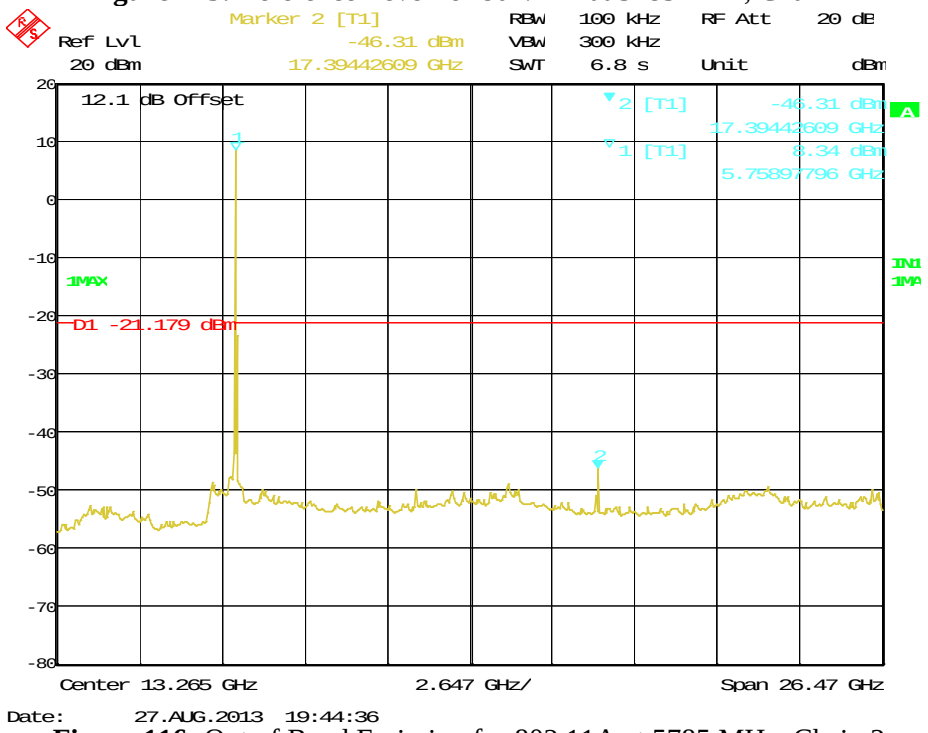


Figure 116: Out of Band Emission for 802.11A at 5785 MHz, Chain 2

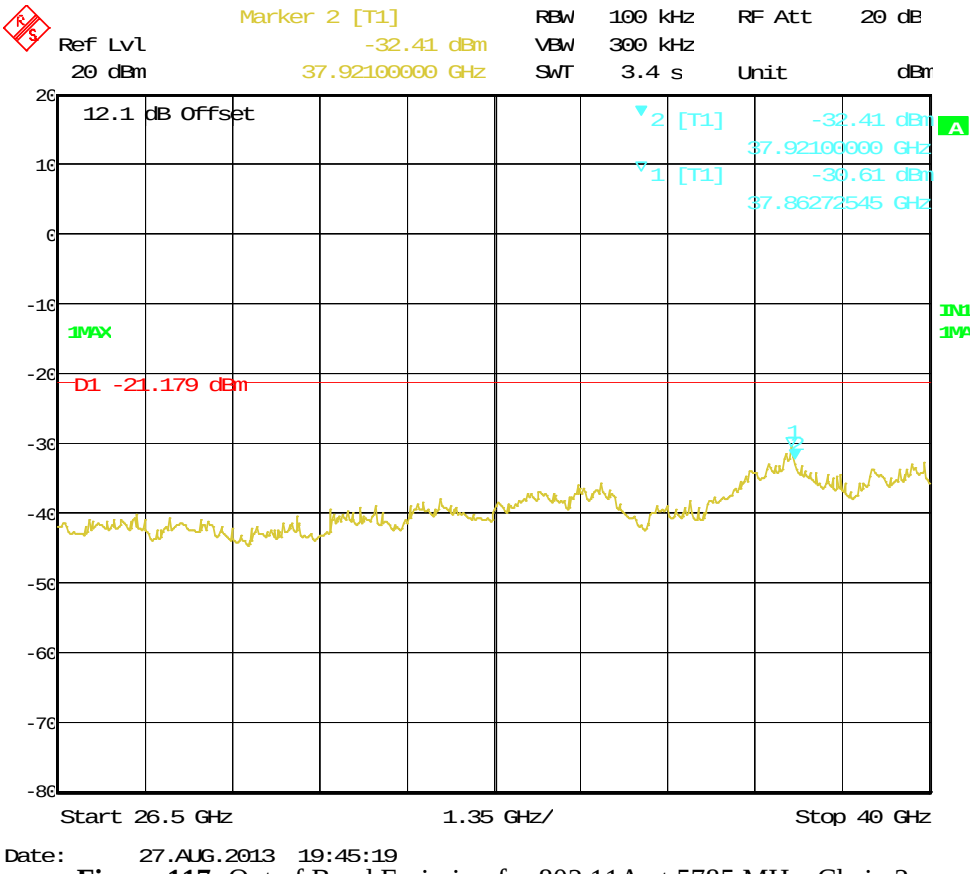


Figure 117: Out of Band Emission for 802.11A at 5785 MHz, Chain 2

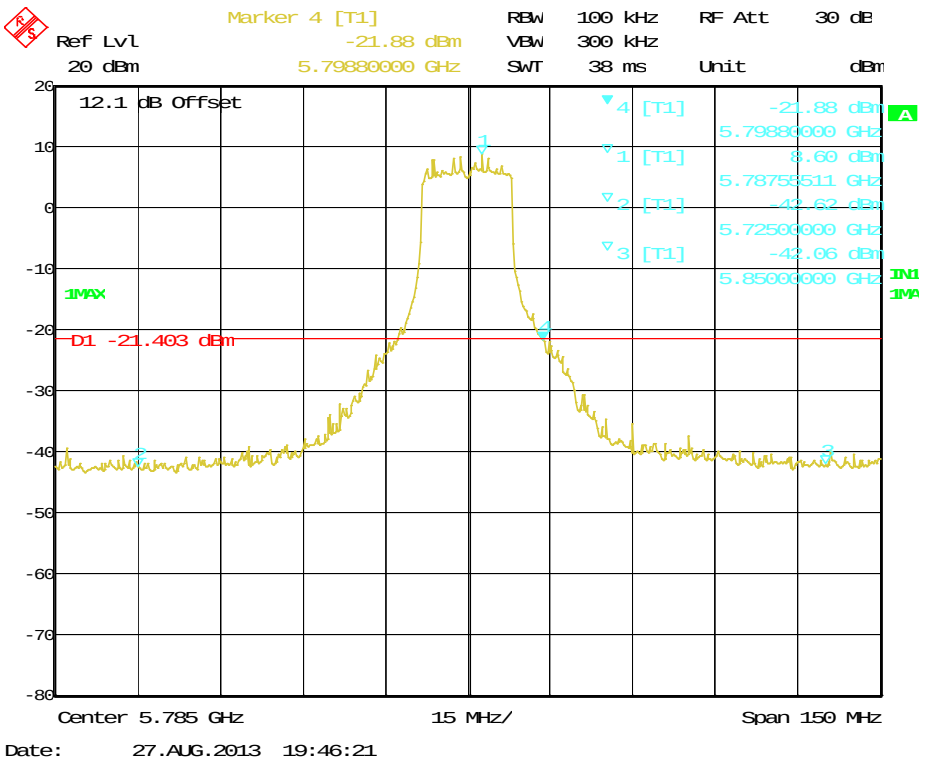


Figure 118: Reference Level for 802.11A at 5785 MHz, Chain 3

