

FCC TEST REPORT

Test report No.: EMC- FCC- R0231
FCC ID: O6ZHR54
Type of equipment: Digital Satellite Receiver
Model Name: HR54-500
Applicant: HUMAX Co., Ltd
Max.RF Output Power: 21.77 dBm
FCC Rule Part(s): FCC Part 15 Subpart E 15.407
Frequency Range:
5 180 MHz ~ 5 240 MHz
5 260 MHz ~ 5 320 MHz
5 500 MHz ~ 5 700 MHz
5 745 MHz ~ 5 825 MHz
Test result: Complied

The above equipment was tested by EMC compliance Testing Laboratory for compliance with the requirements of FCC Rules and Regulations.
The results of testing in this report apply to the product/system which was tested only.
Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of receipt: 2015. 03. 18

Date of test: 2015. 03. 27 ~ 04. 02

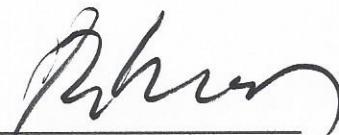
Issued date: 2015. 04. 20

Tested by:



AHN, BYUNG WOO

Approved by:



SON, MIN GI

[Contents]

1. Client information	3
2. Laboratory information.....	4
3. Description of E.U.T.....	5
3.1 Basic description.....	5
3.2 General description.....	5
3.3 Available channel list and frequency	6
3.4 Test Voltage.....	6
4. Summary of test results.....	7
4.1 Standards & results	7
4.2 Uncertainty	7
5. Test results.....	8
5.1 Antenna Requirement	8
5.2 Maximum Conducted Output Power	9
5.3 Bandwidth Measurement	13
5.4 Peak Power Spectral Density	89
5.6 Spurious Emission, Band Edge And Restricted Bands	130
5.7 Frequency Stability	154
5.8 DFS(Dynamic Frequency Selection)	157
5.9 Conducted Emission	163
6. Test equipment used for test	165

1. Client information

Applicant: HUMAX Co., Ltd
Address: HUMAX Village, 11-4, Sunae-dong, Bundang-gu, Seongnam city, Gyeonggi-do, Korea
Telephone number: +82-31-776-6748
Facsimile number: +82-31-776-6149
Contact person: Nak-Yul Sung / nysung@humaxdigital.com

Manufacturer: HUMAX Co., Ltd
Address: (Yubang-dong)2, Yeongmun-ro, Cheoin-gu Yongin-si, Gyeonggi-do, Korea

2. Laboratory information

Address

EMC compliance Ltd.

480-5, Sin-dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea
Telephone Number: 82-31-336-9919 Facsimile Number: 82-505-299-8311

Certificate

KOLAS No.: 231

FCC Site Designation No: KR0040

FCC Site Registration No: 687132

VCCI Site Registration No.: R-3327, G-198, C-3706, T-1849

IC Site Registration No.: 8035A-2

SITE MAP



3. Description of E.U.T.

3.1 Basic description

Applicant:	HUMAX Co., Ltd
Address of Applicant	HUMAX Village, 11-4, Sunae-dong, Bundang-gu, Seongnam city, Gyeonggi-do, Korea
Manufacturer#1	HUMAX Co., Ltd
Address of Manufacturer	(Yubang-dong)2, Yeongmun-ro, Cheoin-gu Yongin-si, Gyeonggi-do, Korea
Type of equipment	Digital Satellite Receiver
Basic Model	HR54-500
Serial number	N/A

3.2 General description

Frequency Range	2 425 MHz ~ 2 475 MHz (RF4CE) 2 412 MHz ~ 2 462 MHz (802.11b/g/n_HT20) 5 180 MHz ~ 5 240 MHz (802.11a/an_HT20) 5 260 MHz ~ 5 320 MHz (802.11a/an_HT20) 5 500 MHz ~ 5 700 MHz (802.11a/an_HT20) 5 745 MHz ~ 5 825 MHz (802.11a/an_HT20)
Type of Modulation	CCK, OFDM, O-QPSK
Number of Channels	2.4 GHz WIFI: 11 ch (RF4CD), 13 ch (802.11b/g/n_HT20) 5.0 GHz WIFI: 4 ch (11a/n_HT20): 5 150 MHz Band, 5 250 MHz Band 8 ch (11a/n_HT20): 5 470 MHz Band, 5 ch (11a/n_HT20): 5 725 MHz Band
Type of Antenna	PCB antenna
Antenna Gain	2.4 GHz WIFI: 3.1 dBi 2.4 GHz RF4CE: ANT 1: 5.7dBi, ANT 2: 3.5dBi 5.0 GHz WIFI: 2.8 dBi (5 150 MHz Band, 5 250 MHz Band, 5 470 MHz Band, 5 725 MHz Band)
Transmit Power	21.77 dBm
Power supply	DC 12 V (AC Adaptor: EPS44R3-16)
Product SW/HW Version	v1b2365_v11_0x0945 / Rev2.6
Radio SW/HW Version	5.99.188.12 / Rev2.6
Test SW Version	Teraterm
RF power setting in TEST SW	Set default

* Declared by the applicant.

3.3 Available channel list and frequency

	Frequency			
Low frequency	5 180 MHz	5 260 MHz	5 500 MHz	5 745 MHz
Middle frequency	5 200 MHz	5 280 MHz	5 580 MHz	5 785 MHz
High frequency	5 220 MHz	5 320 MHz	5 700 MHz	5 825 MHz

3.4 Test Voltage

Mode	Voltage
Norminal voltage	DC 12 V

3.5 Duty Factor

	Duty cycle	Duty factor
802.11a	0.932 1	0.31
802.11n HT20	0.924 2	0.34

* Duty cycle factor=10log(1/Duty cycle)

4. Summary of test results

4.1 Standards & results

FCC Rule	IC Rule (RSS-GEN)	Parameter	Report Section	Test Result
15.203				
15.407(a)(1)(2)(3)	N/A	Antenna Requirement	5.1	C
15.403(i),15.407(e)	4.6	Bandwidth Measurement	5.2	C
15.407(a)(1)(2)	4.8	Maximum Conducted Output Power	5.3	C
15.407(a)(1)(2)(5)	N/A	Peak Power Spectral Density	5.4	C
15.205(a), 15.209(a), 15.407(b)(1), 15.407(b)(2), 15.407(b)(3)	4.9	Spurious Emission, Band Edge and Restricted bands	5.6	C
15.407(g)	4.7	Frequency Stability	5.7	C
15.207(a)	N/A	Conducted Emissions	5.8	C
15.407(h)	N/A	Dynamic Frequency Selection	5.9	C
Note: C = complies NC = Not complies NT = Not tested NA = Not Applicable				

* The general test methods used to test this device is ANSI C63.10 : 2013

4.2 Uncertainty

Measurement Item	Expanded Uncertainty U = KUc (K = 2)	
Conducted RF power	± 1.36 dB	
Conducted Spurious Emissions	± 1.52 dB	
Radiated Spurious Emissions	30 MHz ~ 300 MHz:	+ 4.94 dB, - 5.06 dB + 4.93 dB, - 5.05 dB
	300 MHz ~ 1 000 MHz:	+ 4.97 dB, - 5.08 dB + 4.84 dB, - 4.96 dB
Conducted Emissions	1 GHz ~ 40 GHz:	+ 6.03 dB, - 6.05 dB
	9 kHz ~ 150 kHz: 150 kHz ~ 30 MHz:	± 3.75 dB ± 3.36 dB

5. Test results

5.1 Antenna Requirement

5.1.1 Regulation

According to §15.203, 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.

And according to §15.407(a)(1)(2)(3), If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.1.2 Result

-Complied

The transmitter has an integral PCB antenna.

The total directional peak gain of the antenna exceeds 6.0 dBi

	5 150 MHz Band	5 250 MHz Band	5 470 MHz Band	5 725 MHz Band
ANT Gain			2.8 dBi	

According to KDB 662911 D01 Multiple Transmitter Output v02r01

- Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB.

Total gain = 5.81 dBi (individual gain(2.8 dBi) + Array gain(3.01 dBi))

For power measurements on IEEE 802.11 devices

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices:

Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB.

Total gain = 2.8 dBi (individual gain(2.8 dBi) + Array gain(0 dBi))

5.2 Maximum Conducted Output Power

5.2.1 Regulation

According to §15.407(a) (1) (iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to §15.407(a) (2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to §15.407(a) (3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

5.2.2 Measurement Procedure

These test measurement settings are specified in section C of 789033 D02 General UNII Test Procedures.

5.2.2.1 Method PM (Measurement using an RF average power meter):

- (i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.
 - The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
 - At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
 - The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
- (ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section II.B.
- (iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
- (iv) Adjust the measurement in dBm by adding $10 \log(1/x)$ where x is the duty cycle (e.g., $10 \log(1/0.25)$ if the duty cycle is 25 percent).

5.2.4 Test Result

-Complied

*802.11a

5 150 Band

Frequency [MHz]	Average Power (dBm)		Duty Factor	Result		Limit (dBm)	Margin (dBm)	
	ANT 1	ANT 2		ANT 1	ANT 2		ANT 1	ANT 2
5 180	17.07	16.26	0.31	17.38	16.57	23.98	6.60	7.41
5 200	17.02	16.77	0.31	17.33	17.07	23.98	6.65	6.91
5 240	16.93	16.91	0.31	17.24	17.21	23.98	6.74	6.77

5 250 Band

Frequency [MHz]	Average Power (dBm)		Duty Factor	Result		Limit (dBm)	Margin (dBm)	
	ANT 1	ANT 2		ANT 1	ANT 2		ANT 1	ANT 2
5 260	18.36	18.63	0.31	18.67	18.94	23.98	5.31	5.04
5 280	18.20	18.71	0.31	18.51	19.02	23.98	5.47	4.96
5 320	18.43	18.62	0.31	18.74	18.93	23.98	5.24	5.05

5 470 Band

Frequency [MHz]	Average Power (dBm)		Duty Factor	Result		Limit (dBm)	Margin (dBm)	
	ANT 1	ANT 2		ANT 1	ANT 2		ANT 1	ANT 2
5 500	17.78	18.12	0.31	18.09	18.43	23.98	5.89	5.55
5 580	17.89	18.69	0.31	18.20	19.00	23.98	5.78	4.98
5 700	18.09	18.74	0.31	18.40	19.05	23.98	5.58	4.93

5 725 Band

Frequency [MHz]	Average Power (dBm)		Duty Factor	Result		Limit (dBm)	Margin (dBm)	
	ANT 1	ANT 2		ANT 1	ANT 2		ANT 1	ANT 2
5 745	16.56	16.74	0.31	16.87	17.05	30.00	13.13	12.95
5 785	16.58	16.55	0.31	16.89	16.86	30.00	13.11	13.14
5 825	16.50	16.37	0.31	16.81	16.68	30.00	13.19	13.32

*802.11n HT20

5 150 Band

Frequency [MHz]	Average Power (dBm)		Duty Factor	Result		Limit (dBm)	Margin (dBm)	
	ANT 1	ANT 2		ANT 1	ANT 2		ANT 1	ANT 2
5 180	17.04	17.01	0.34	17.39	17.35	23.98	6.59	6.63
5 200	17.19	17.00	0.34	17.53	17.34	23.98	6.45	6.64
5 240	17.29	17.10	0.34	17.63	17.44	23.98	6.35	6.54

5 250 Band

Frequency [MHz]	Average Power (dBm)		Duty Factor	Result		Limit (dBm)	Margin (dBm)	
	ANT 1	ANT 2		ANT 1	ANT 2		ANT 1	ANT 2
5 260	18.31	18.82	0.34	18.65	19.16	23.98	5.33	4.82
5 280	18.29	18.56	0.34	18.63	18.90	23.98	5.35	5.08
5 320	18.15	18.60	0.34	18.49	18.94	23.98	5.49	5.04

5 470 Band

Frequency [MHz]	Average Power (dBm)		Duty Factor	Result		Limit (dBm)	Margin (dBm)	
	ANT 1	ANT 2		ANT 1	ANT 2		ANT 1	ANT 2
5 500	17.97	18.21	0.34	18.31	18.55	23.98	5.67	5.43
5 580	18.29	18.50	0.34	18.63	18.84	23.98	5.35	5.14
5 700	18.05	18.75	0.34	18.39	19.09	23.98	5.59	4.89

5 725 Band

Frequency [MHz]	Average Power (dBm)		Duty Factor	Result		Limit (dBm)	Margin (dBm)	
	ANT 1	ANT 2		ANT 1	ANT 2		ANT 1	ANT 2
5 745	16.45	16.74	0.34	16.79	17.08	30.00	13.21	12.92
5 785	16.52	16.50	0.34	16.86	16.84	30.00	13.14	13.16
5 825	16.53	16.31	0.34	16.87	16.65	30.00	13.13	13.35

*802.11n HT20_MIMO (ANT 1+2)

5 150 Band

Frequency [MHz]	Average Power (dBm)		Duty Factor	Result	Limit (dBm)	Margin (dBm)
	ANT 1	ANT 2				
5 180	17.00	16.42	0.34	20.07	23.98	3.91
5 200	17.14	16.22	0.34	20.06	23.98	3.92
5 240	16.70	16.32	0.34	19.87	23.98	4.11

5 250 Band

Frequency [MHz]	Average Power (dBm)		Duty Factor	Result	Limit (dBm)	Margin (dBm)
	ANT 1	ANT 2				
5 260	18.28	18.40	0.34	21.69	23.98	2.29
5 280	18.26	18.56	0.34	21.77	23.98	2.21
5 320	18.19	18.16	0.34	21.53	23.98	2.45

5 470 Band

Frequency [MHz]	Average Power (dBm)		Duty Factor	Result	Limit (dBm)	Margin (dBm)
	ANT 1	ANT 2				
5 500	17.80	17.52	0.34	21.01	23.98	2.97
5 580	18.31	18.06	0.34	21.54	23.98	2.44
5 700	18.12	18.44	0.34	21.64	23.98	2.34

5 725 Band

Frequency [MHz]	Average Power (dBm)		Duty Factor	Result	Limit (dBm)	Margin (dBm)
	ANT 1	ANT 2				
5 745	16.72	16.08	0.34	19.76	30.00	10.24
5 785	16.56	16.19	0.34	19.73	30.00	10.27
5 825	16.66	16.34	0.34	19.86	30.00	10.14

-NOTE:

1. Since the directional gain of the PCB antenna declared by the manufacturer (GANT = 2.8 dB i), does not exceed 6.0 dB i, Therefore it doesn't need to reduce the output power.
2. Total power calculation = $10 \log(10^{(Ant1 \text{ power}/10)} + 10^{(Ant2 \text{ power}/10)})$.
3. 802.11a: 5 180 MHz : Duty cycle = 0.932 1, Duty cycle factor = $10 \log(1/\text{duty cycle}) = 10 \log(1/0.932 1) = 0.31 \text{ dB}$.
802.11n HT20: 5 180 MHz : Duty cycle = 0.924 2, Duty cycle factor = $10 \log(1/\text{duty cycle}) = 10 \log(1/0.924 2) = 0.34 \text{ dB}$.
3. Result = Total power calculation + C.L + Duty Factor

5.3 Bandwidth Measurement

5.3.1 Regulation

According to §15.403,(i) *Emission bandwidth*. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

According to §15.407,(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

5.3.2 Measurement Procedure

1. Emission Bandwidth (EBW)

- a) Set RBW = approximately 1% of the emission bandwidth.
- b) Set the VBW $>$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 kHz for the band 5.715-5.85 GHz.

The following procedure shall be used for measuring this bandwidth:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

5.3.3 Test Result

-Complied

*802.11a

5 150 Band

Frequency [MHz]	26 dB Bandwidth [MHz]		OBW [MHz]	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	20.61	20.61	16.79	16.73
5 200	20.55	20.26	16.79	16.85
5 240	20.20	20.32	16.56	16.79

5 250 Band

Frequency [MHz]	26 dB Bandwidth [MHz]		OBW [MHz]	
	ANT 1	ANT 2	ANT 1	ANT 2
5 260	20.55	20.32	16.79	16.73
5 280	20.49	20.43	16.73	16.73
5 320	20.55	20.55	16.73	16.79

5 470 Band

Frequency [MHz]	26 dB Bandwidth [MHz]		OBW [MHz]	
	ANT 1	ANT 2	ANT 1	ANT 2
5 500	20.49	20.38	16.73	16.67
5 580	20.38	20.15	16.73	16.67
5 700	20.26	20.49	16.79	16.67

5 725 Band

Frequency [MHz]	6 dB Bandwidth [MHz]		OBW [MHz]	
	ANT 1	ANT 2	ANT 1	ANT 2
5 745	16.44	16.44	16.79	16.67
5 785	16.44	16.44	16.73	16.73
5 825	16.44	16.44	16.73	16.79

*802.11n HT20

5 150 Band

Frequency [MHz]	26 dB Bandwidth [MHz]		OBW [MHz]	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	20.67	20.96	17.89	17.83
5 200	20.84	20.61	17.71	17.71
5 240	20.90	20.84	17.77	17.71

5 250 Band

Frequency [MHz]	26 dB Bandwidth [MHz]		OBW [MHz]	
	ANT 1	ANT 2	ANT 1	ANT 2
5 260	20.78	20.84	17.77	17.77
5 280	20.90	20.84	17.77	17.77
5 320	20.84	20.78	17.83	17.83

5 470 Band

Frequency [MHz]	26 dB Bandwidth [MHz]		OBW [MHz]	
	ANT 1	ANT 2	ANT 1	ANT 2
5 500	20.67	20.61	17.77	17.77
5 580	20.78	20.67	17.83	17.83
5 700	20.49	20.84	17.83	17.83

5 725 Band

Frequency [MHz]	6 dB Bandwidth [MHz]		OBW [MHz]	
	ANT 1	ANT 2	ANT 1	ANT 2
5 745	17.71	17.71	17.77	17.77
5 785	17.71	17.71	17.83	17.77
5 825	17.71	17.66	17.77	17.77

*802.11n HT20_MIMO (ANT 1+2)

5 150 Band

Frequency [MHz]	26 dB Bandwidth [MHz]		OBW [MHz]	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	20.96	20.61	17.77	17.83
5 200	20.72	20.49	17.83	17.77
5 240	20.84	20.49	17.77	17.83

5 250 Band

Frequency [MHz]	26 dB Bandwidth [MHz]		OBW [MHz]	
	ANT 1	ANT 2	ANT 1	ANT 2
5 260	20.67	20.55	17.77	17.83
5 280	20.72	20.61	17.77	17.71
5 320	20.72	20.55	17.71	17.83

5 470 Band

Frequency [MHz]	26 dB Bandwidth [MHz]		OBW [MHz]	
	ANT 1	ANT 2	ANT 1	ANT 2
5 500	20.61	20.32	17.71	17.71
5 580	20.67	20.61	17.71	17.71
5 700	20.72	20.55	17.77	17.77

5 725 Band

Frequency [MHz]	6 dB Bandwidth [MHz]		OBW [MHz]	
	ANT 1	ANT 2	ANT 1	ANT 2
5 745	17.71	17.71	17.77	17.77
5 785	17.71	17.71	17.77	17.71
5 825	17.71	17.72	17.71	17.77

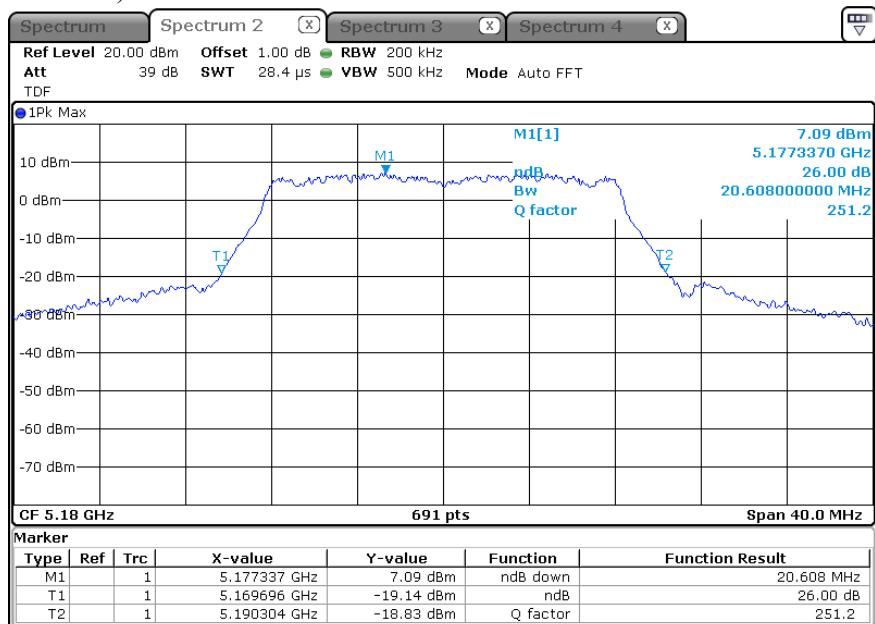
5.3.4 Test Plot

Figure 1. Plot of Bandwidth Measurement

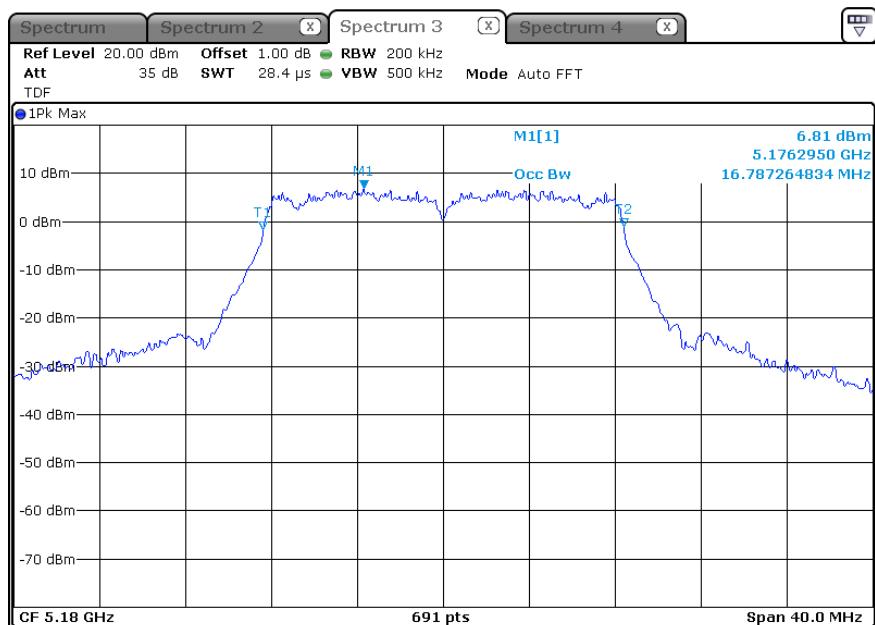
* 802.11a_5 150 Band (26 dB Bandwidth)

-5 180 MHz

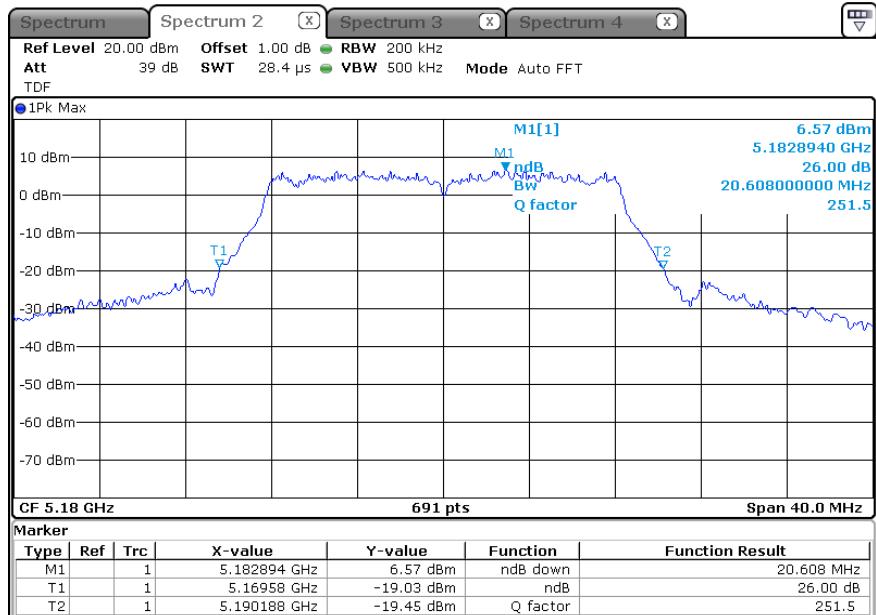
ANT 1(26 dB Bandwidth)



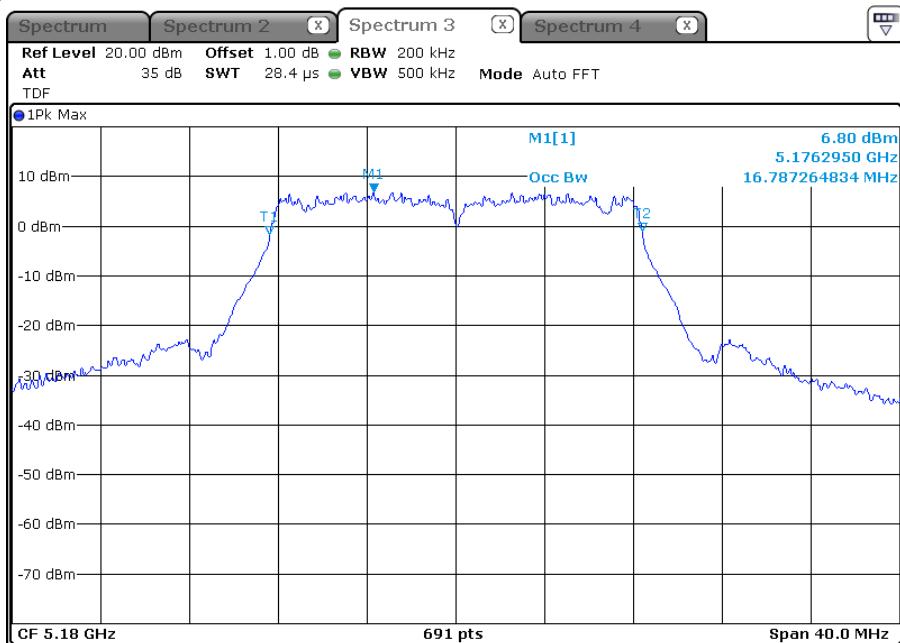
ANT 1(OBW)



ANT 2(26 dB Bandwidth)

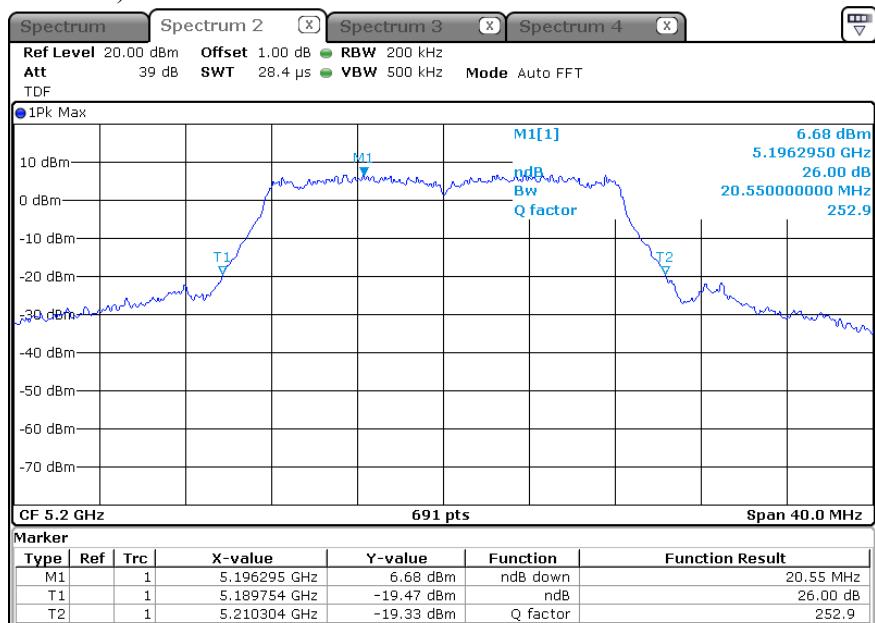


ANT 2(OBW)

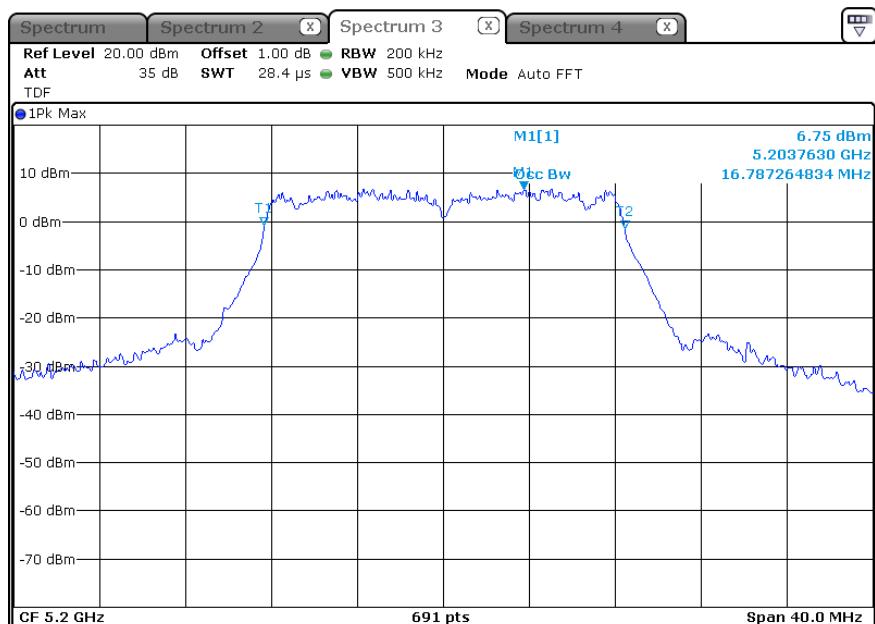


-5 200 MHz

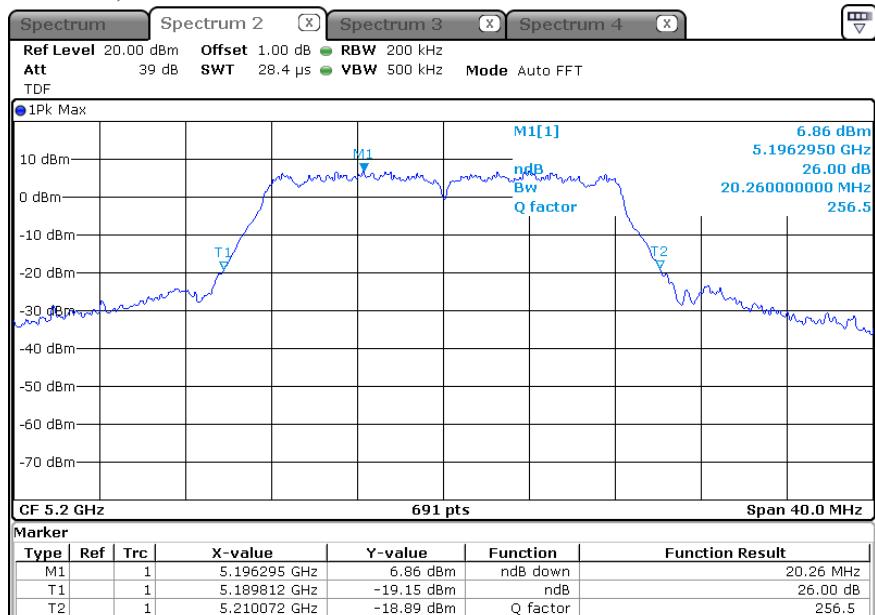
ANT 1(26 dB Bandwidth)



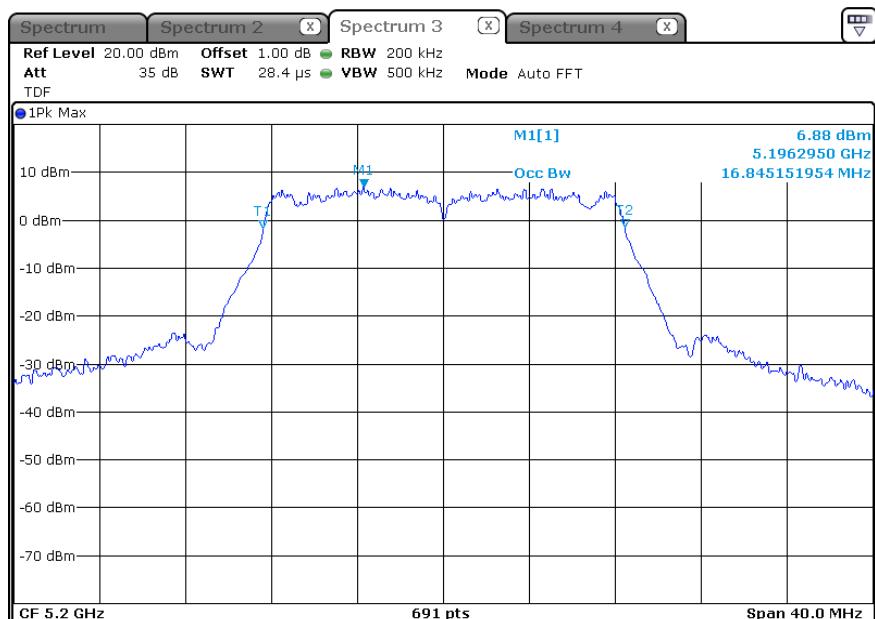
ANT 1(OBW)



ANT 2(26 dB Bandwidth)

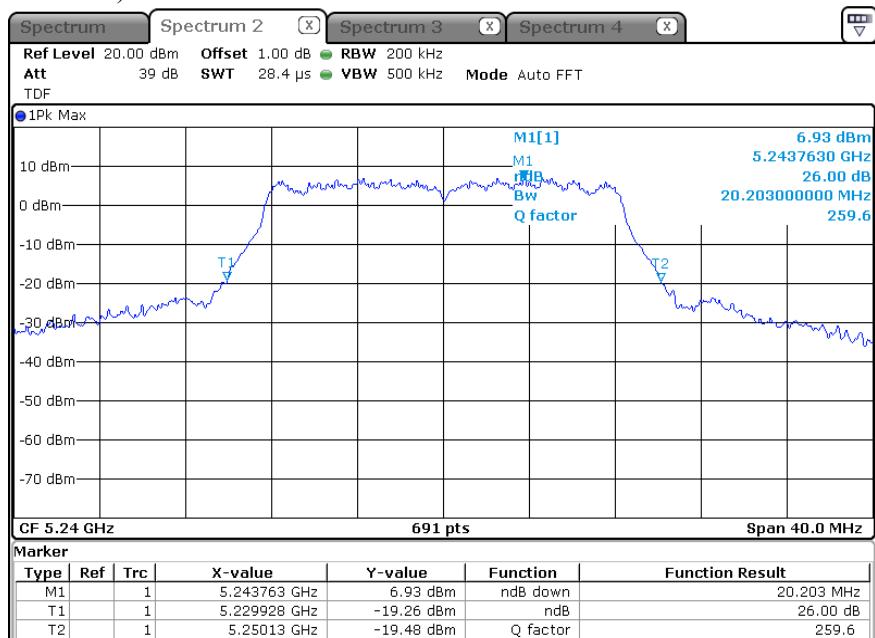


ANT 2(OBW)

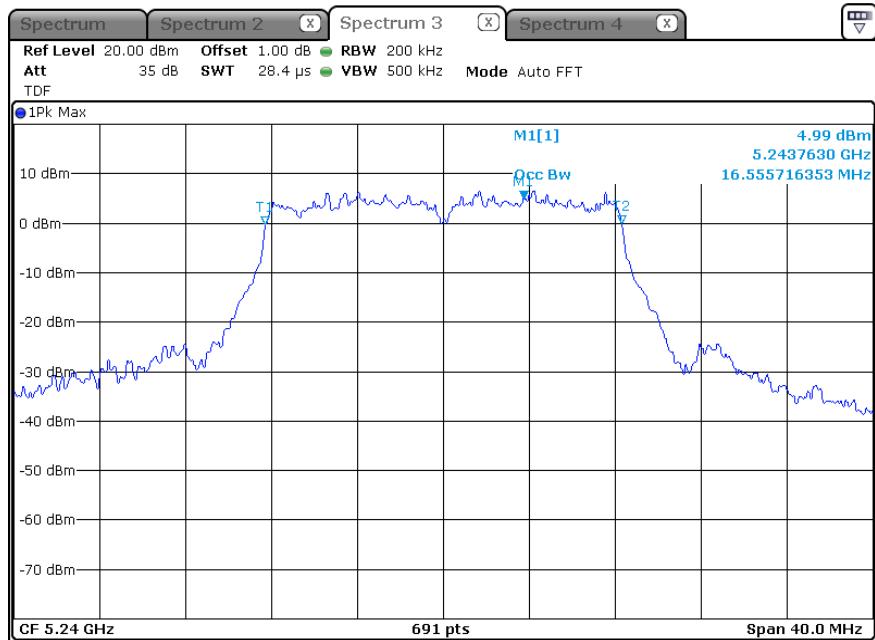


-5 240 MHz

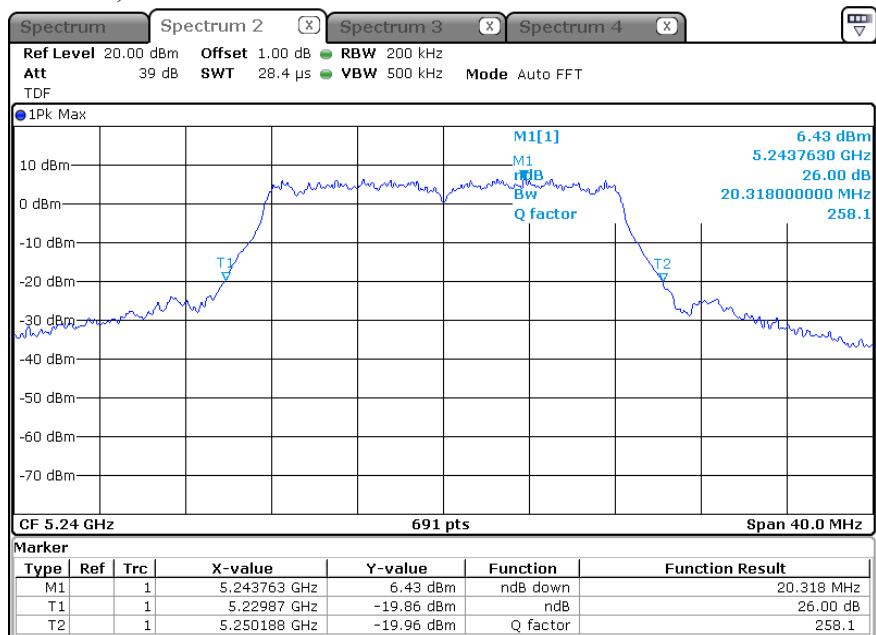
ANT 1(26 dB Bandwidth)



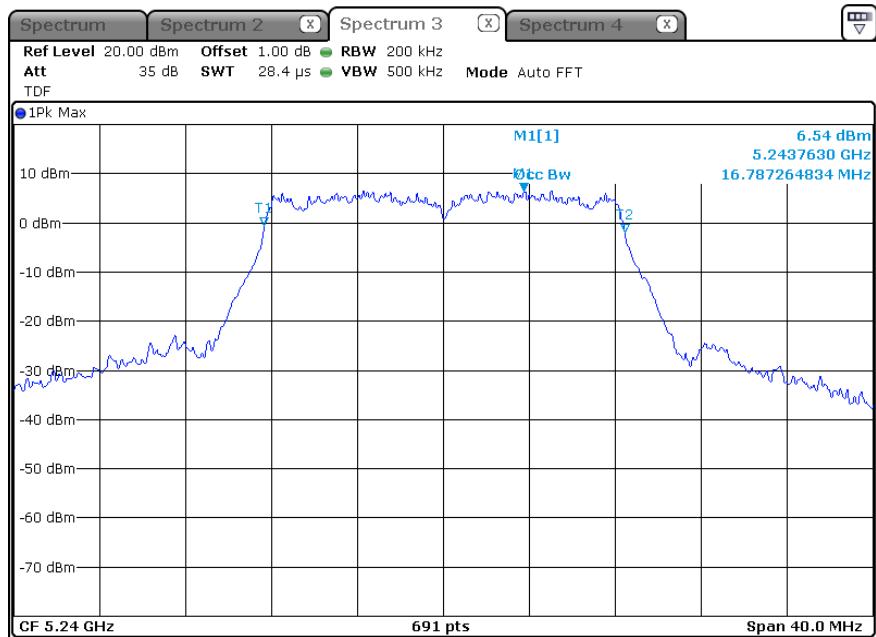
ANT 1(OBW)



ANT 2(26 dB Bandwidth)



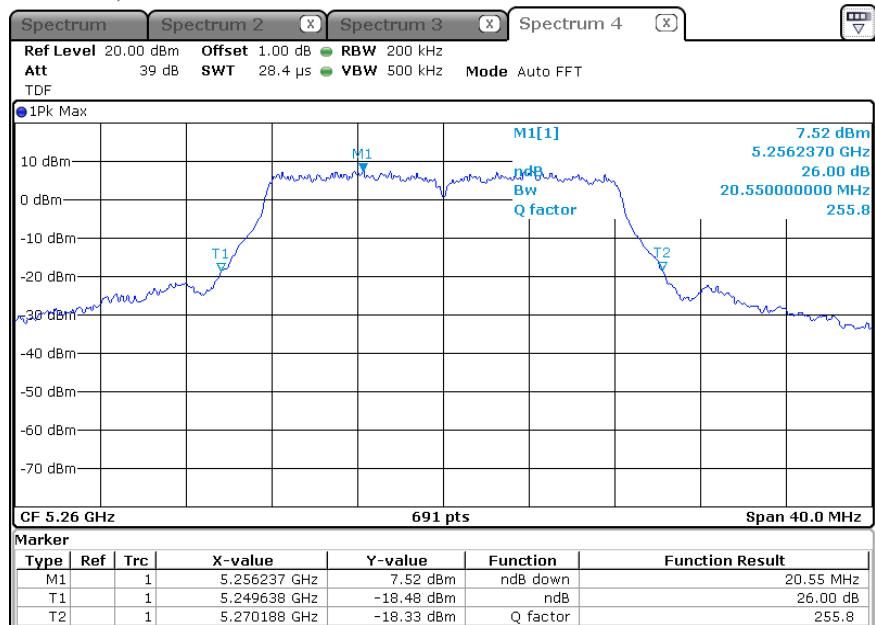
ANT 2(OBW)