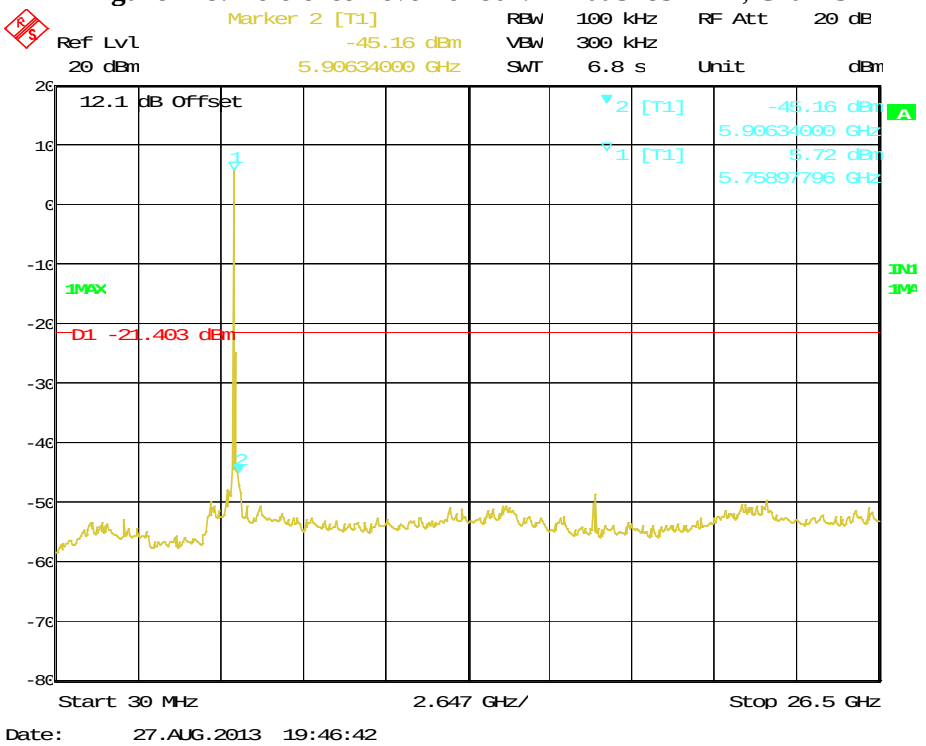


Figure 119: Out of Band Emission for 802.11A at 5785 MHz, Chain 3

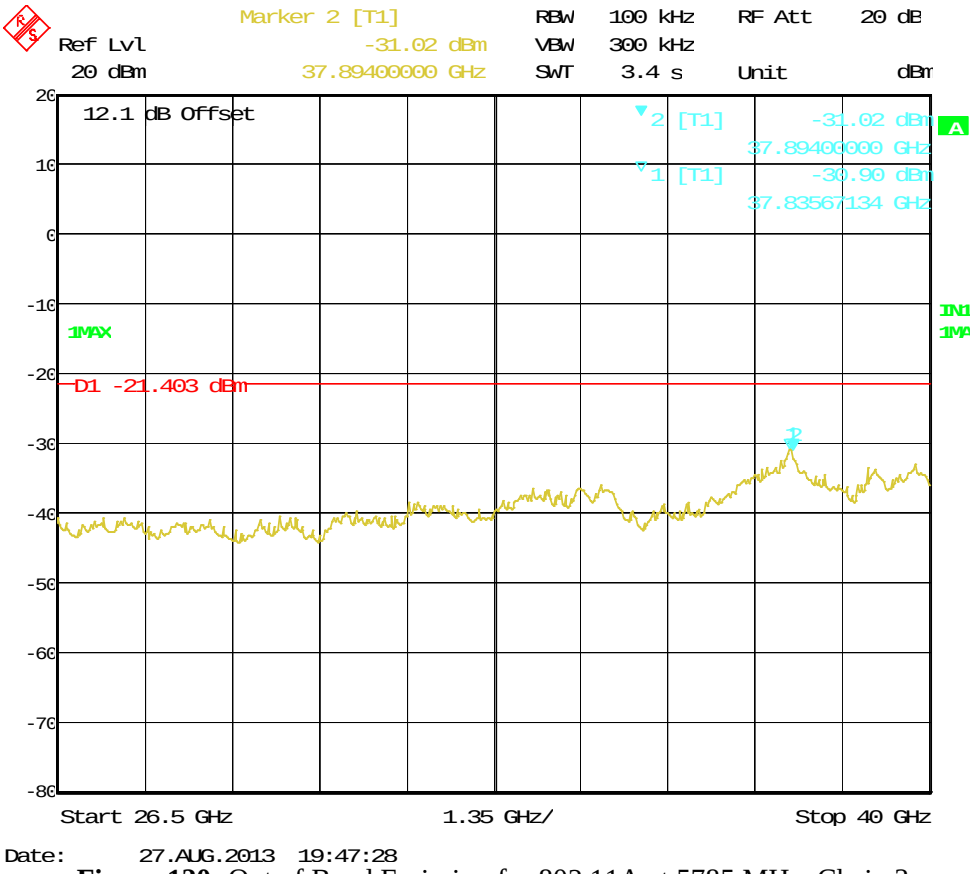


Figure 120: Out of Band Emission for 802.11A at 5785 MHz, Chain 3

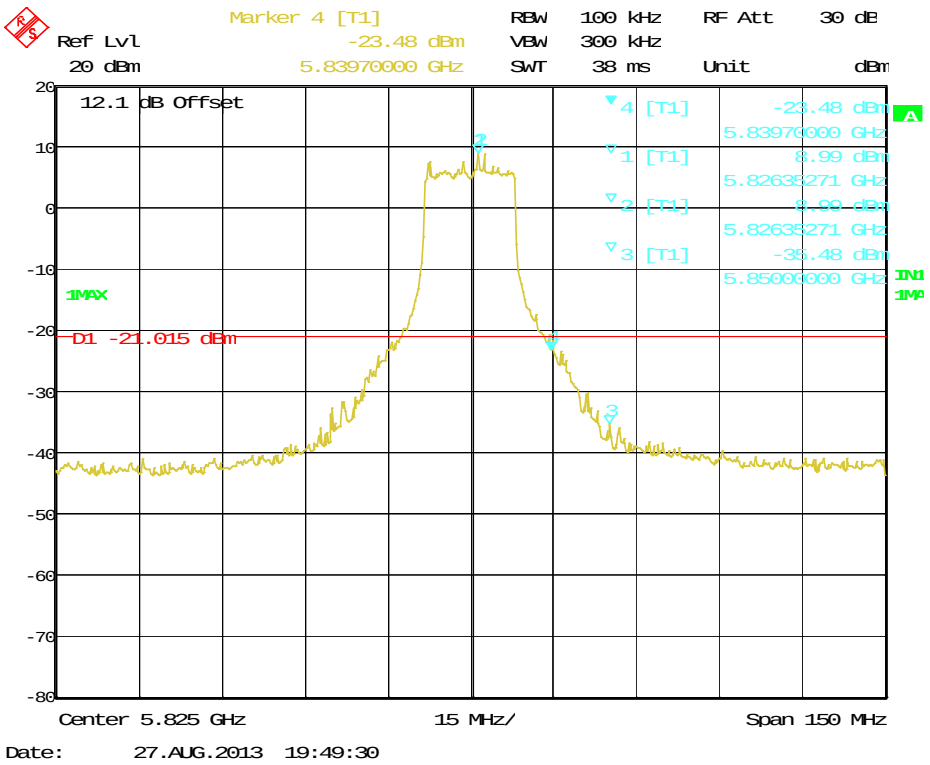