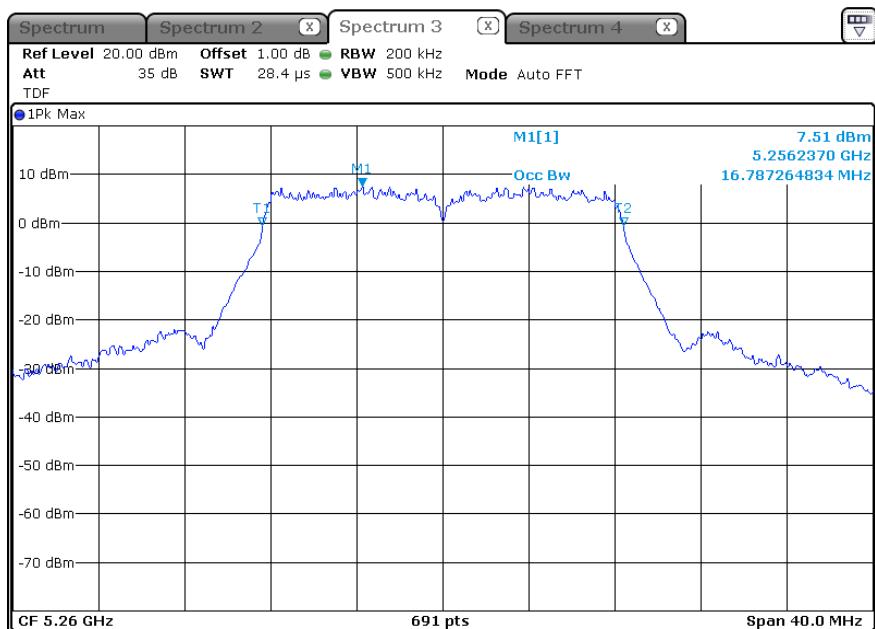
* 802.11a_5 250 Band (26 dB Bandwidth)

-5 260 MHz

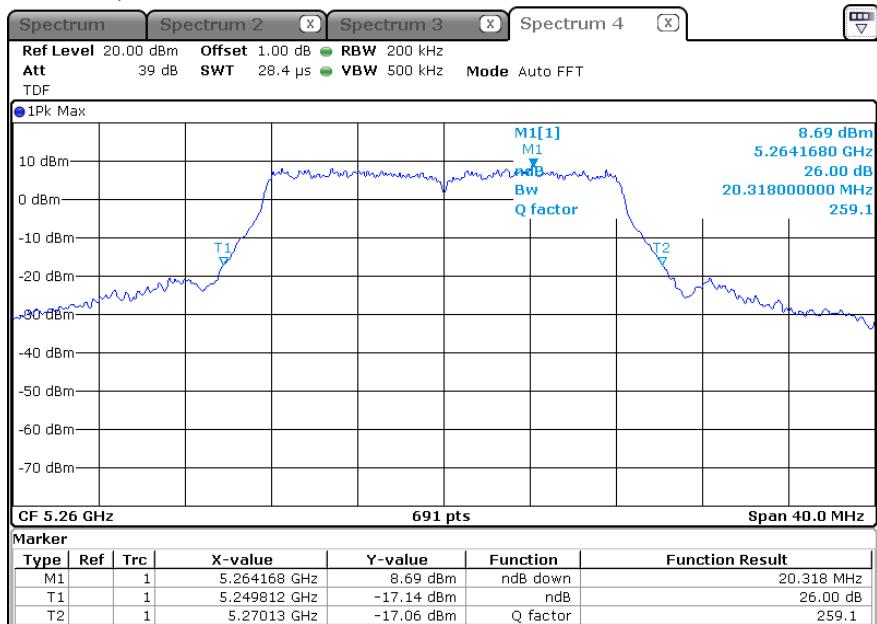
ANT 1(26 dB Bandwidth)



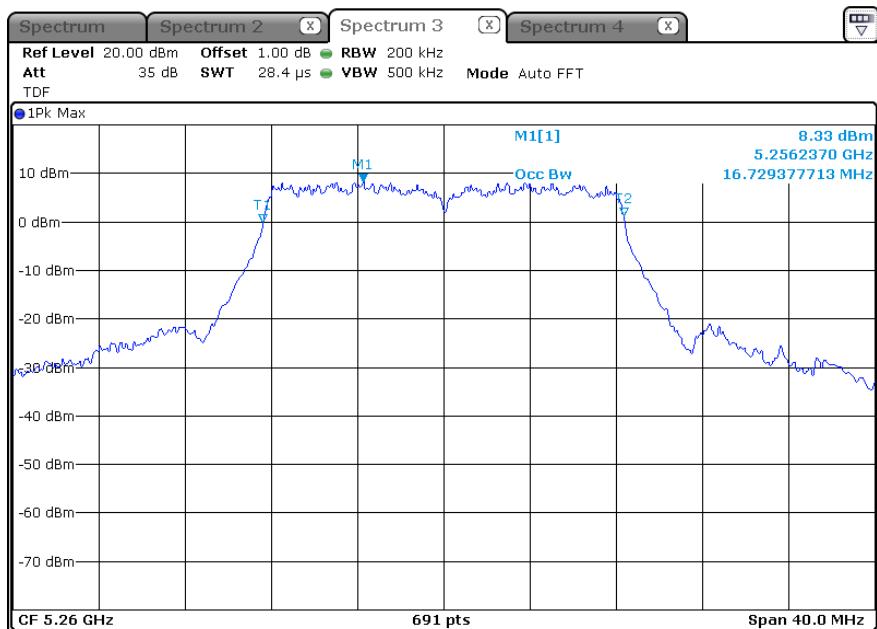
ANT 1(OBW)



ANT 2(26 dB Bandwidth)

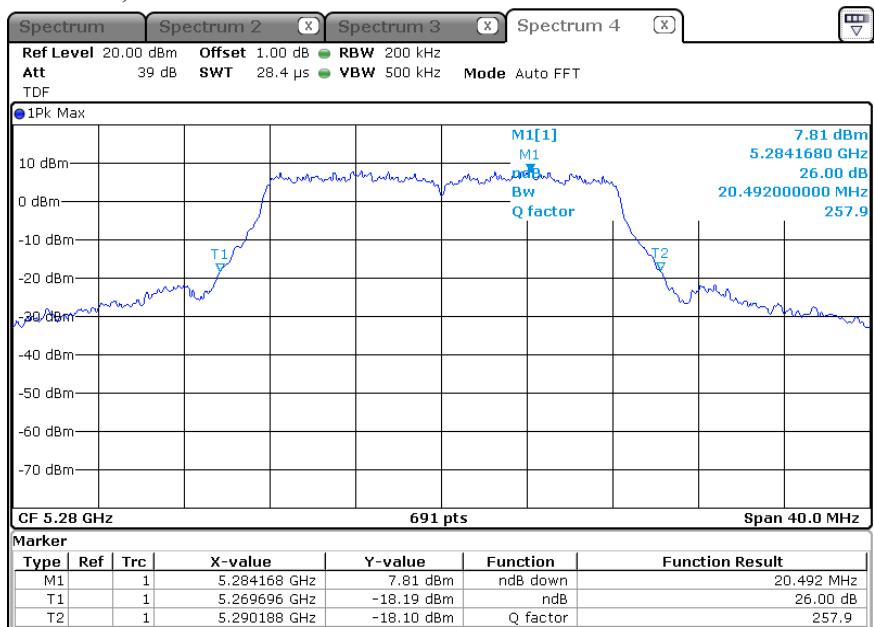


ANT 2(OBW)

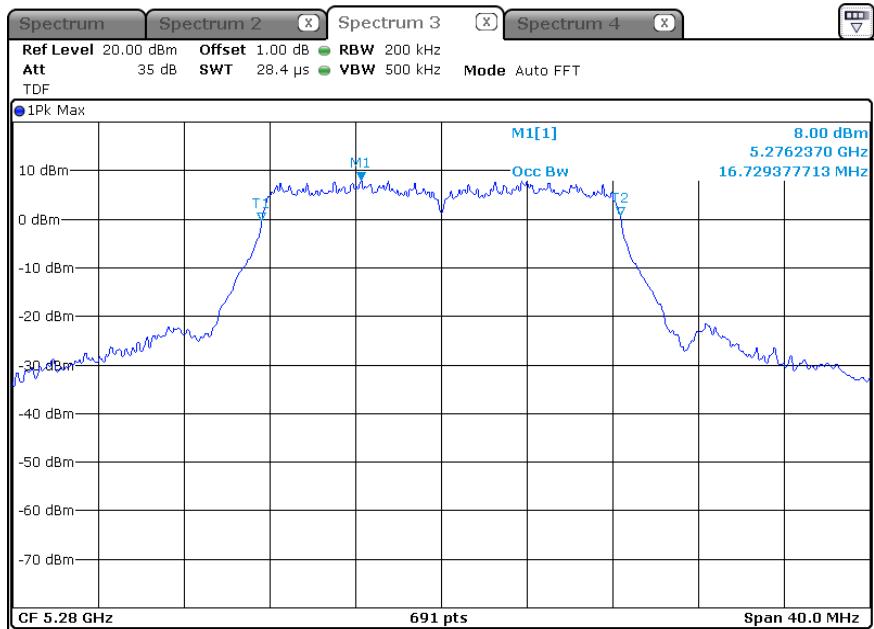


-5 280 MHz

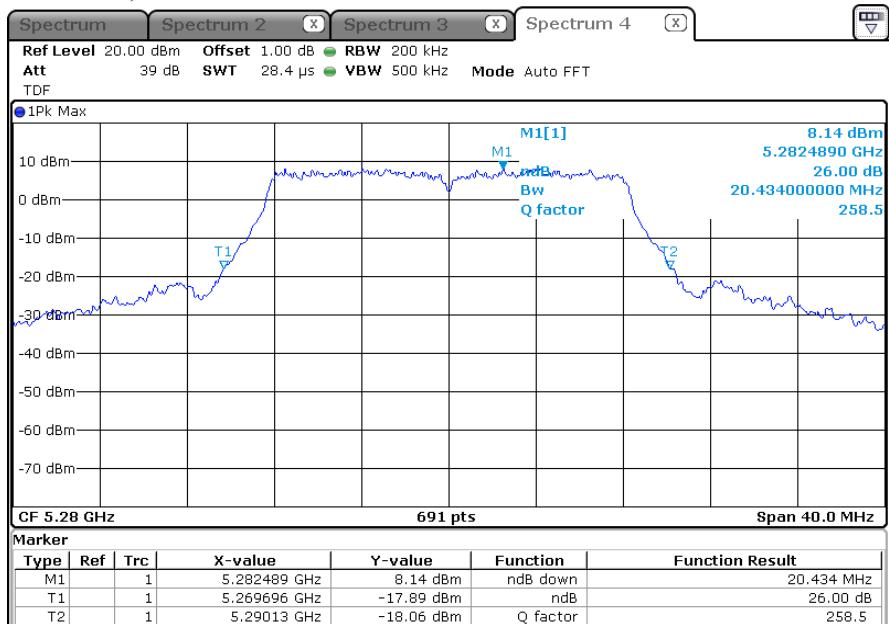
ANT 1 (26 dB Bandwidth)



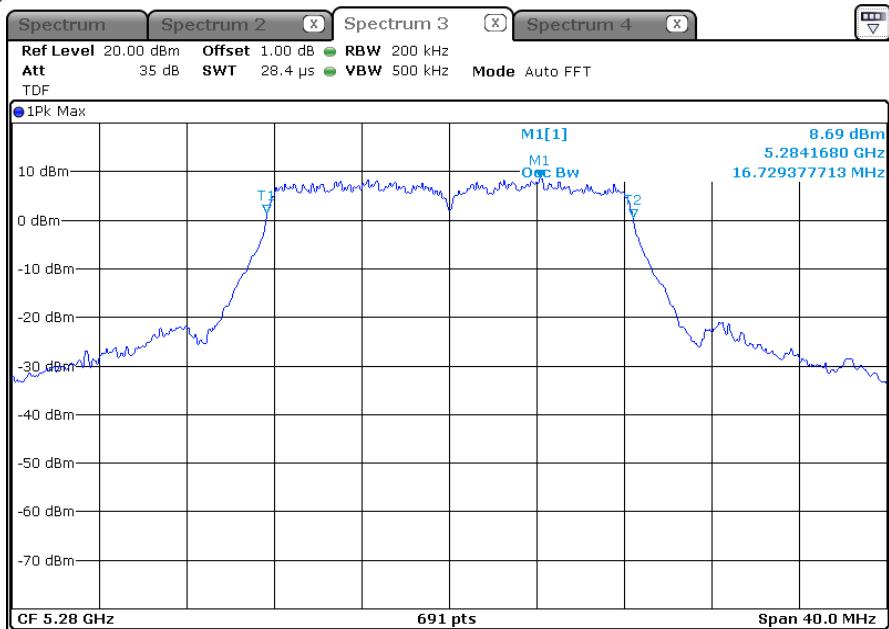
ANT 1 (OBW)



ANT 2 (26 dB Bandwidth)

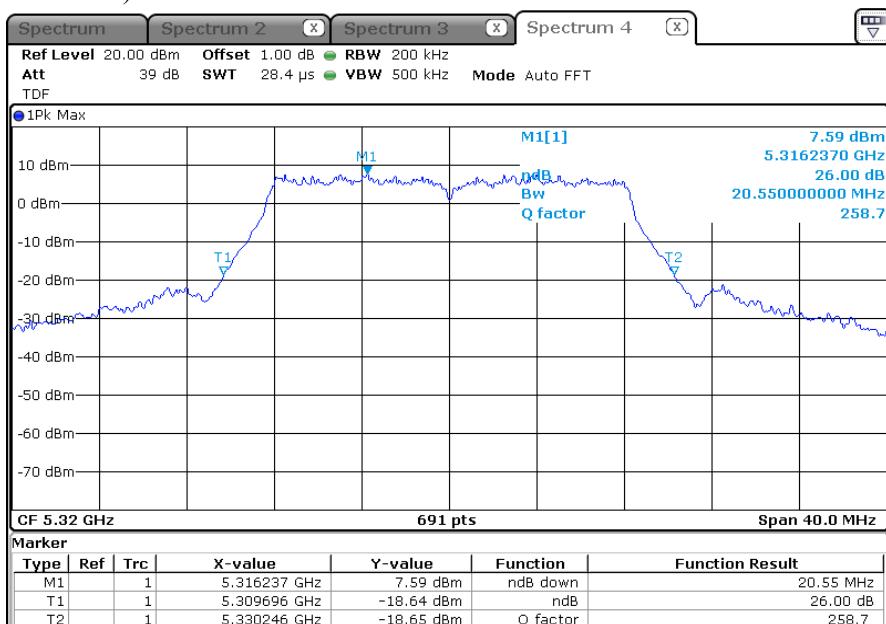


ANT 2 (OBW)

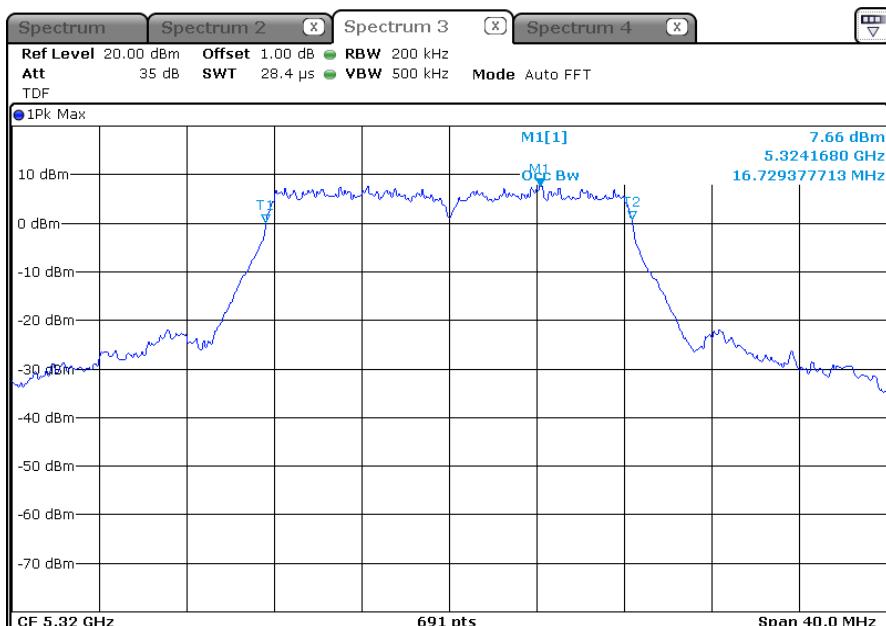


-5 320 MHz

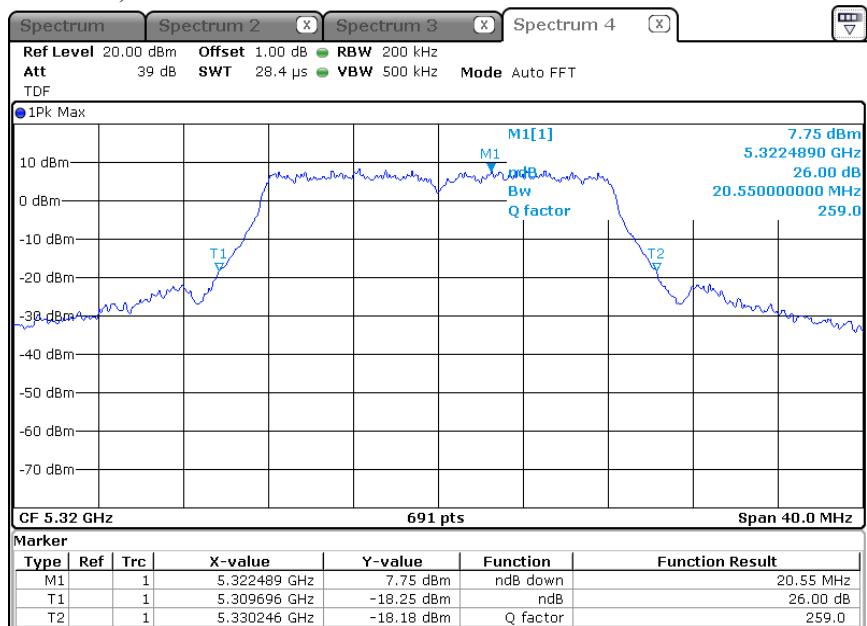
ANT 1(26 dB Bandwidth)



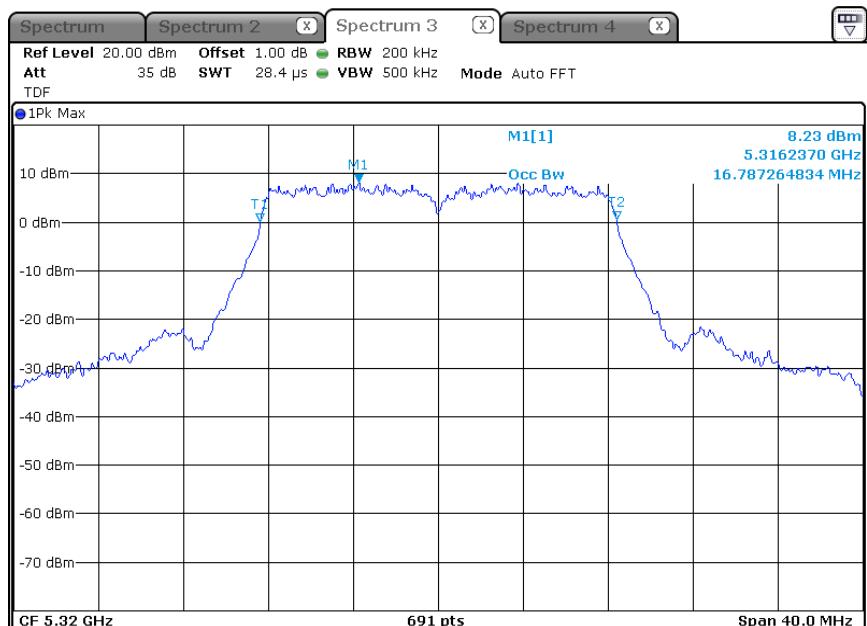
ANT 1(OBW)