Figure 121: Reference Level for 802.11A at 5825 MHz, Chain 0

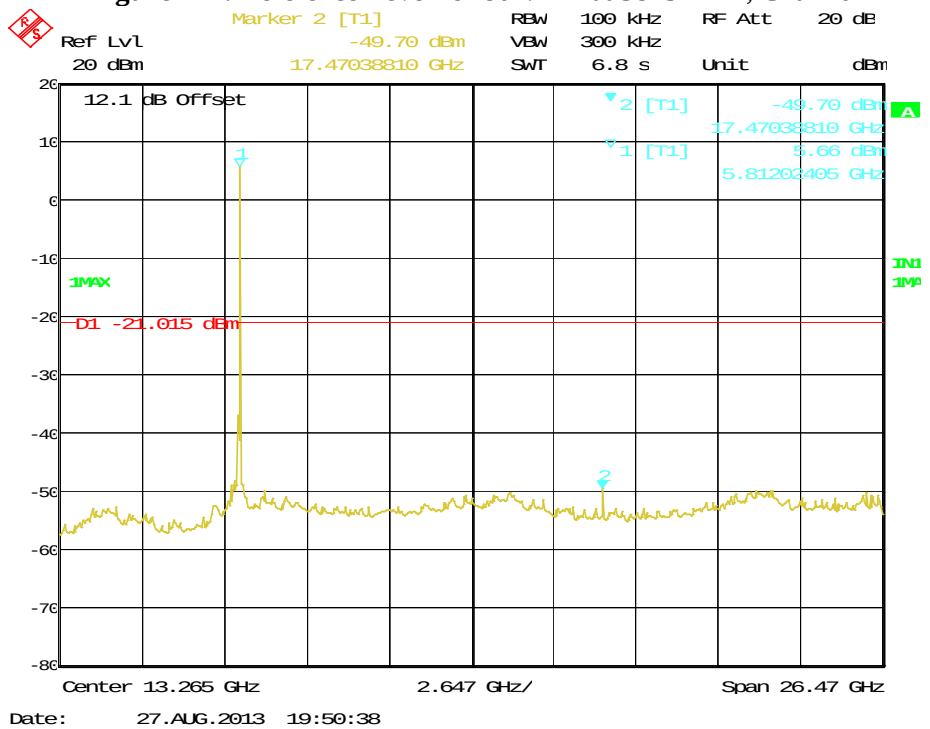


Figure 122: Out of Band Emission for 802.11A at 5825 MHz, Chain 0

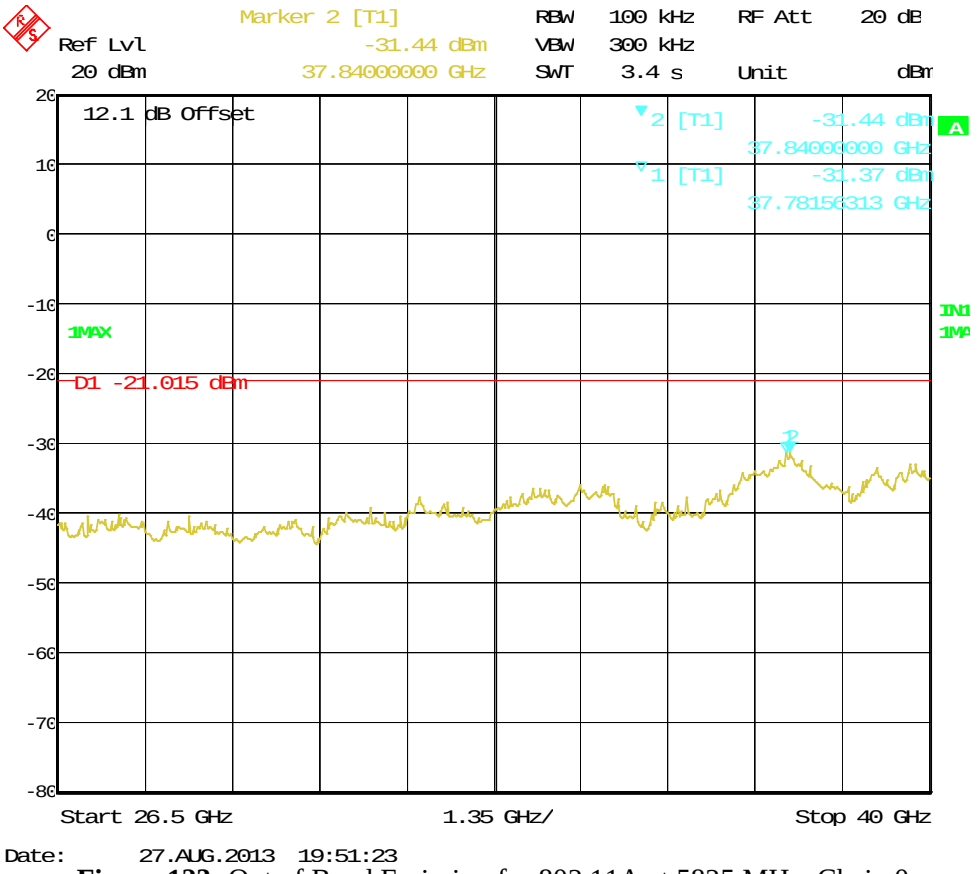


Figure 123: Out of Band Emission for 802.11A at 5825 MHz, Chain 0

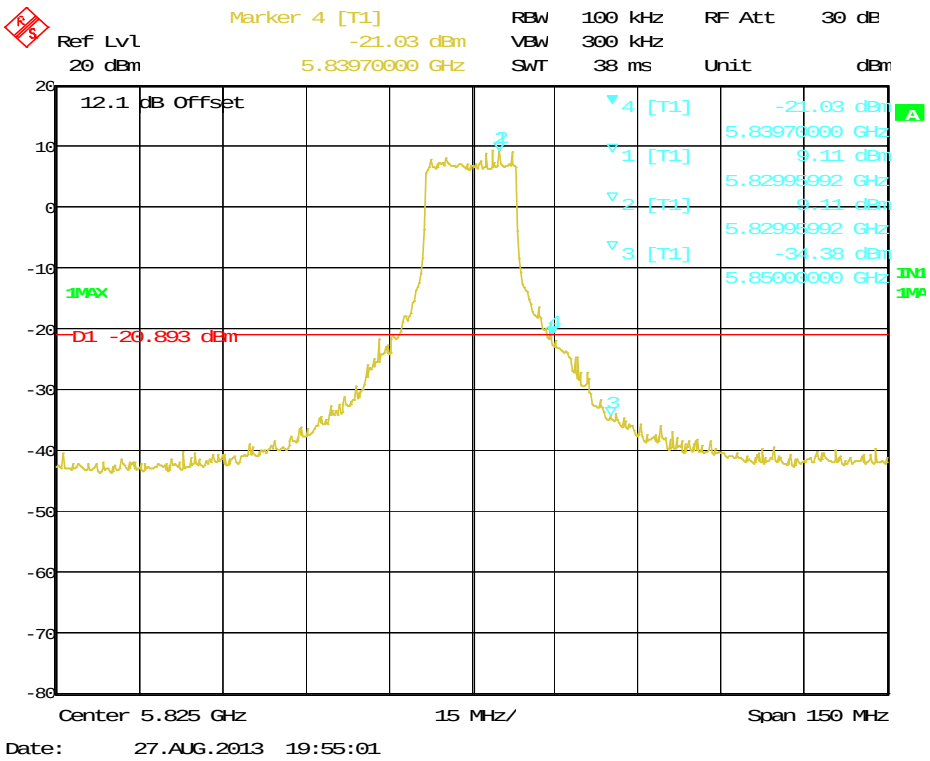


Figure 124: Reference Level for 802.11A at 5825 MHz, Chain 1

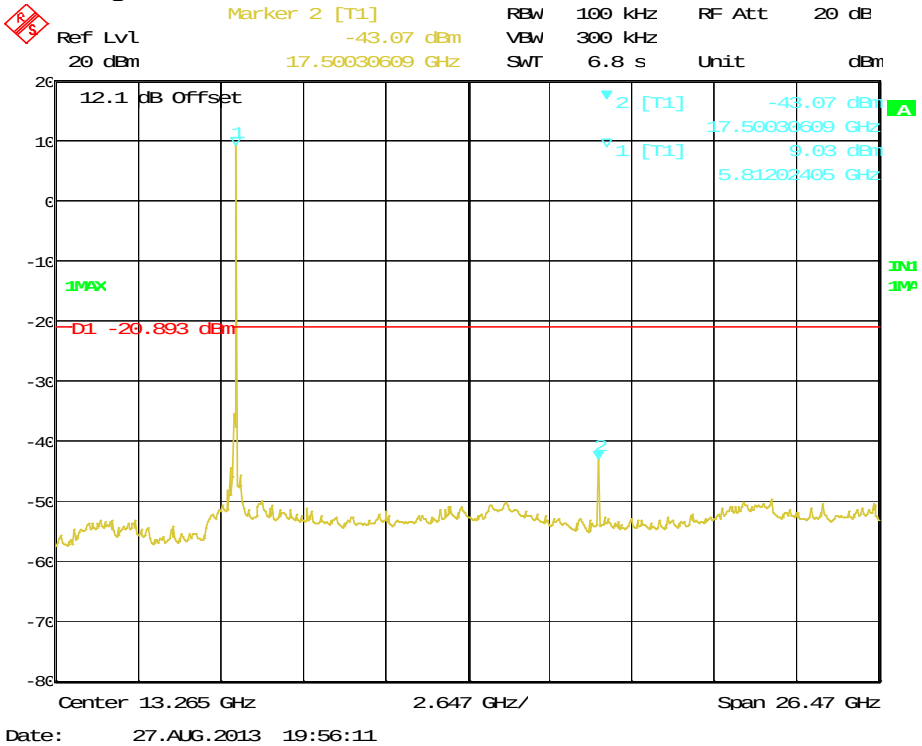


Figure 125: Out of Band Emission for 802.11A at 5825 MHz, Chain 1

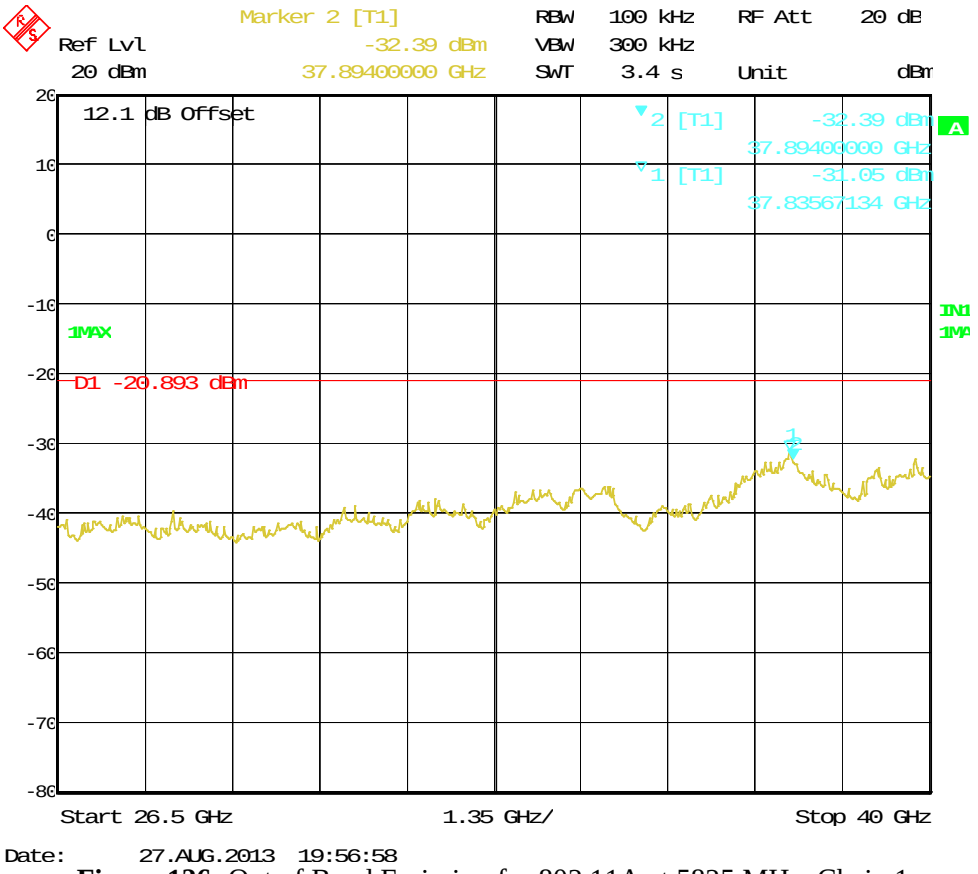


Figure 126: Out of Band Emission for 802.11A at 5825 MHz, Chain 1