ANT 2 (26 dB Bandwidth)



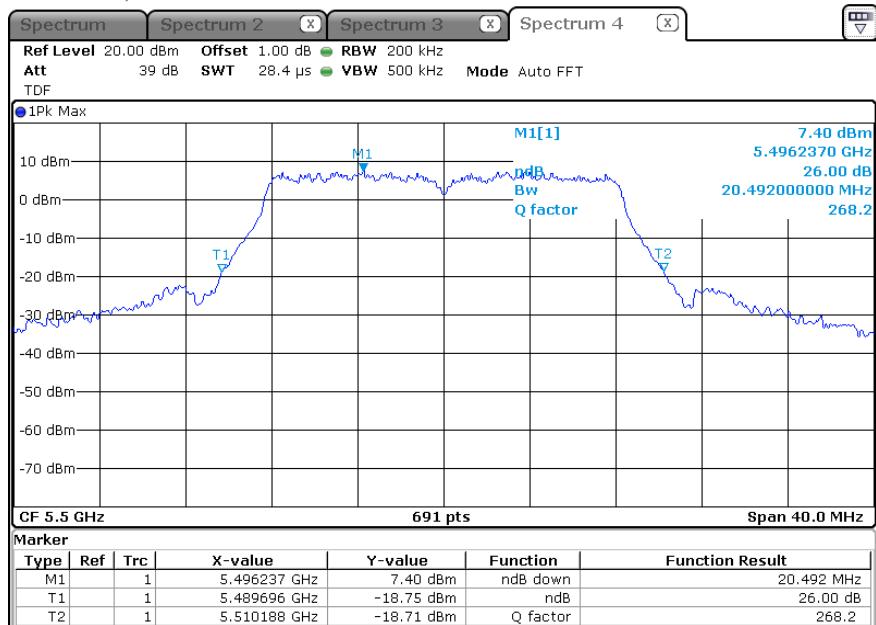
ANT 2 (OBW)



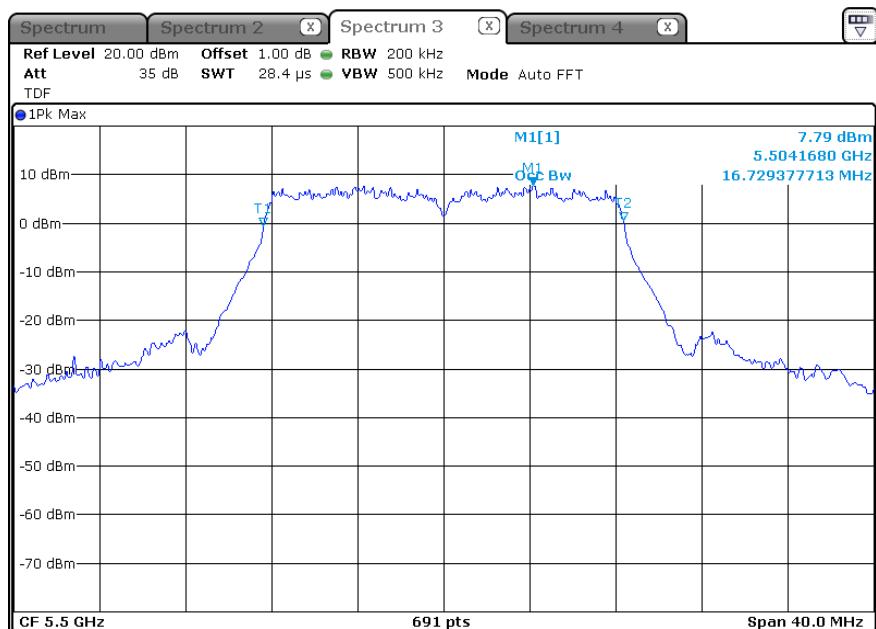
* 802.11a_5 470 Band (26 dB Bandwidth)

-5 500 MHz

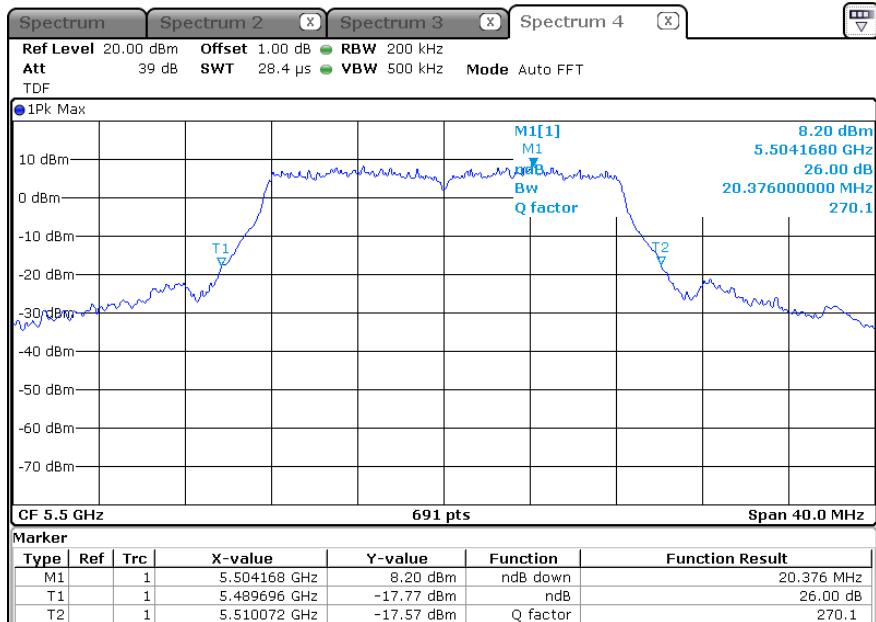
ANT 1 (26 dB Bandwidth)



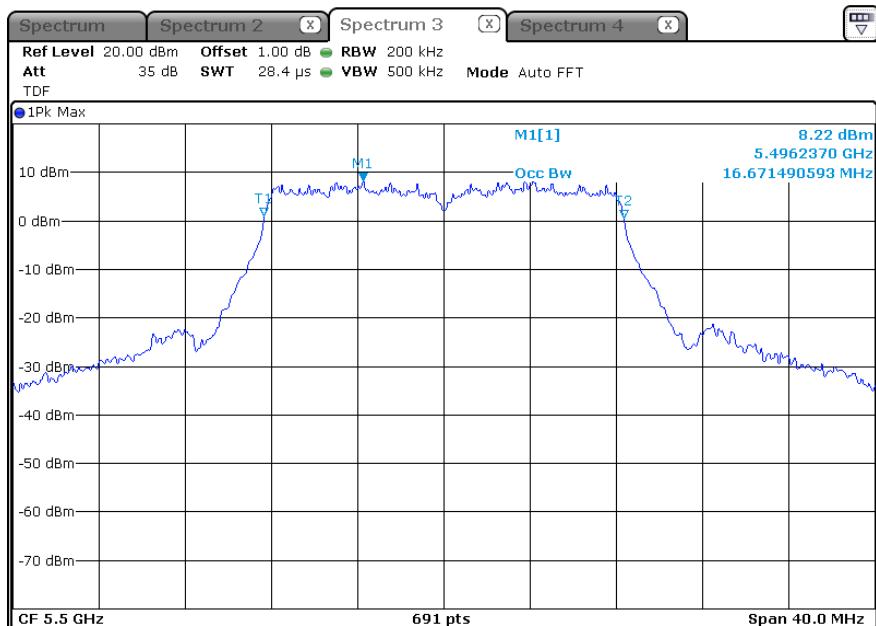
ANT 1 (OBW)



ANT 2 (26 dB Bandwidth)

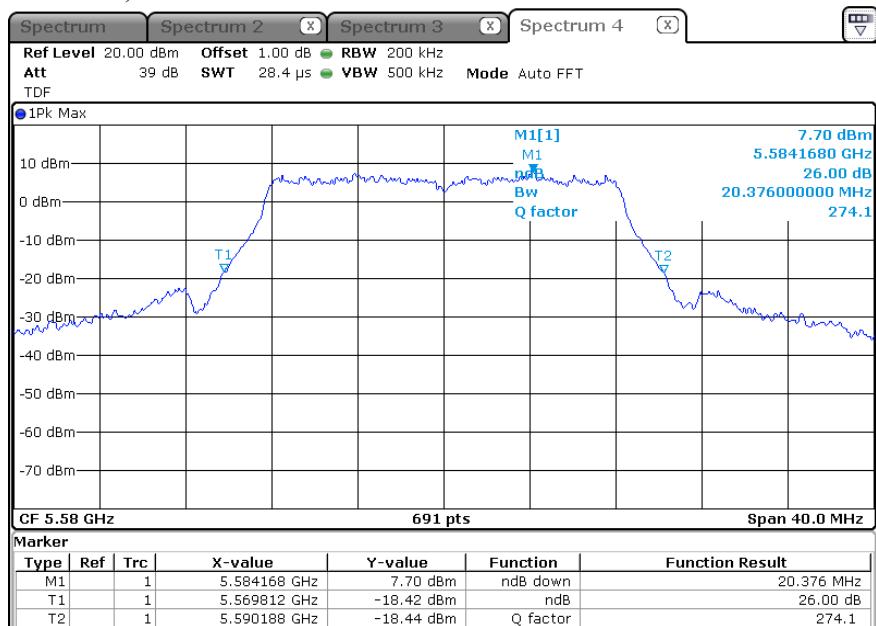


ANT 2 (OBW)

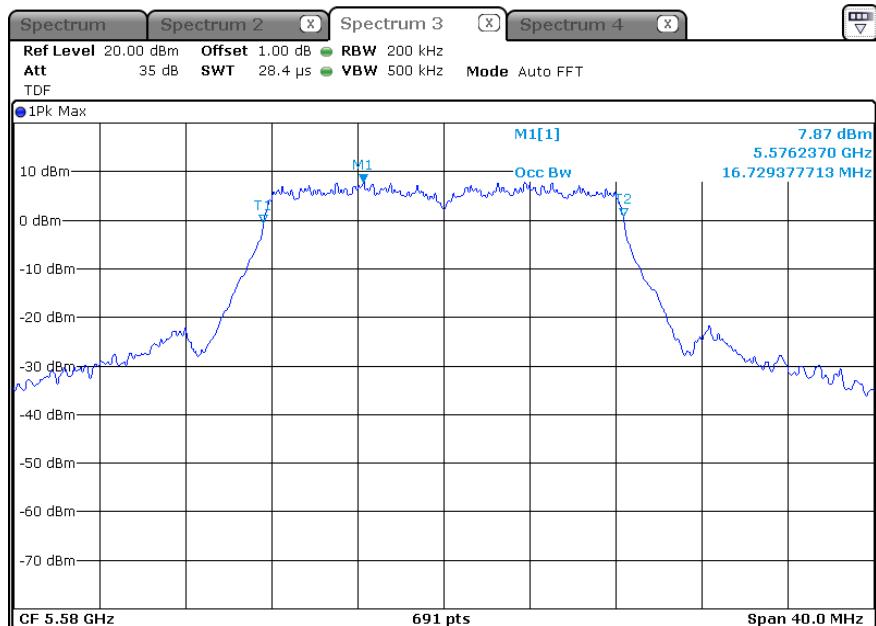


-5 580 MHz

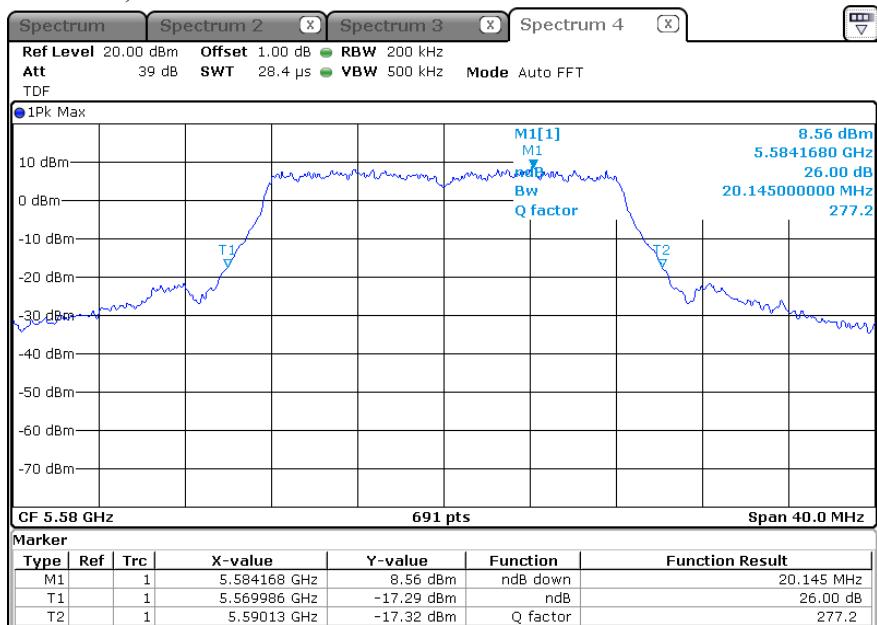
ANT 1 (26 dB Bandwidth)



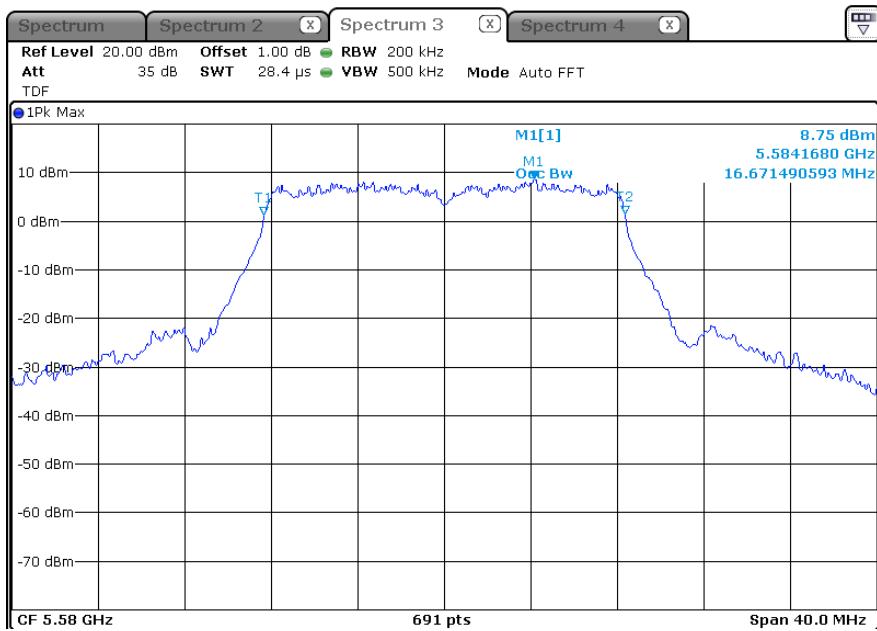
ANT 1 (OBW)



ANT 2 (26 dB Bandwidth)

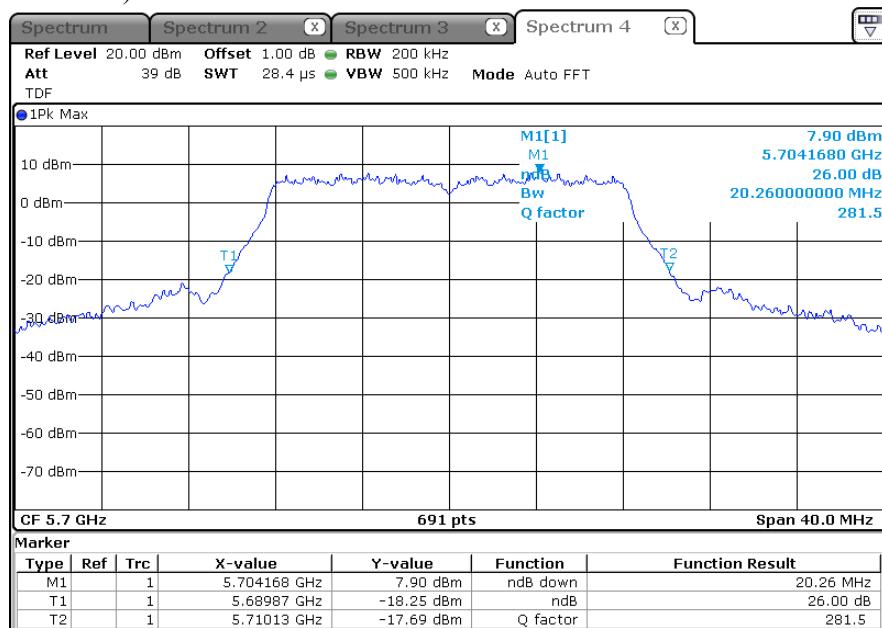


ANT 2 (OBW)

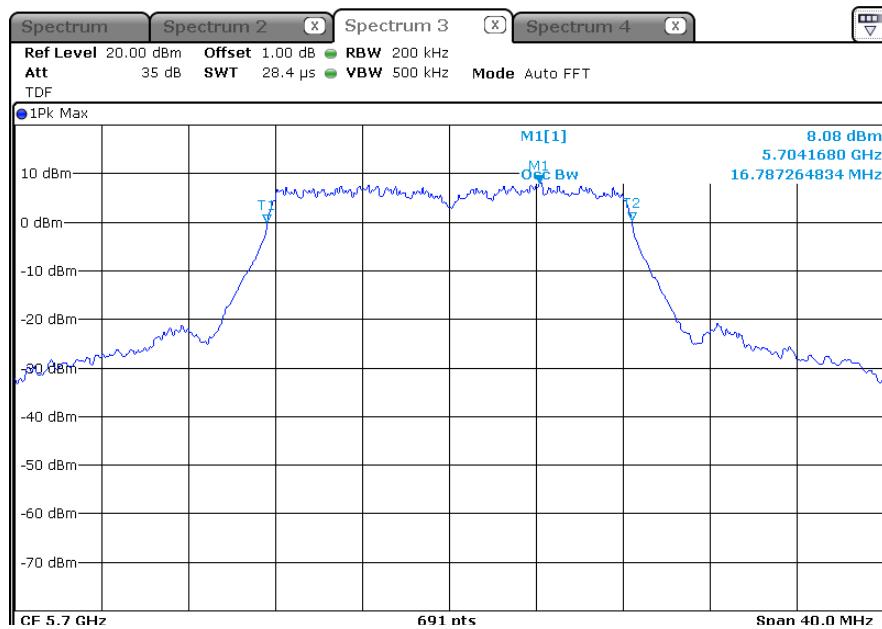


-5 700 MHz

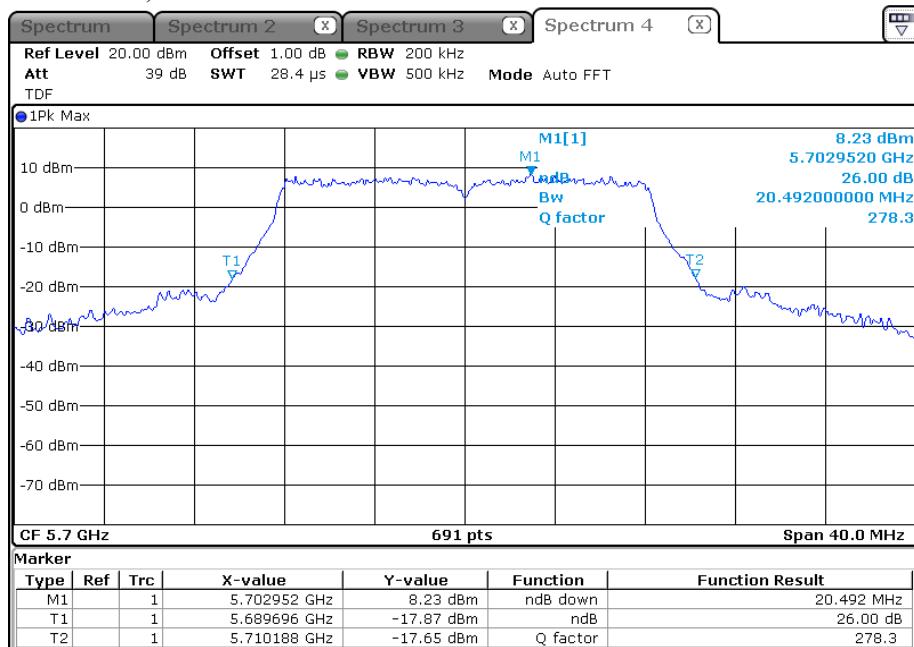
ANT 1(26 dB Bandwidth)