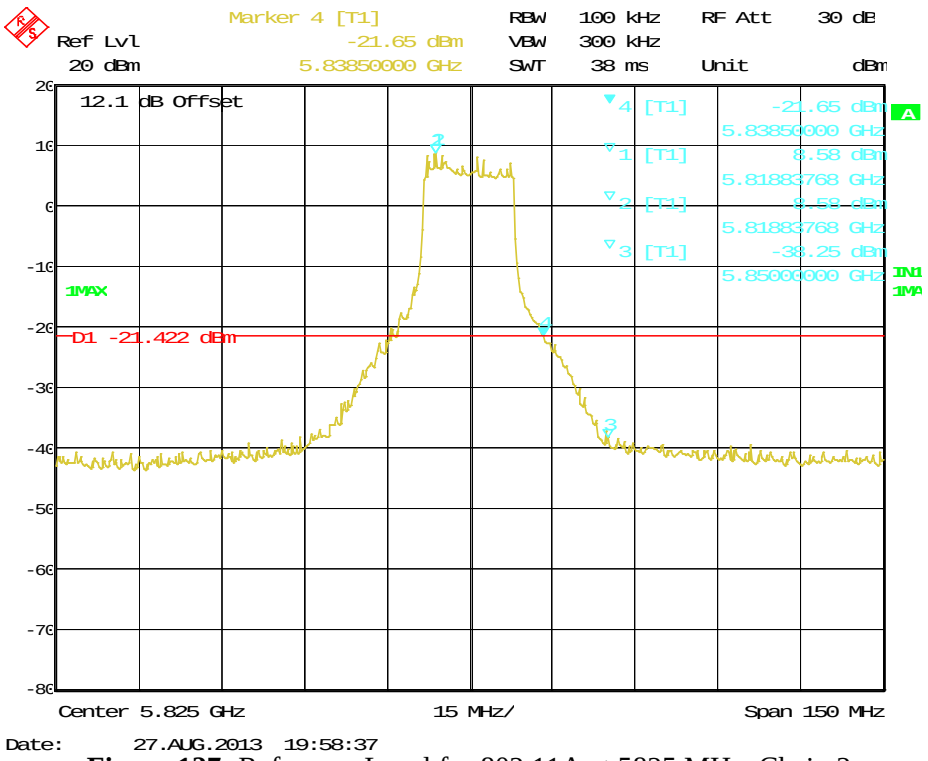


Figure 127: Reference Level for 802.11A at 5825 MHz, Chain 2

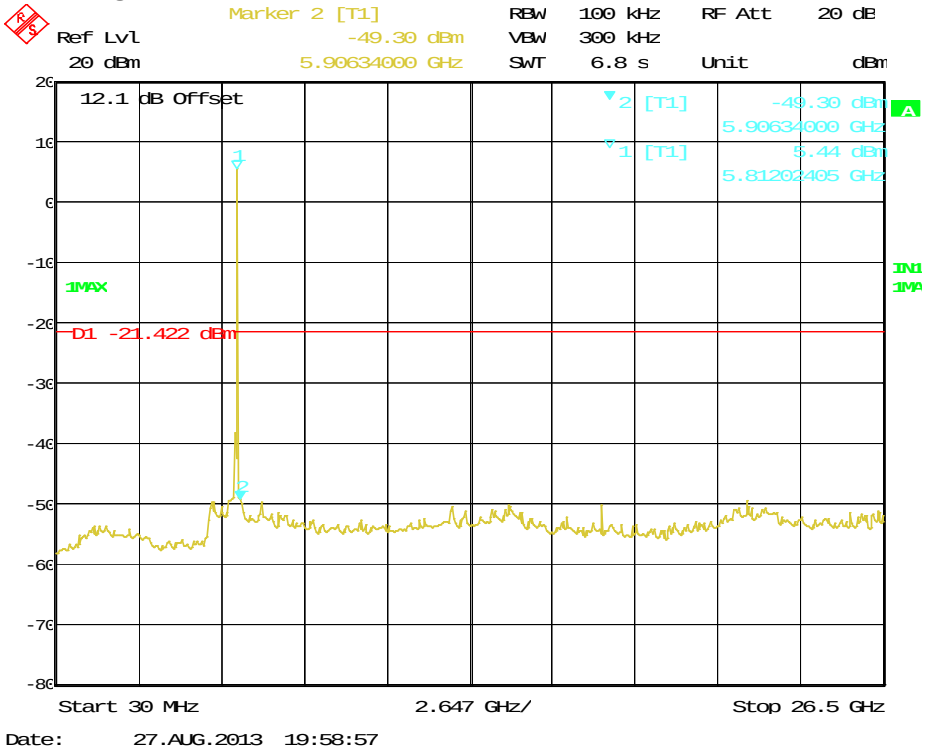


Figure 128: Out of Band Emission for 802.11A at 5825 MHz, Chain 2

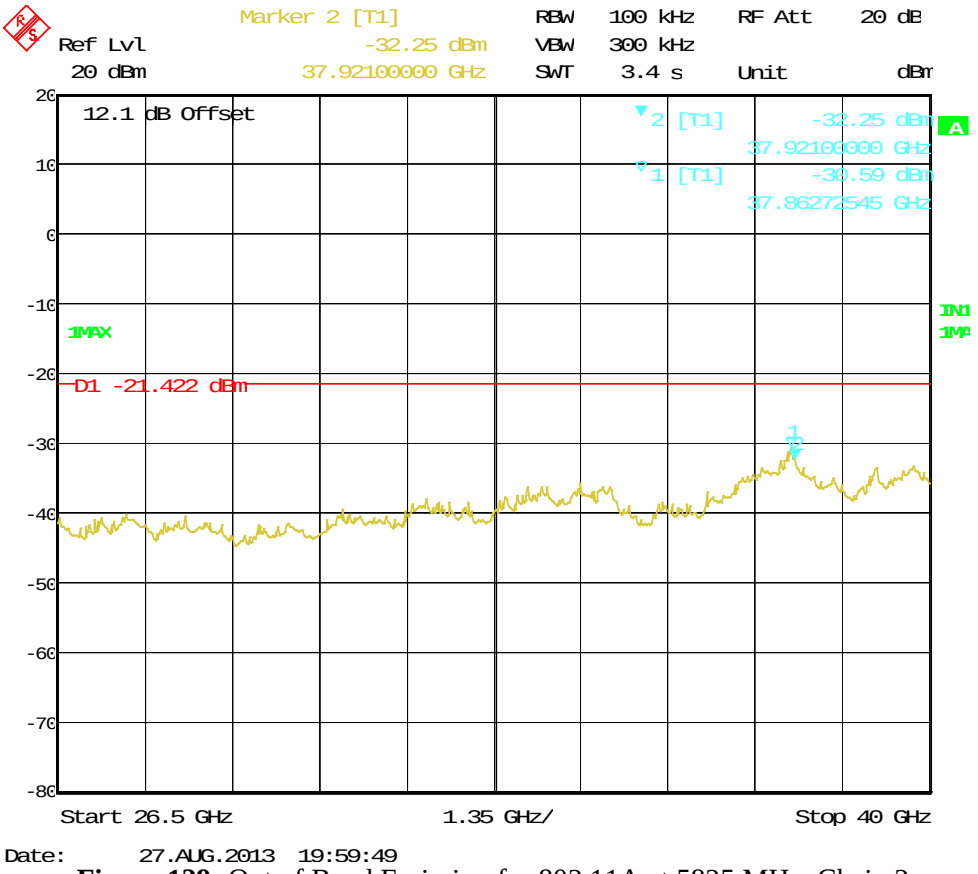


Figure 129: Out of Band Emission for 802.11A at 5825 MHz, Chain 2

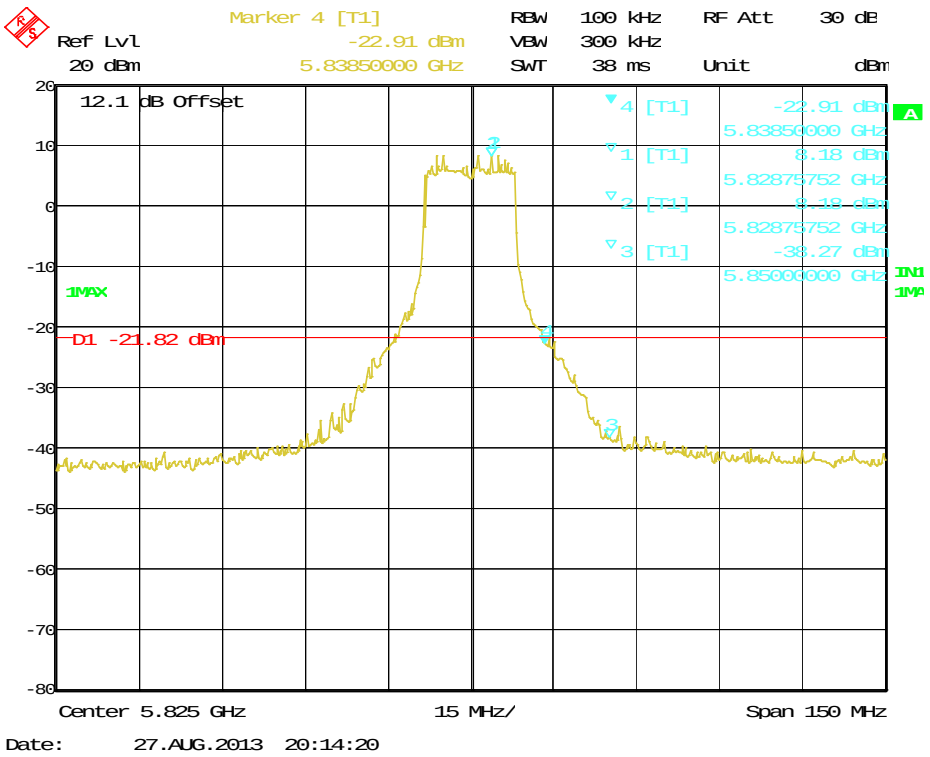


Figure 130: Reference Level for 802.11A at 5825 MHz, Chain 3

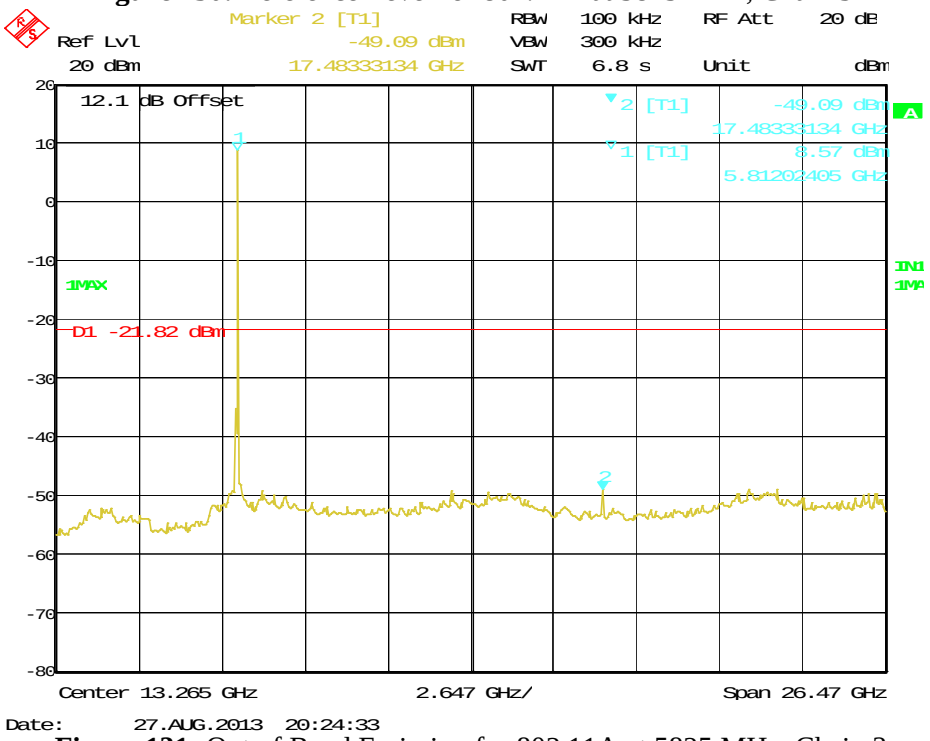


Figure 131: Out of Band Emission for 802.11A at 5825 MHz, Chain 3

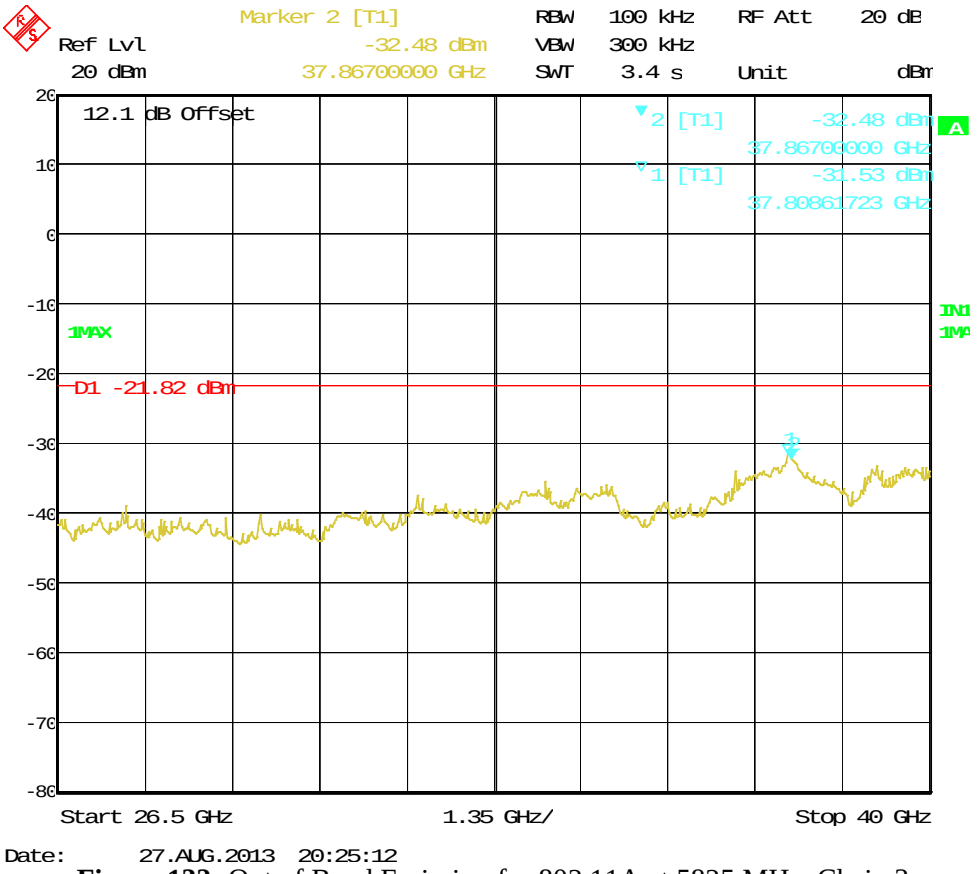


Figure 132: Out of Band Emission for 802.11A at 5825 MHz, Chain 3