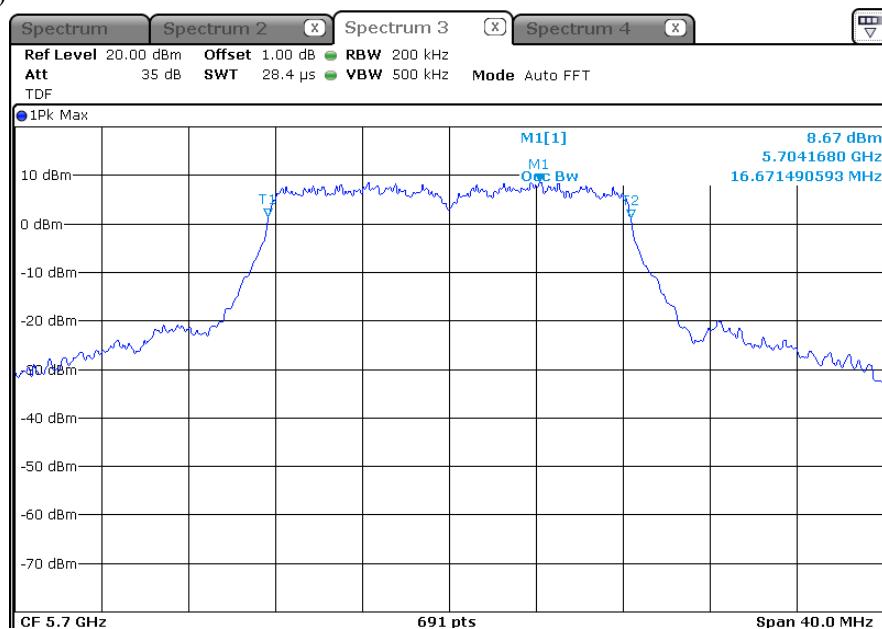
ANT 1(OBW)



ANT 2 (26 dB Bandwidth)



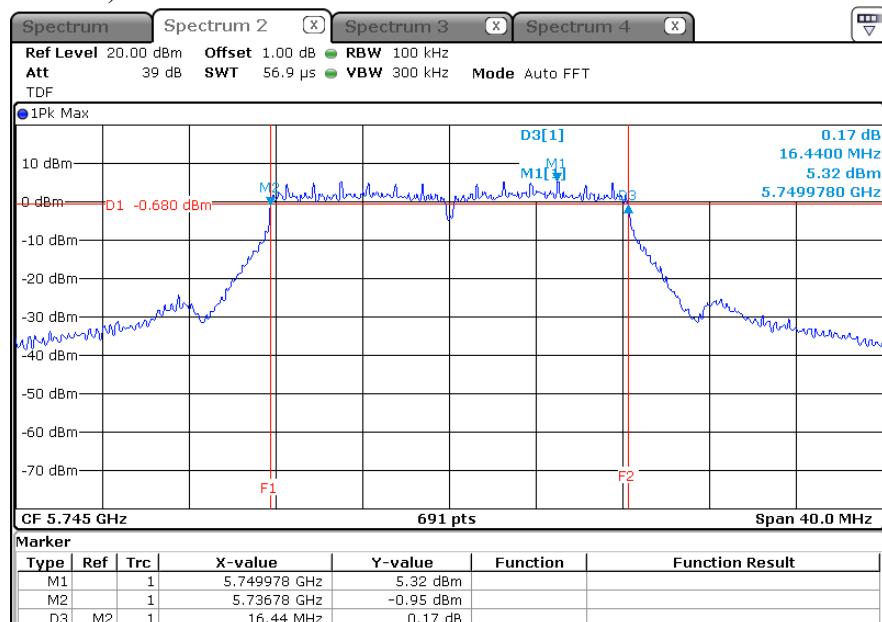
ANT 2 (OBW)



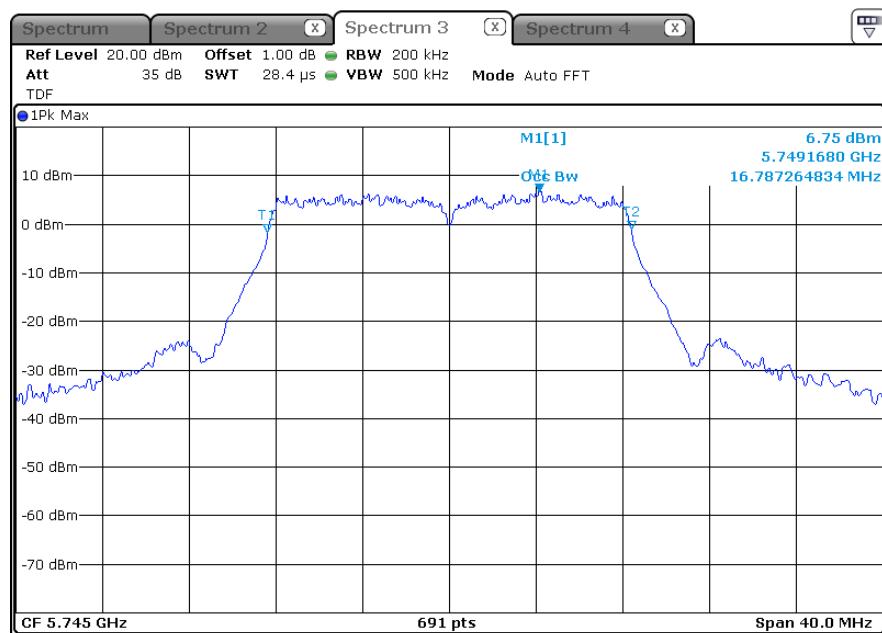
* 802.11a_5 725 Band (6 dB Bandwidth)

-5 745 MHz

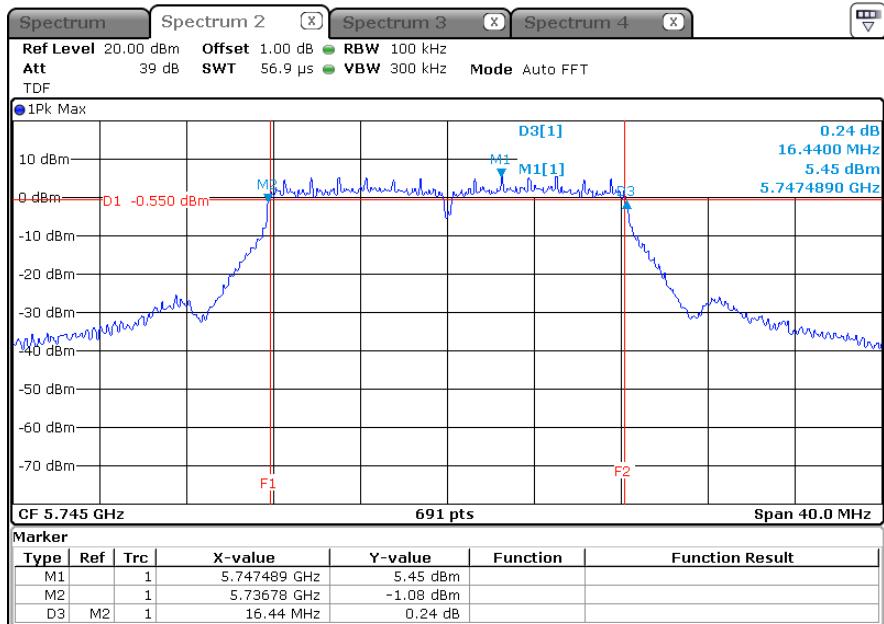
ANT 1(6 dB Bandwidth)



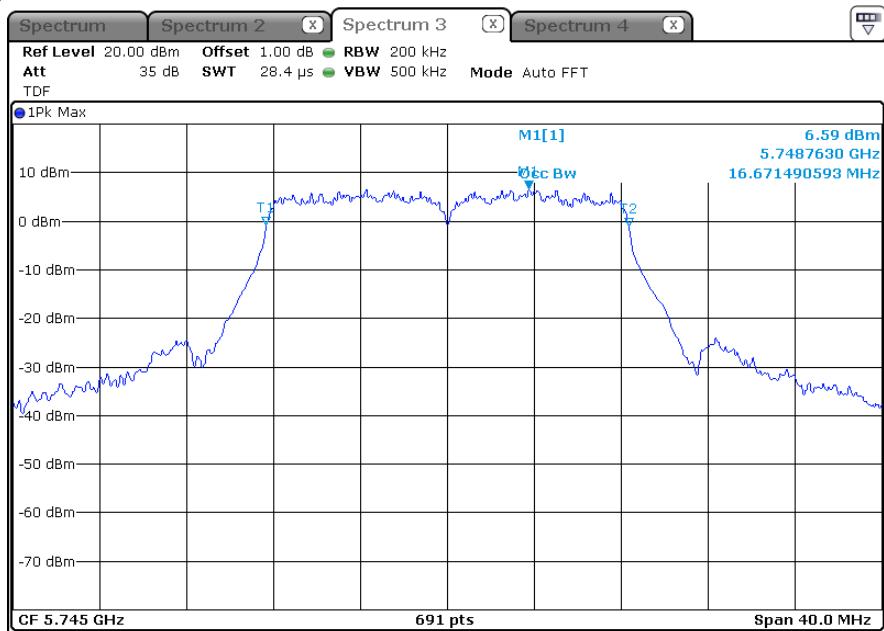
ANT 1(OBW)



ANT 2 (6 dB Bandwidth)

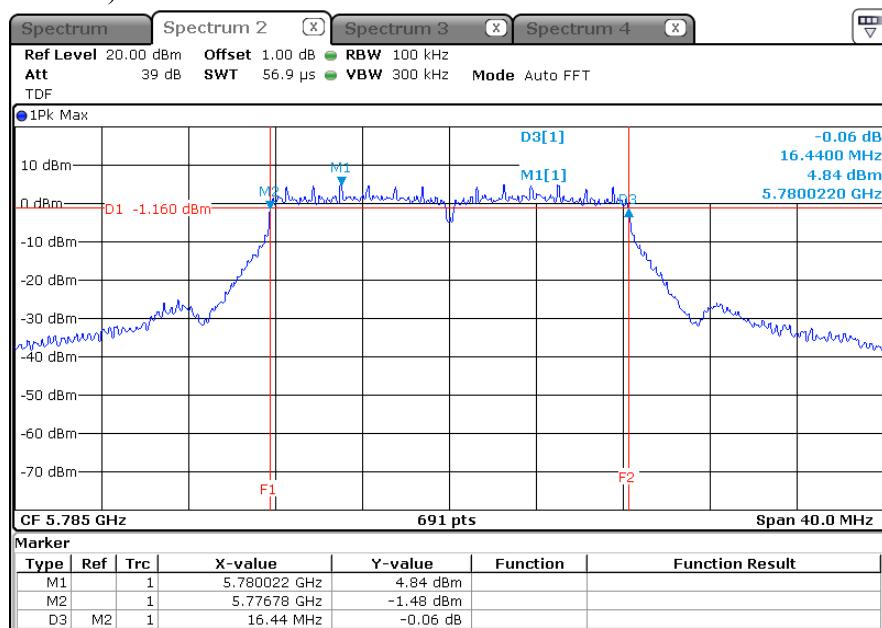


ANT 2 (OBW)

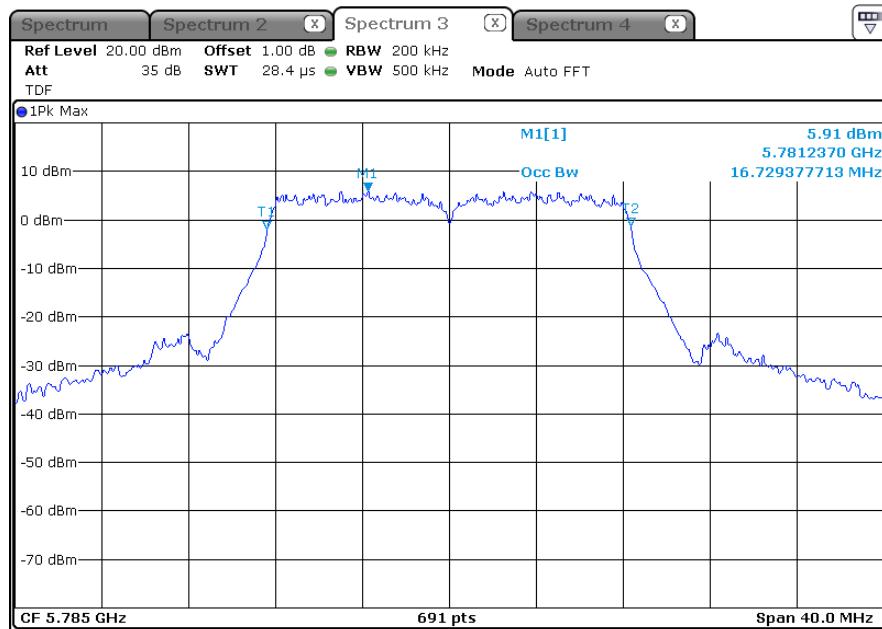


-5 785 MHz

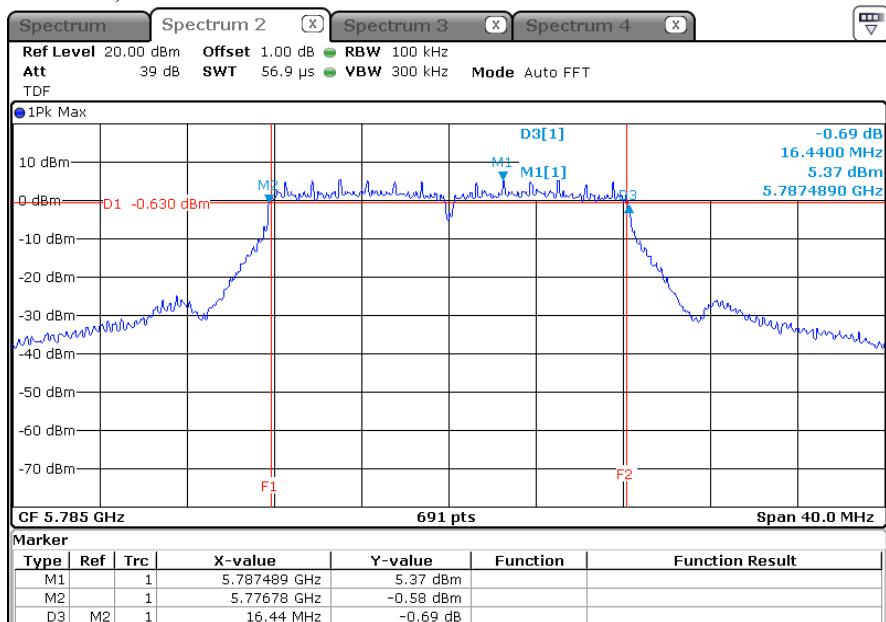
ANT 1(6 dB Bandwidth)



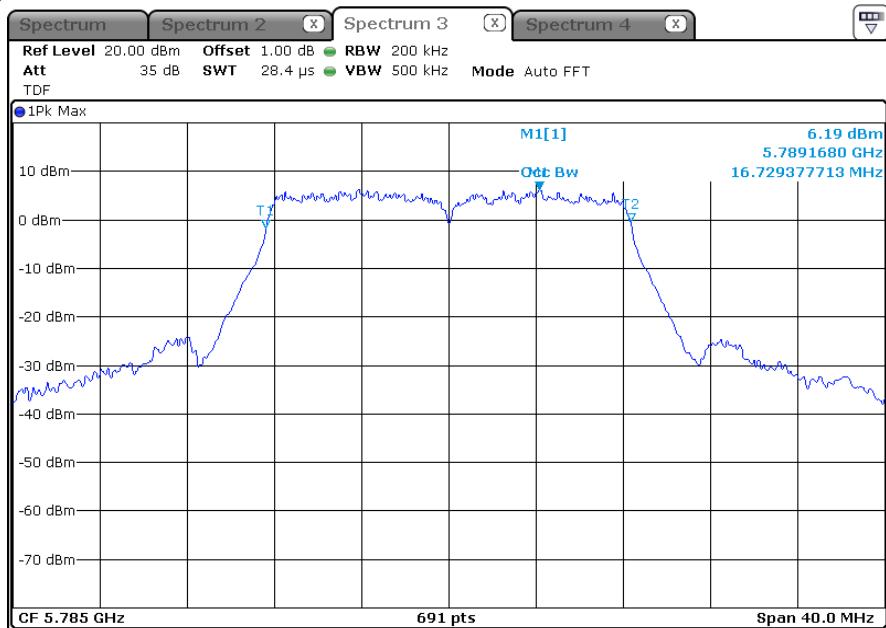
ANT 1(OBW)



ANT 2 (6 dB Bandwidth)

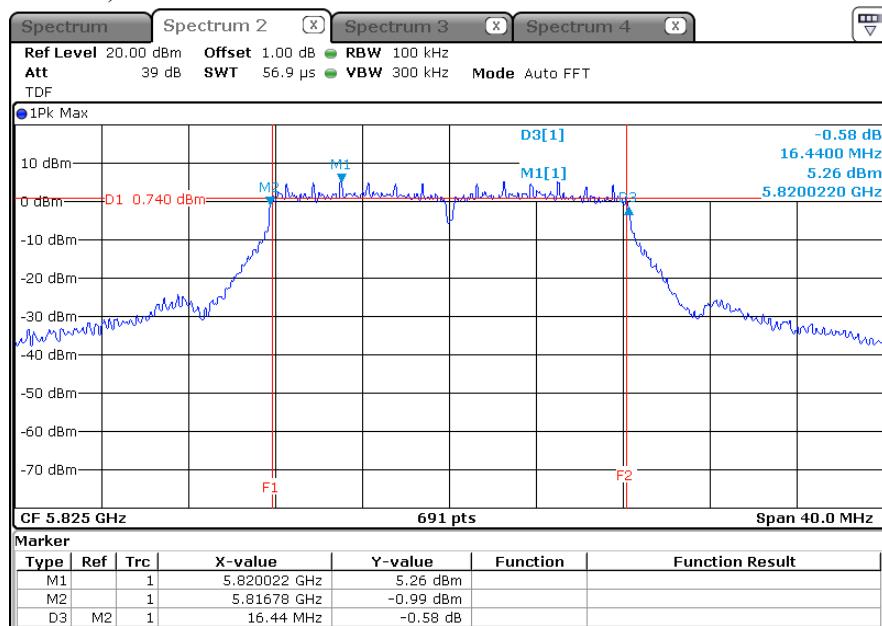


ANT 2 (OBW)

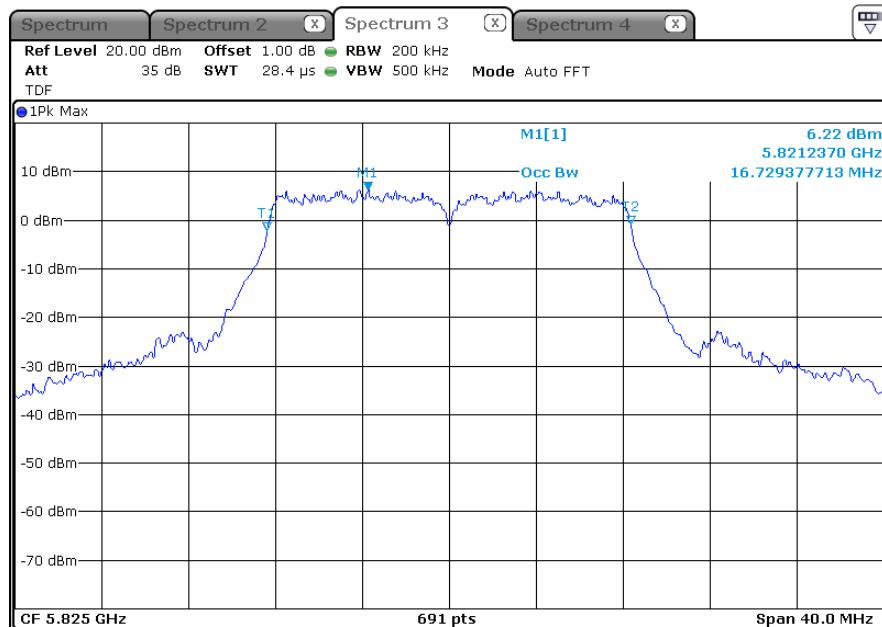


-5 825 MHz

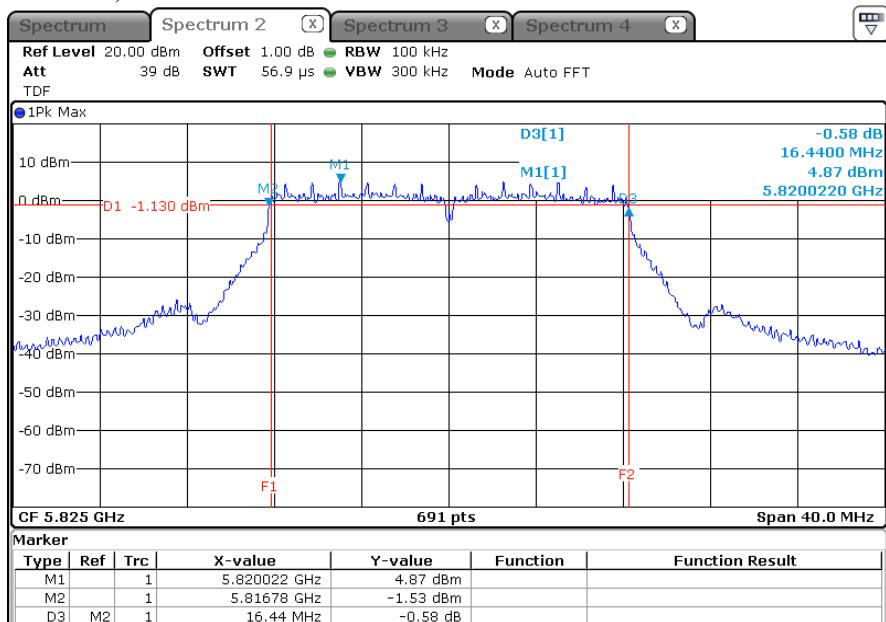
ANT 1(6 dB Bandwidth)