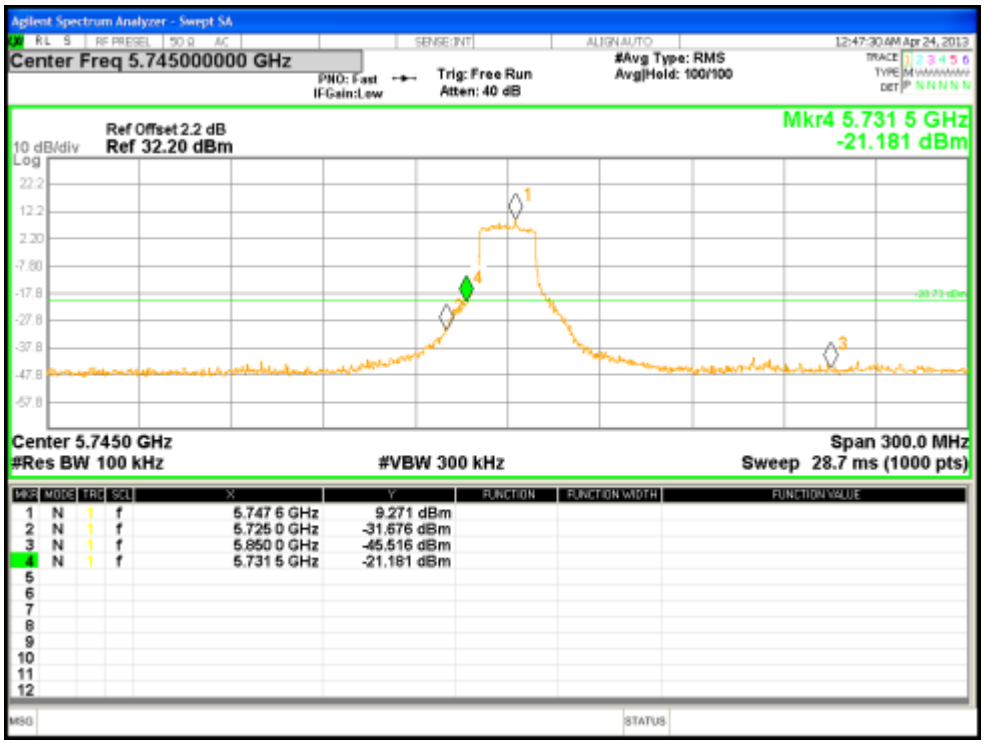


Figure 133: Reference Level for HT20 at 5745 MHz, Chain 0

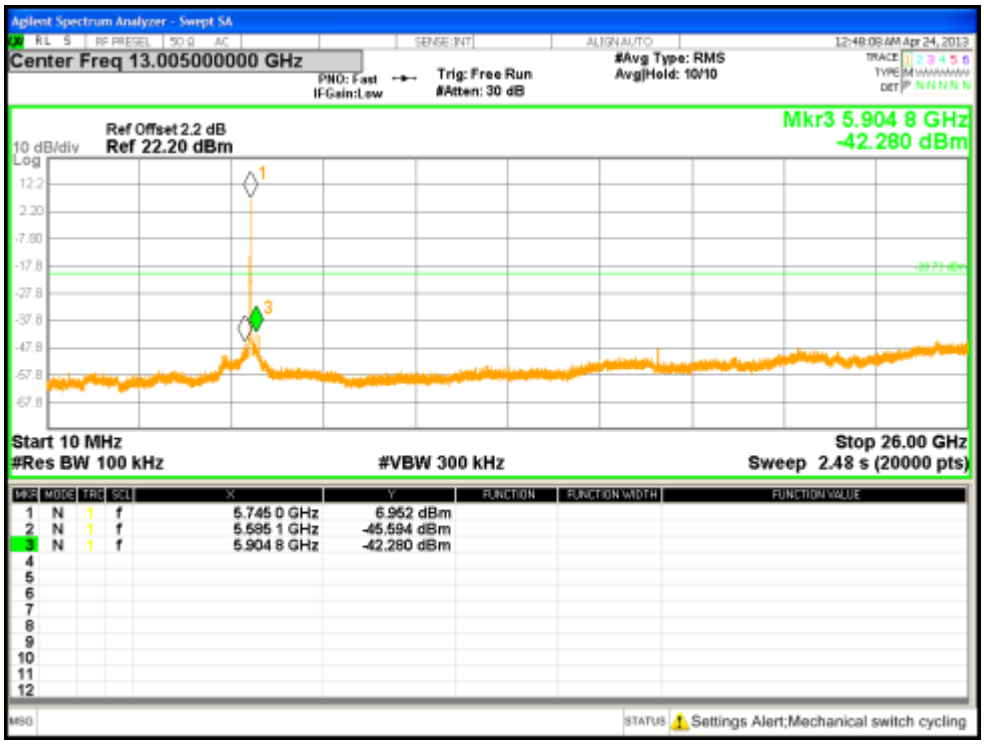


Figure 134: Out of Band Emission for HT20 at 5745 MHz, Chain 0

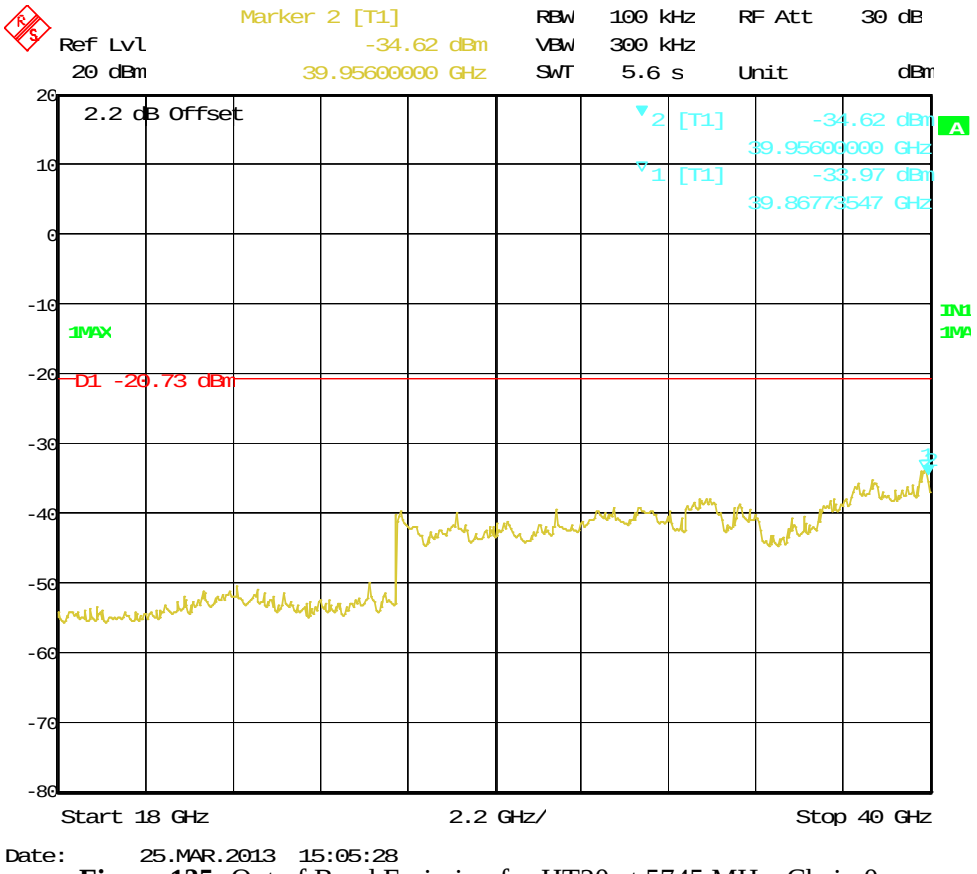


Figure 135: Out of Band Emission for HT20 at 5745 MHz, Chain 0

Figure 136: Reference Level for HT20 at 5745 MHz, Chain 1

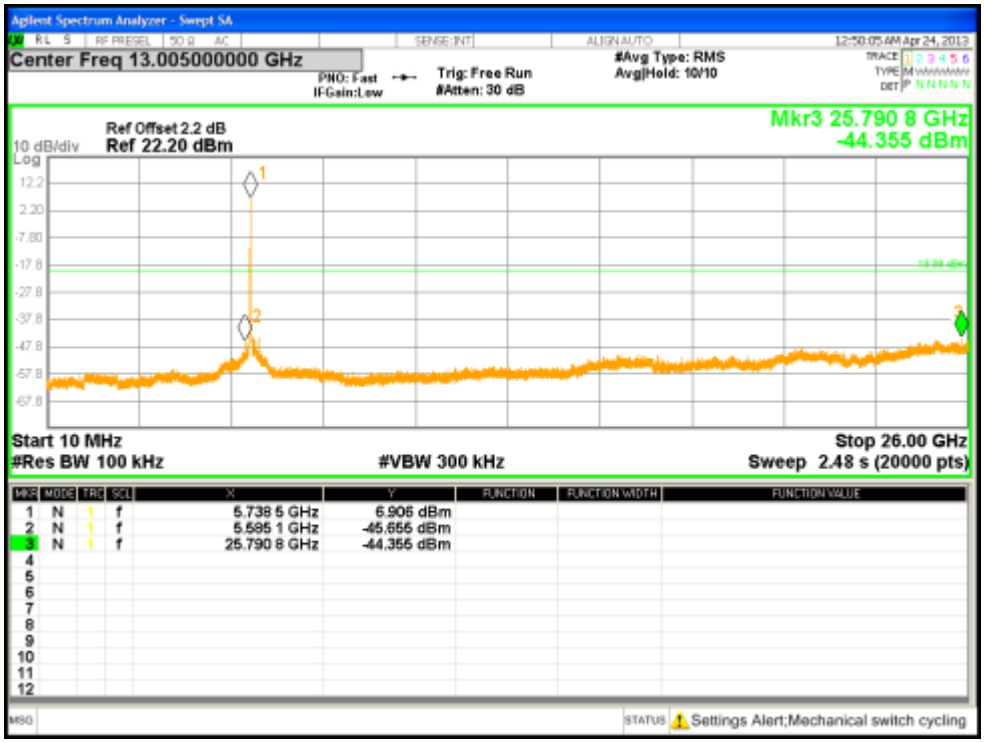


Figure 137: Out of Band Emission for HT20 at 5745 MHz, Chain 1

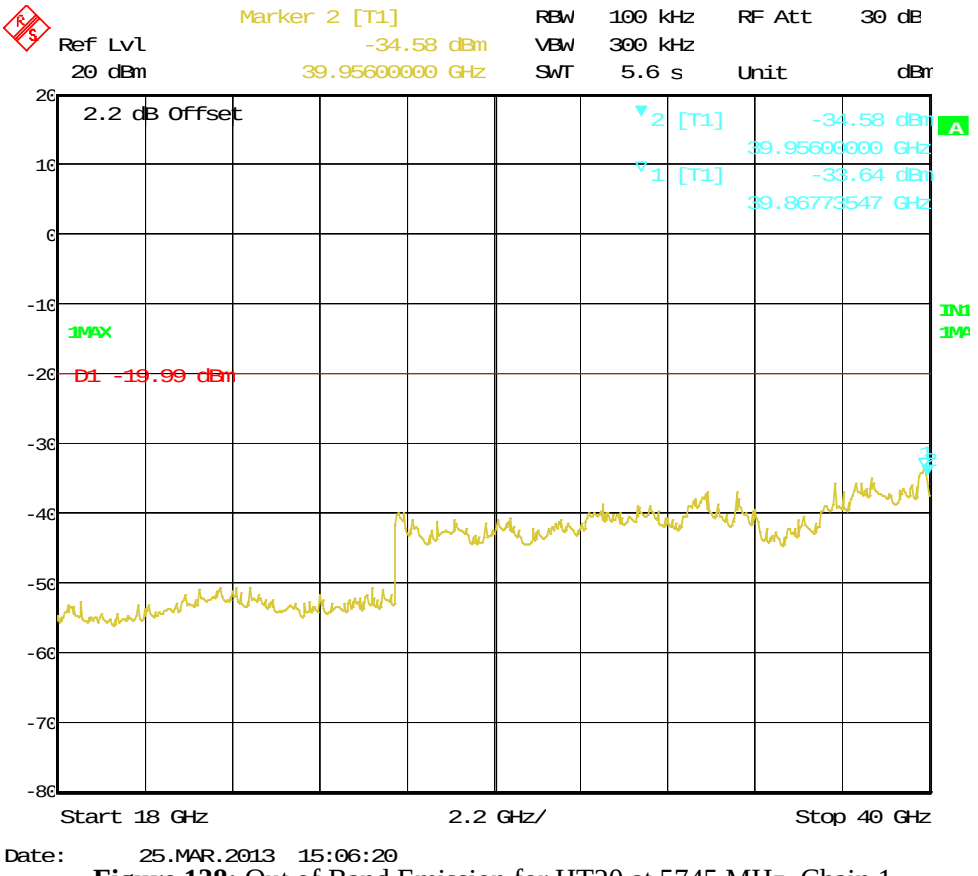


Figure 138: Out of Band Emission for HT20 at 5745 MHz, Chain 1