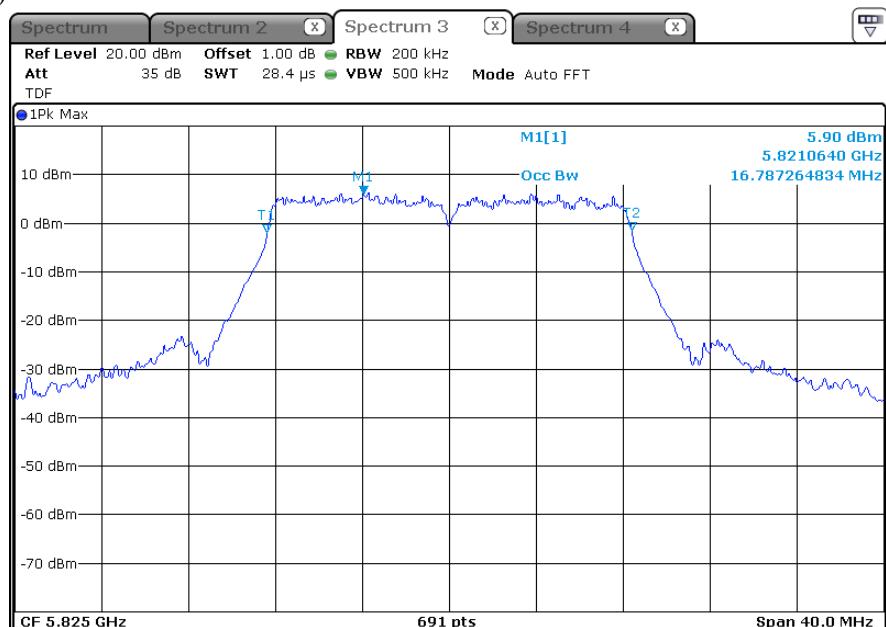
ANT 1(OBW)



ANT 2 (6 dB Bandwidth)



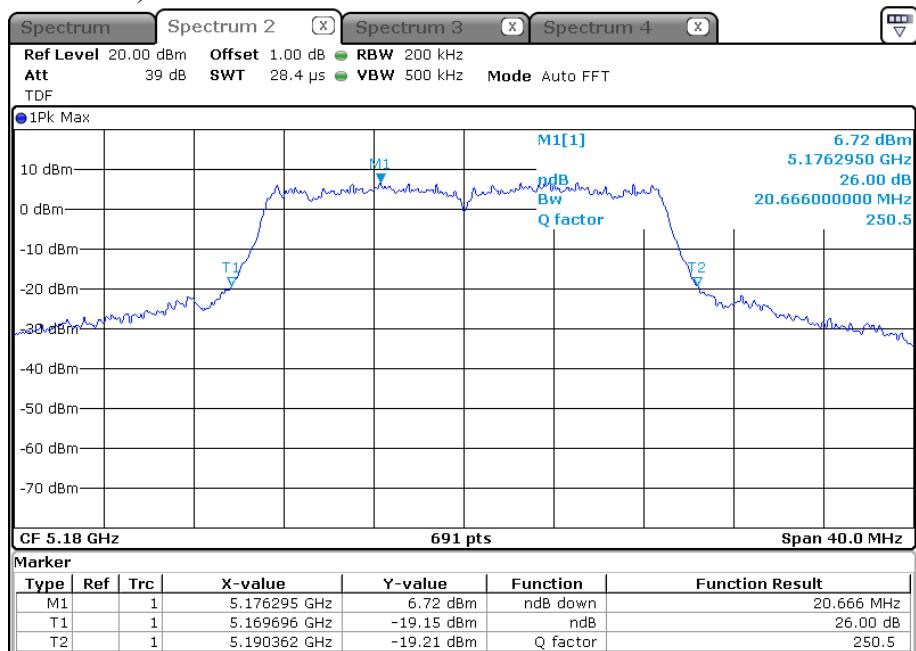
ANT 2 (OBW)



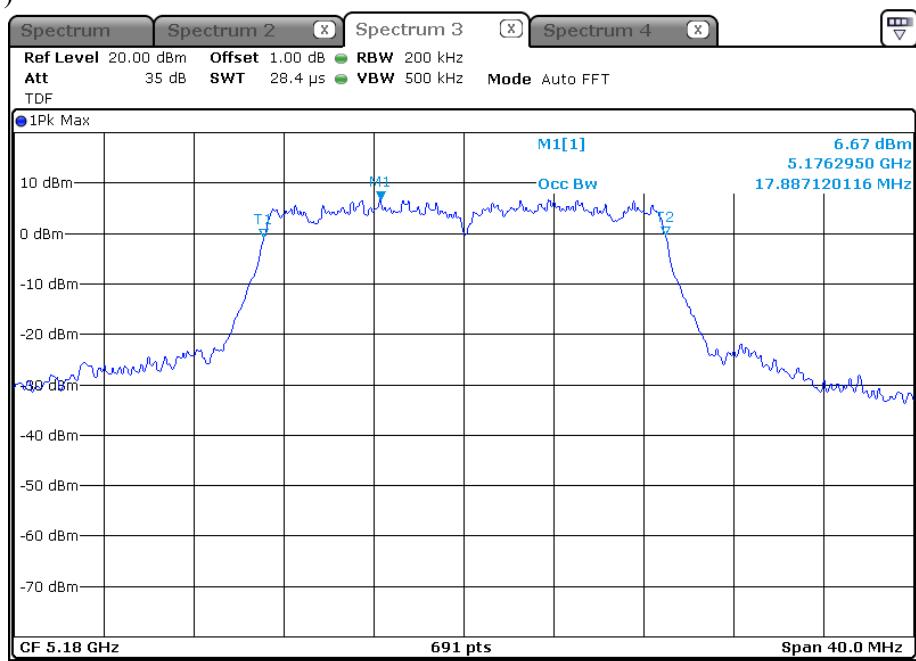
* 802.11n HT20 _5 150 Band (26 dB Bandwidth)

-5 180 MHz

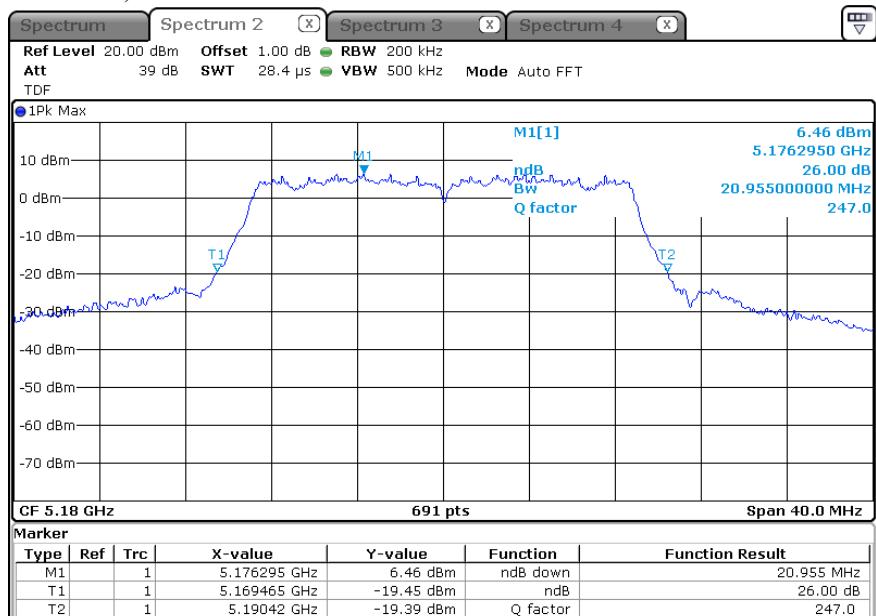
ANT 1(26 dB Bandwidth)



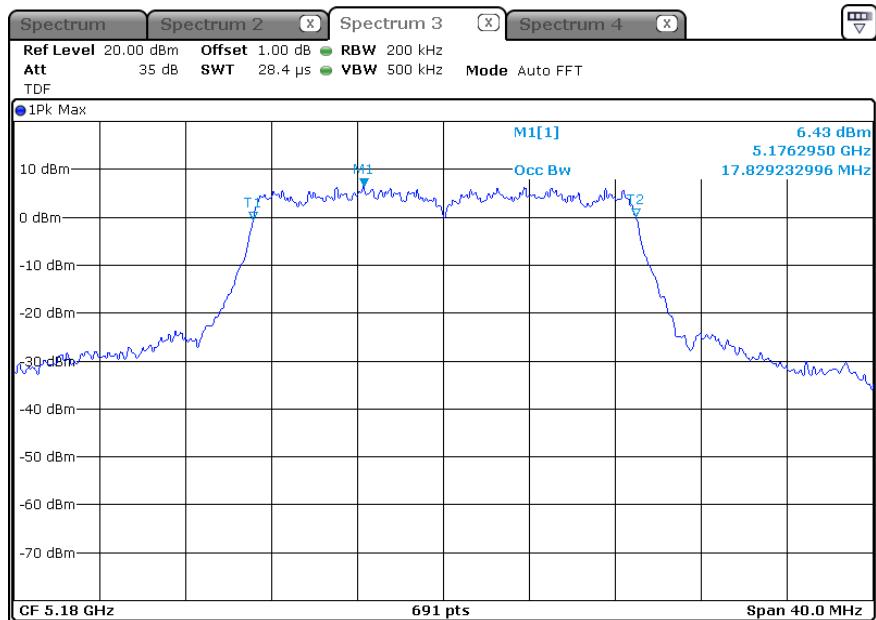
ANT 1(OBW)



ANT 2 (26 dB Bandwidth)

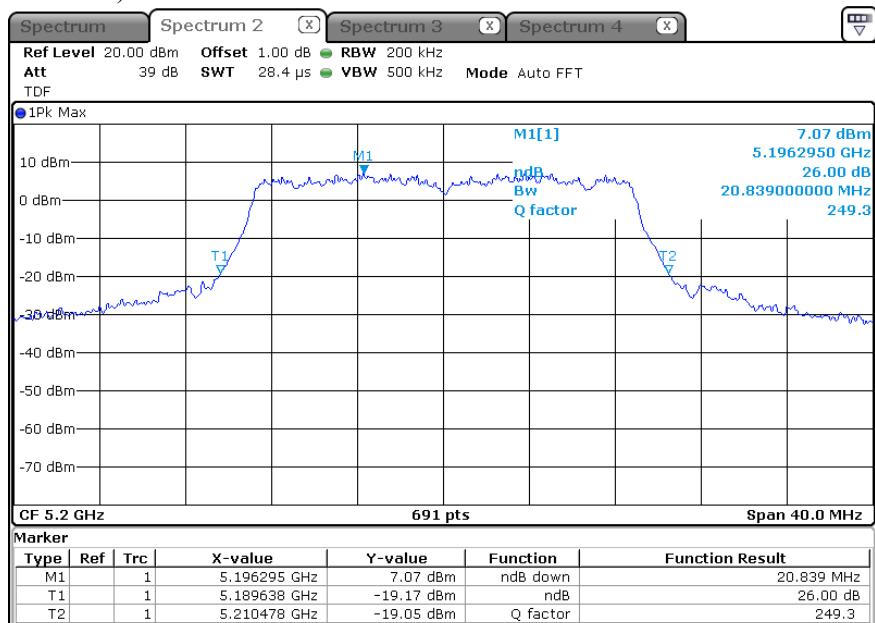


ANT 2(OBW)

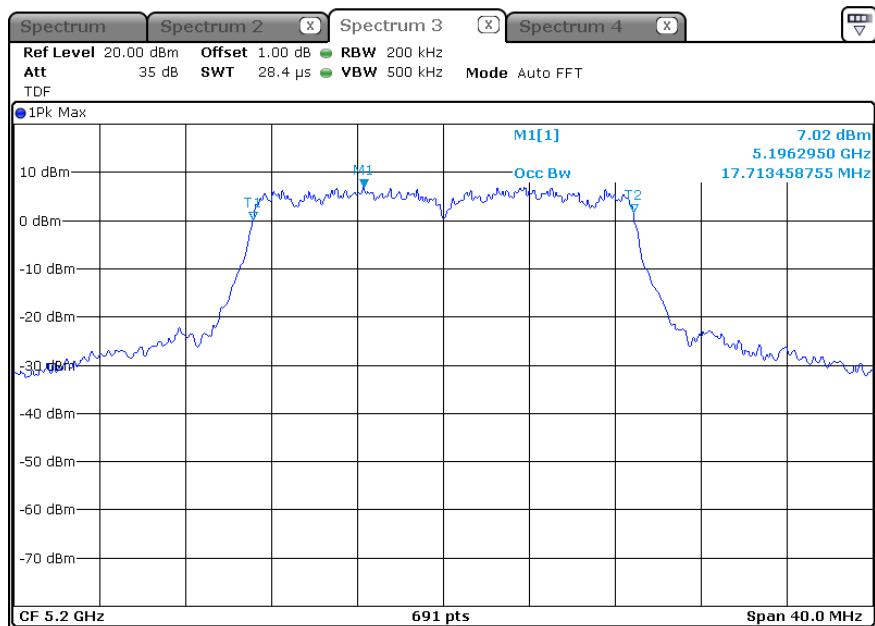


-5 200 MHz

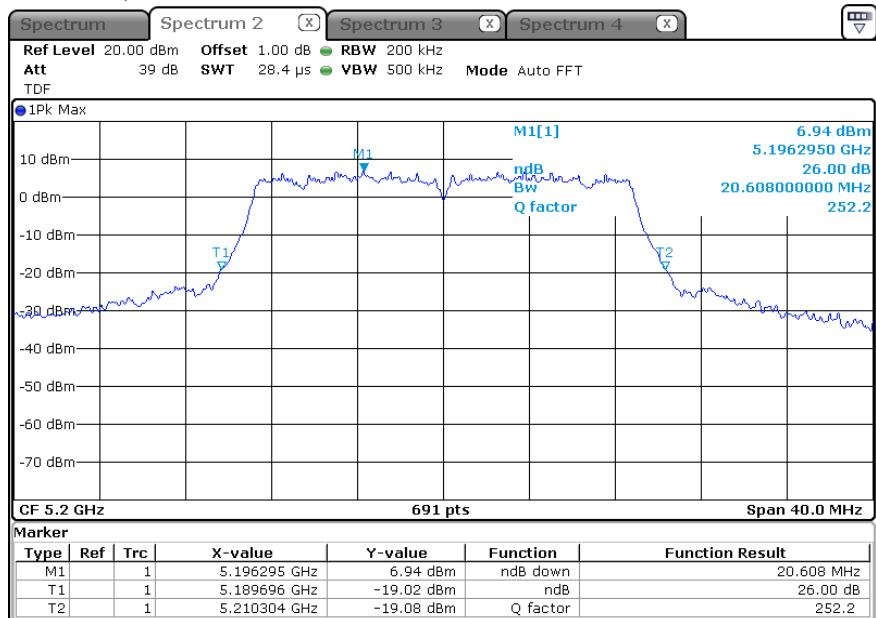
ANT 1(26 dB Bandwidth)



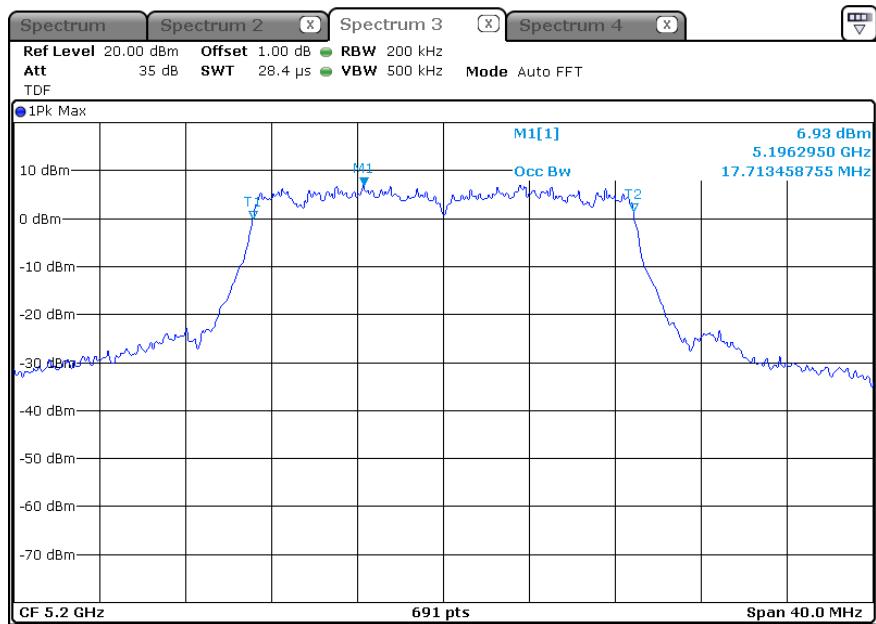
ANT 1(OBW)



ANT 2 (26 dB Bandwidth)

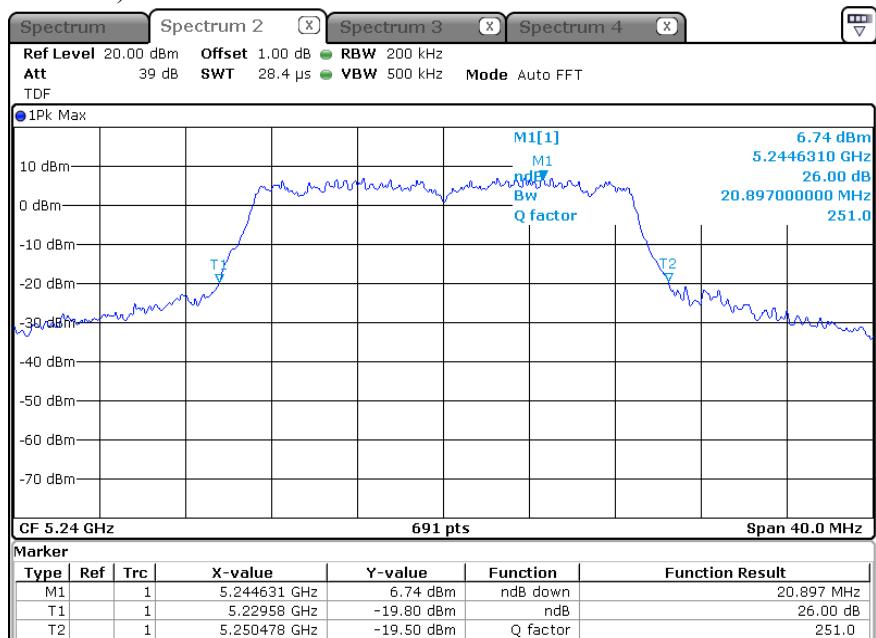


ANT 2 (OBW)

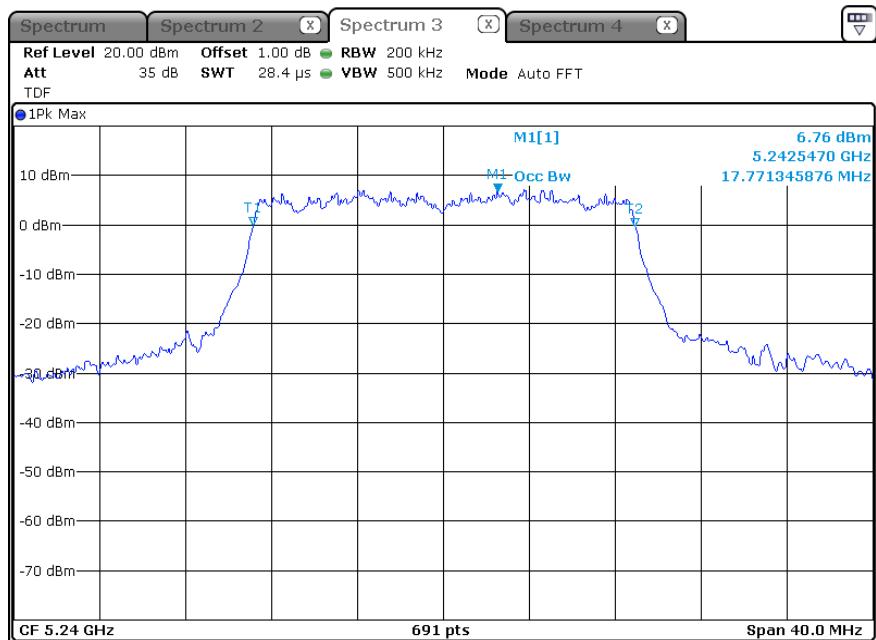


-5 240 MHz

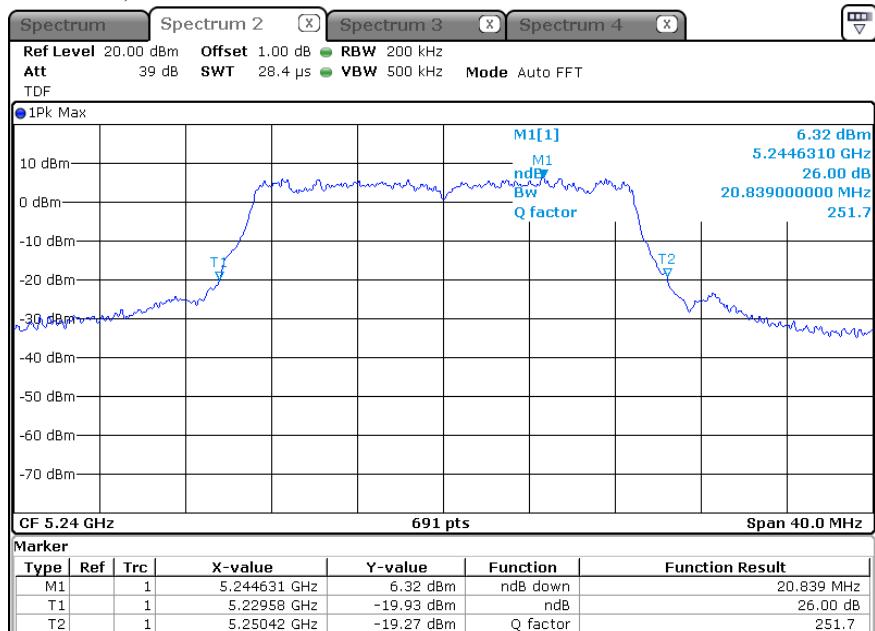
ANT 1(26 dB Bandwidth)



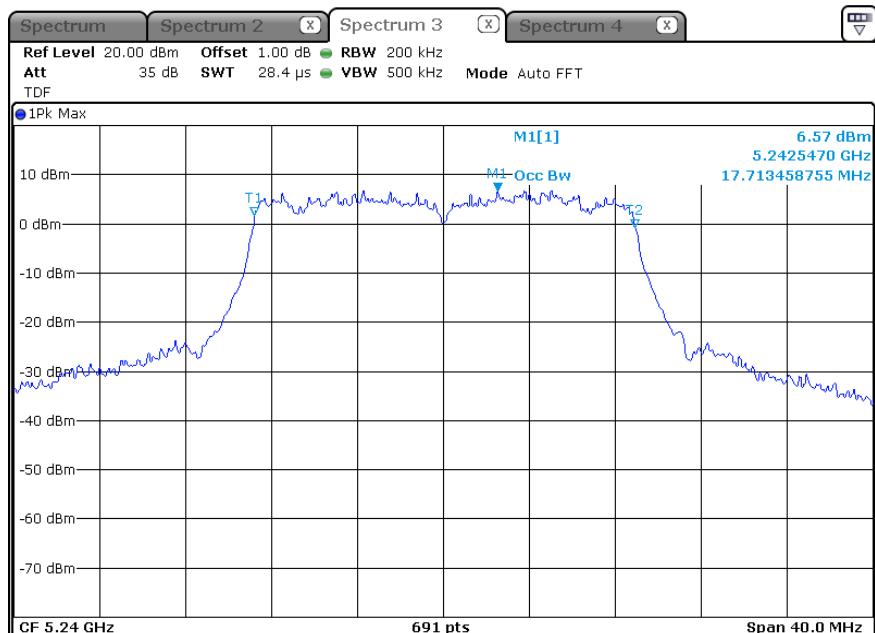
ANT 1(OBW)



ANT 2 (26 dB Bandwidth)



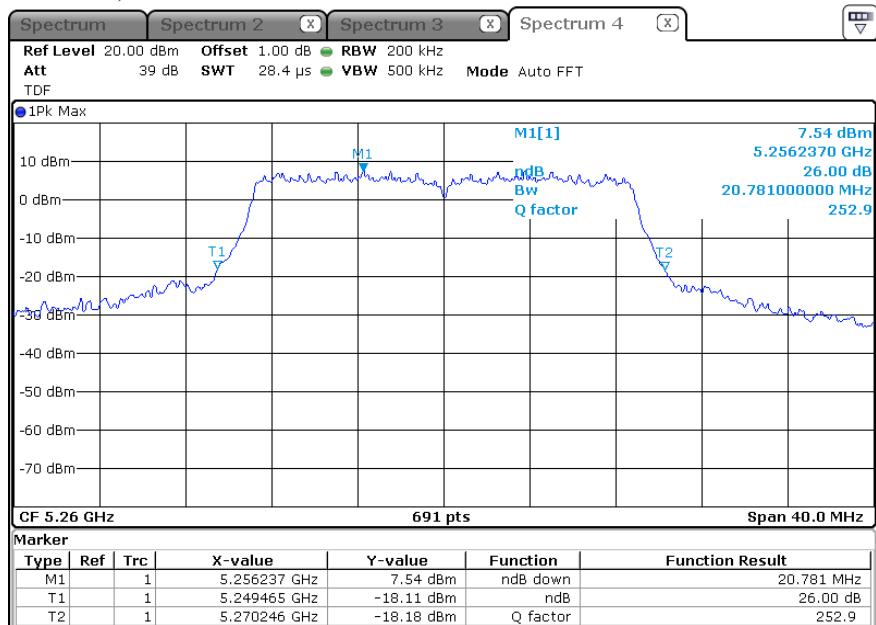
ANT 2 (OBW)



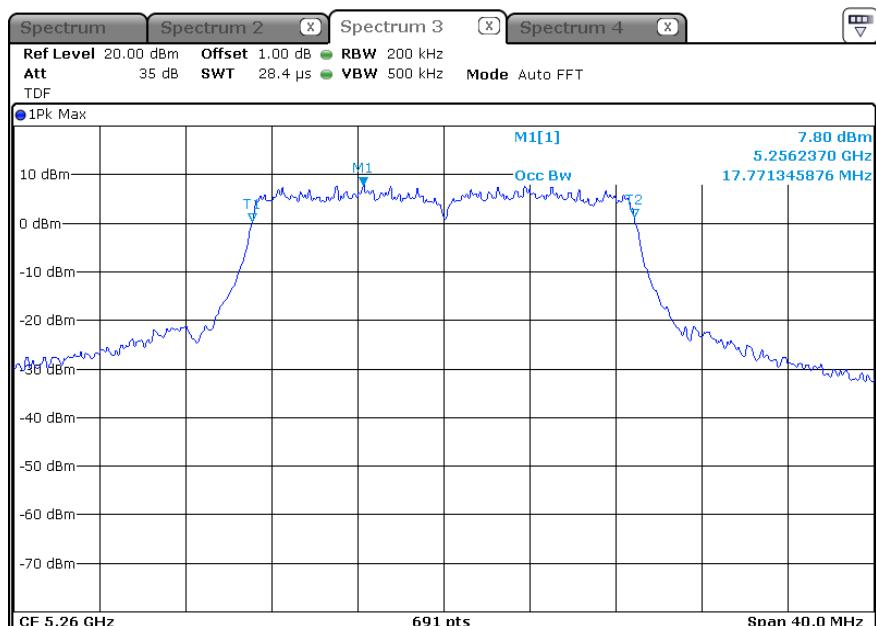
* 802.11n HT20_5 250 Band (26 dB Bandwidth)

-5 260 MHz

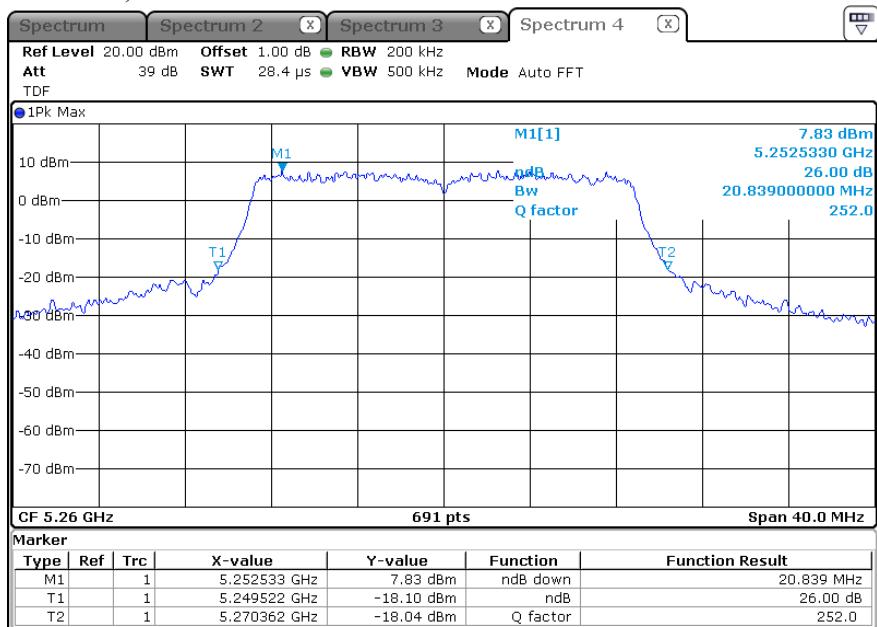
ANT 1(26 dB Bandwidth)



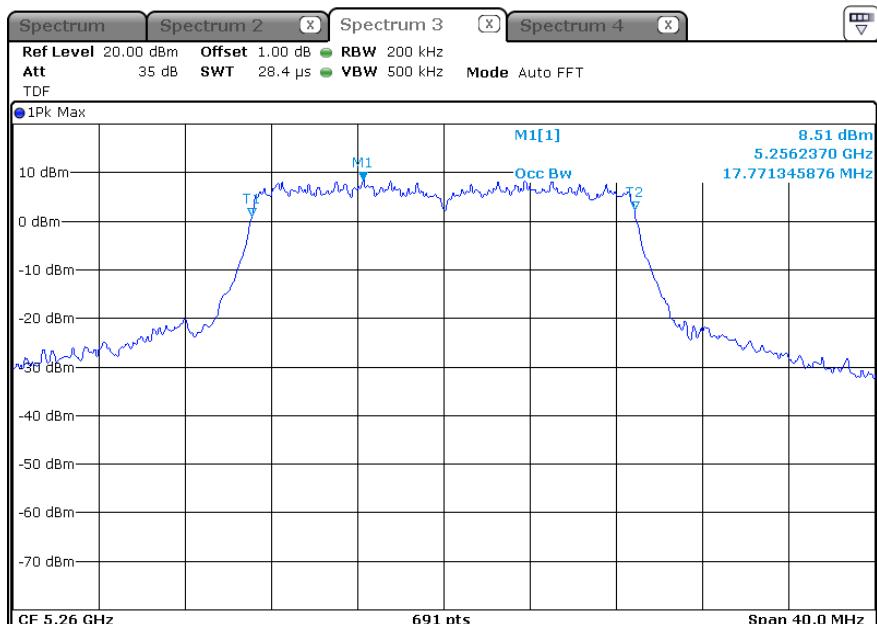
ANT 1(OBW)



ANT 2 (26 dB Bandwidth)

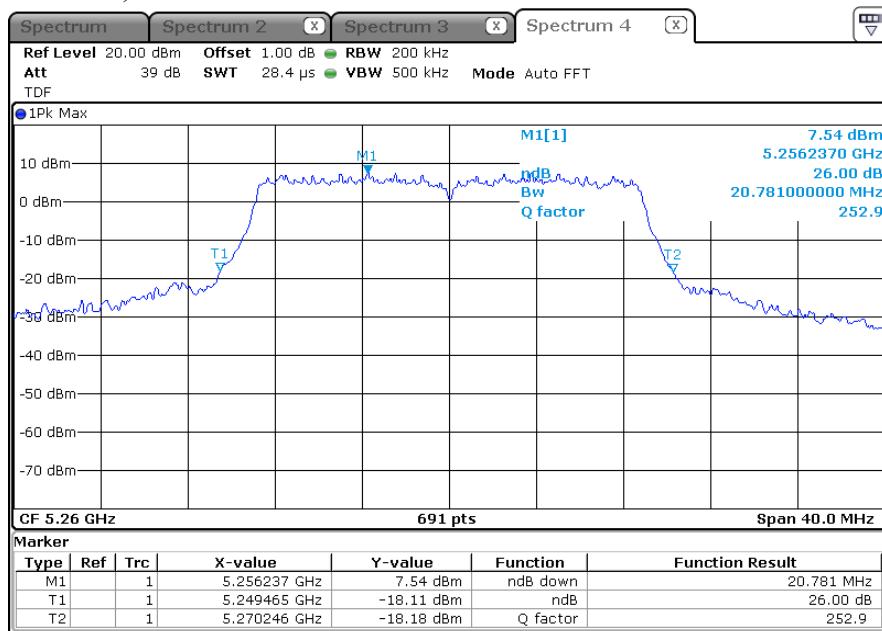


ANT 2 (OBW)

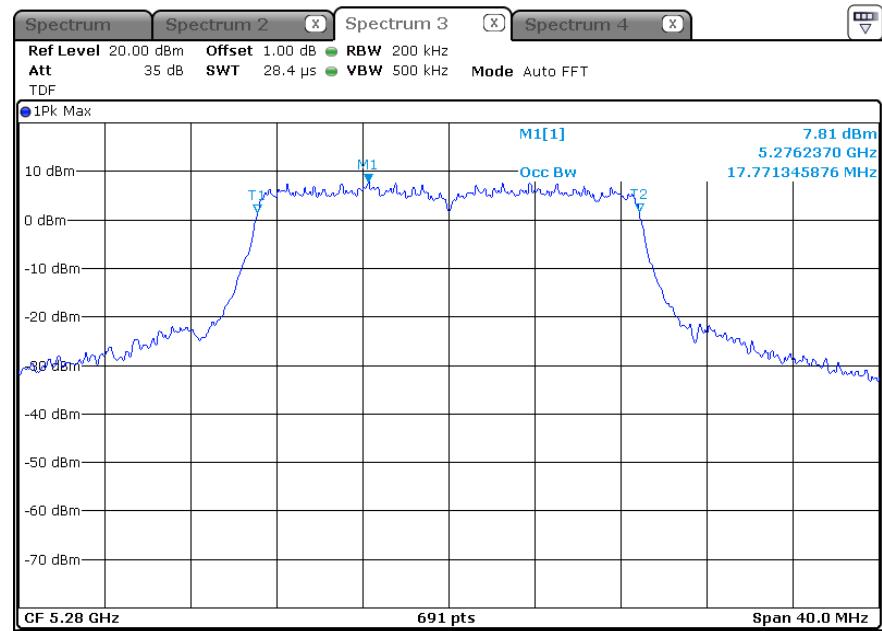


-5 280 MHz

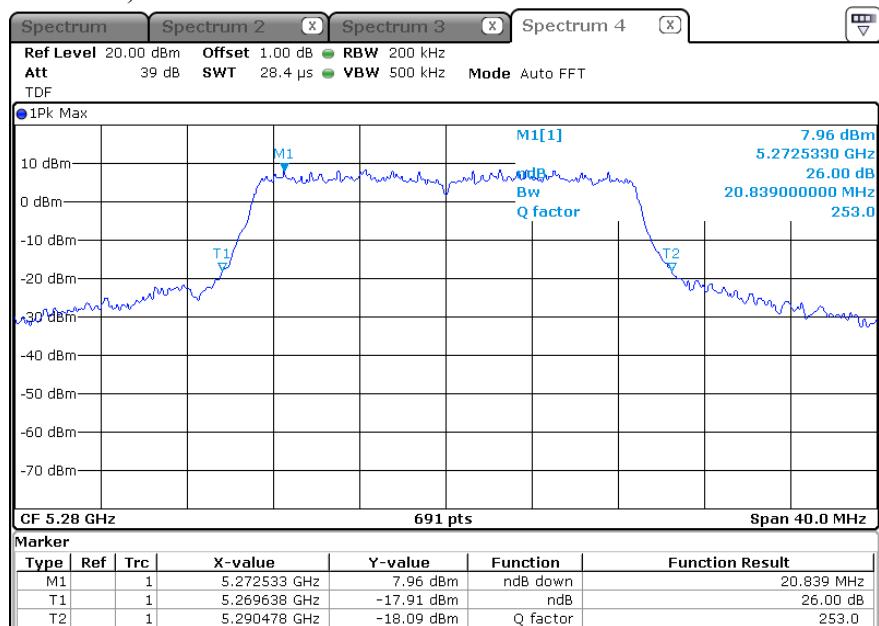
ANT 1(26 dB Bandwidth)



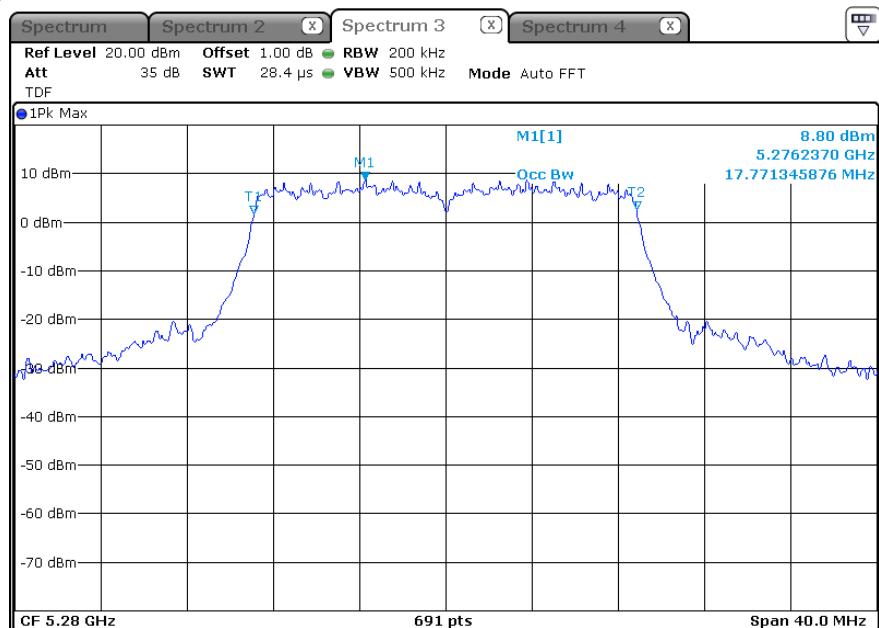
ANT 1(OBW)



ANT 2 (26 dB Bandwidth)

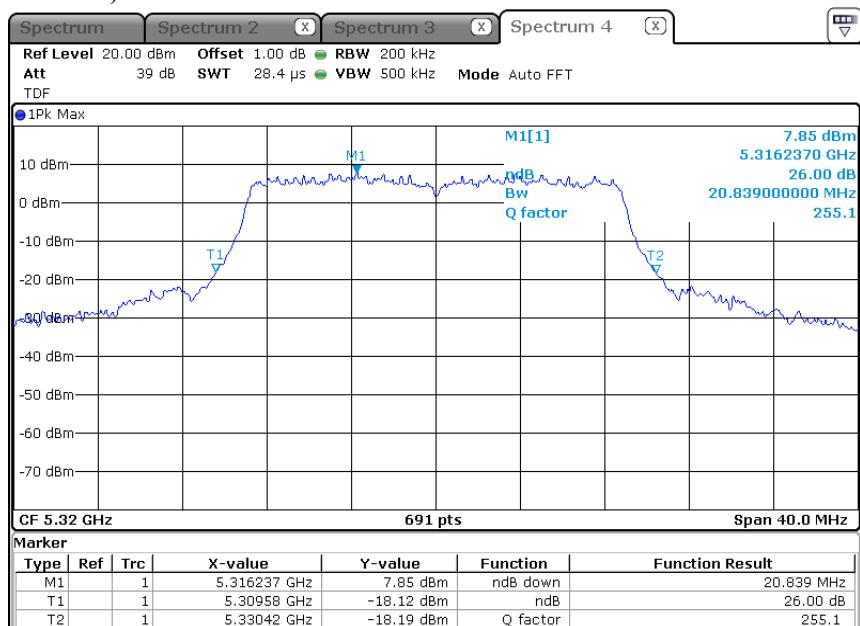


ANT 2 (OBW)

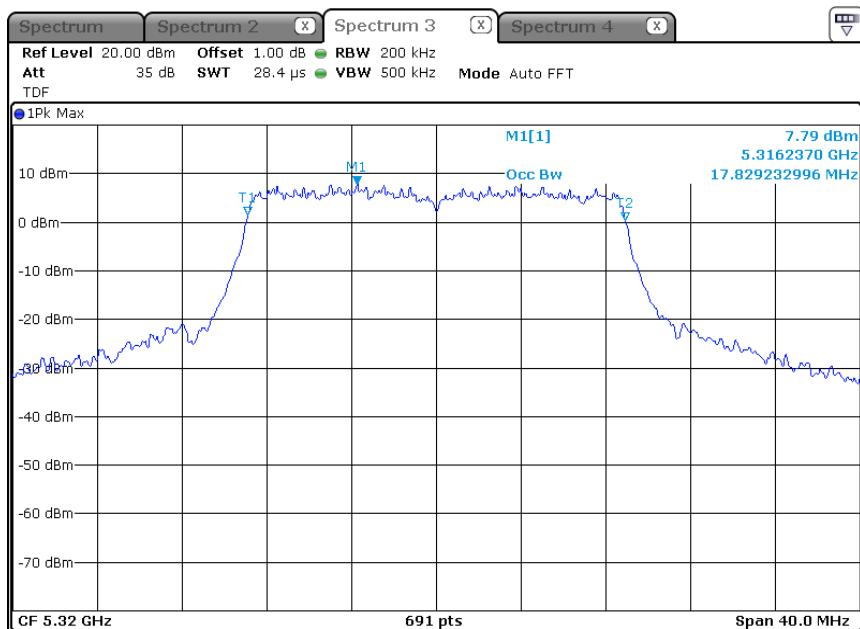


-5 320 MHz

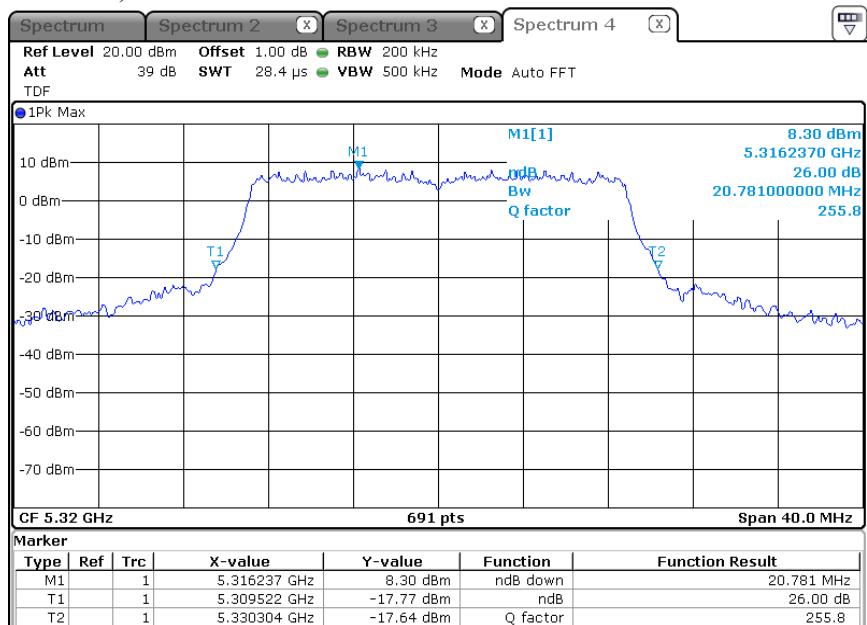
ANT 1(26 dB Bandwidth)



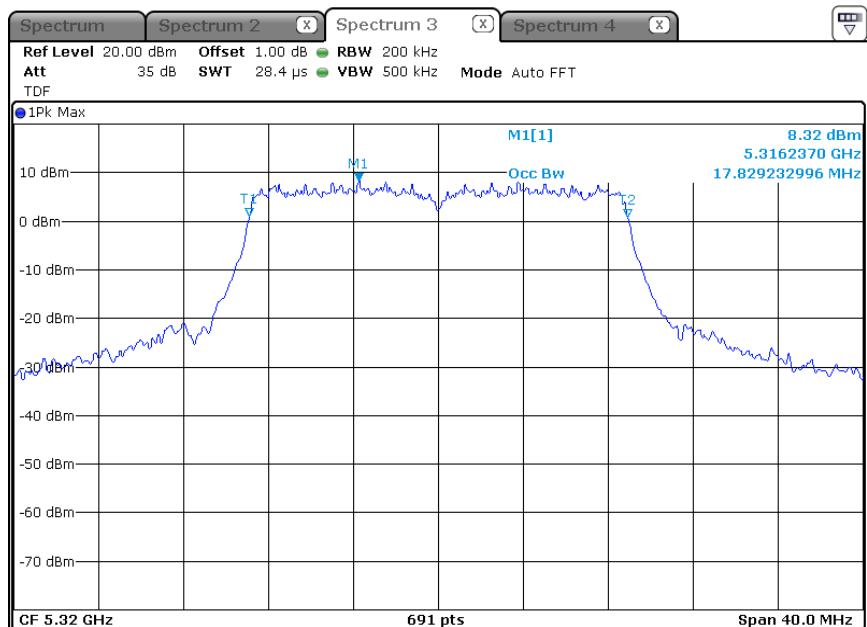
ANT 1(OBW)



ANT 2 (26 dB Bandwidth)



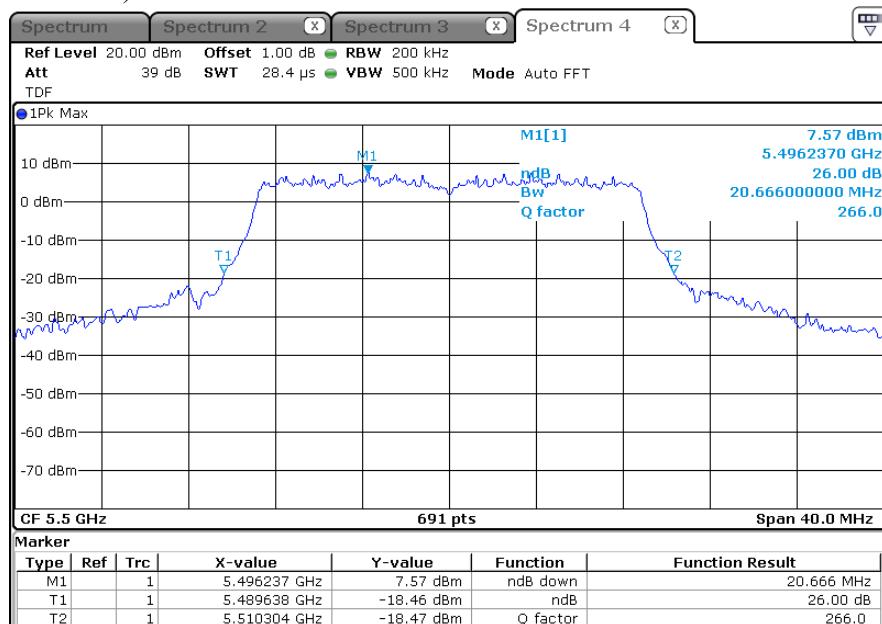
ANT 2 (OBW)



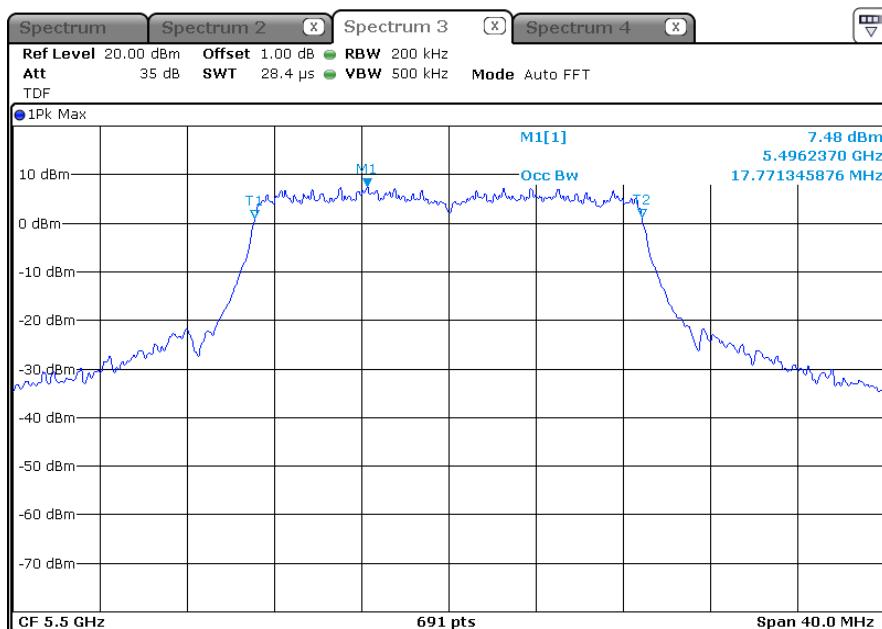
* 802.11n HT20_5 470 Band (26 dB Bandwidth)

-5 500 MHz

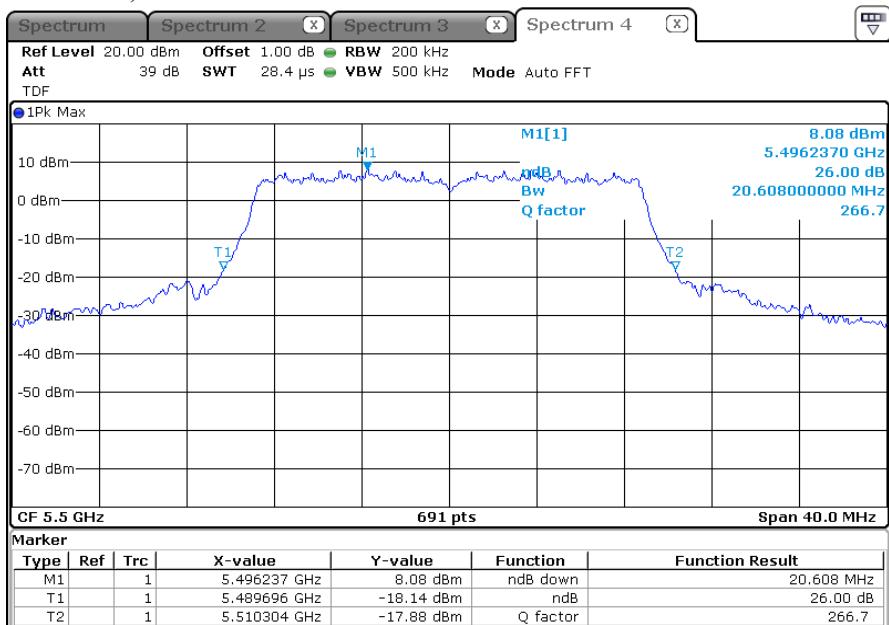
ANT 1(26 dB Bandwidth)



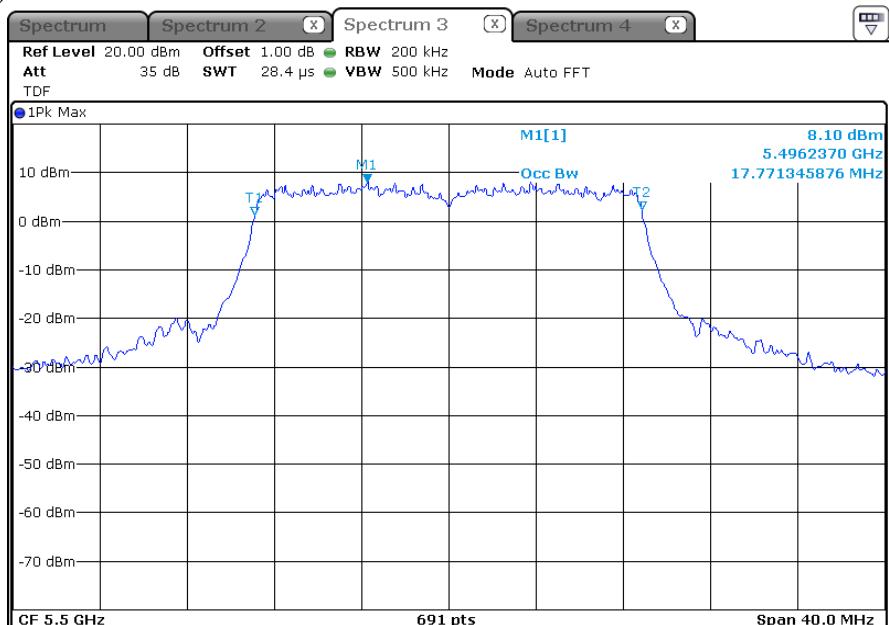
ANT 1(OBW)



ANT 2 (26 dB Bandwidth)

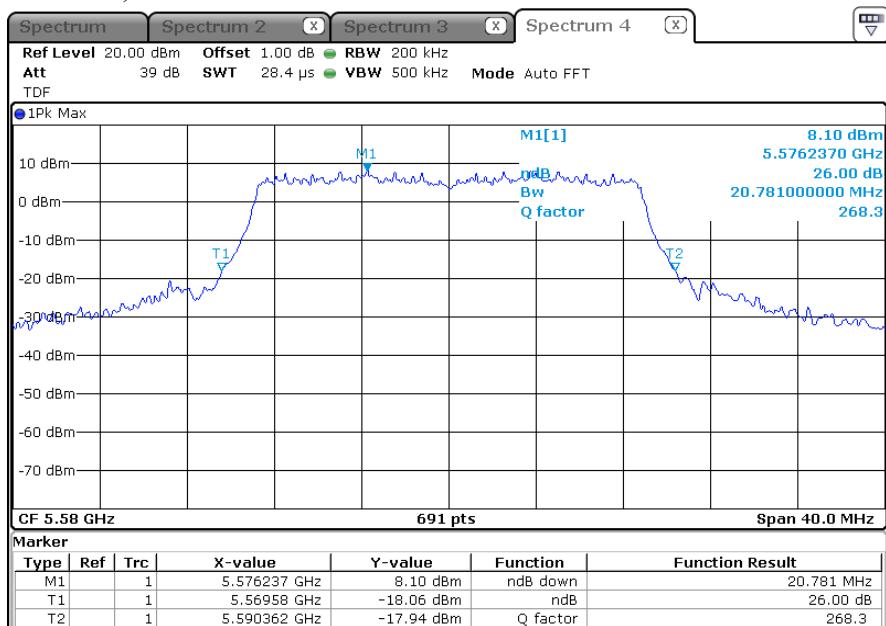


ANT 2 (OBW)

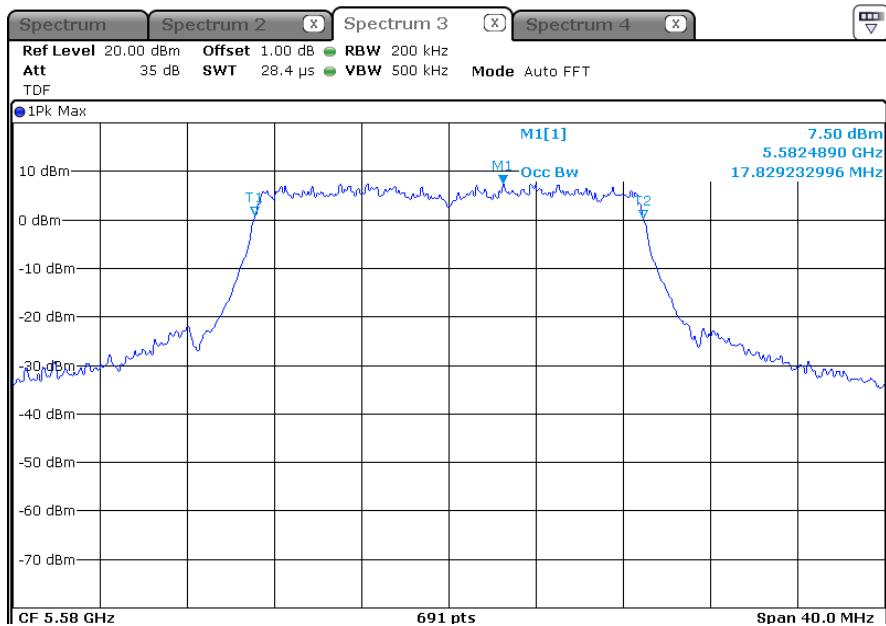


-5 580 MHz

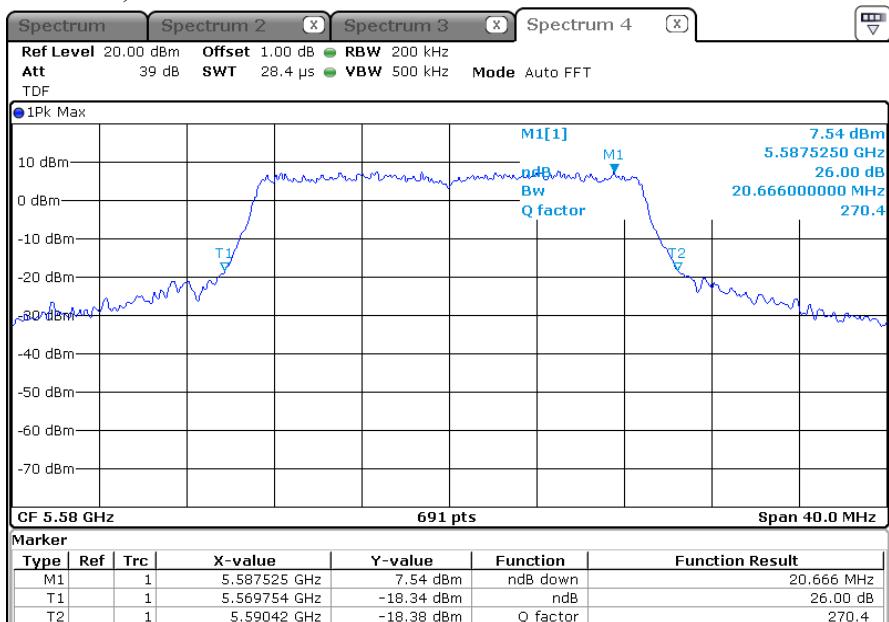
ANT 1(26 dB Bandwidth)



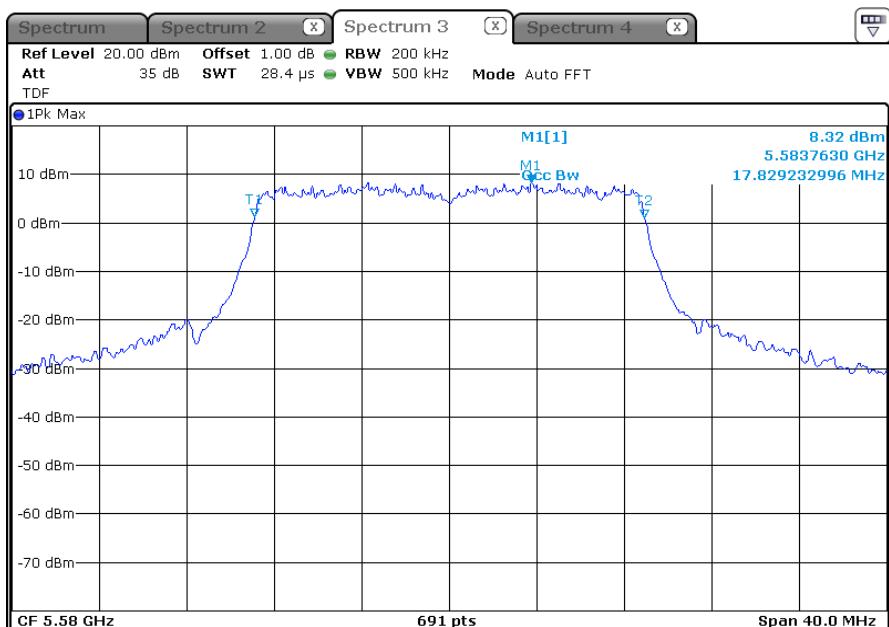
ANT 1(OBW)



ANT 1(26 dB Bandwidth)

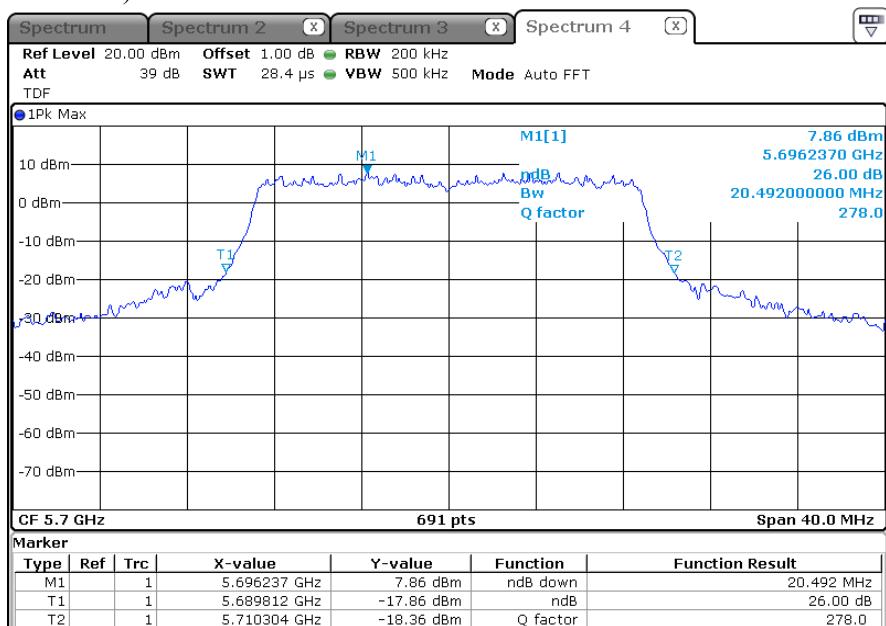


ANT 1(OBW)

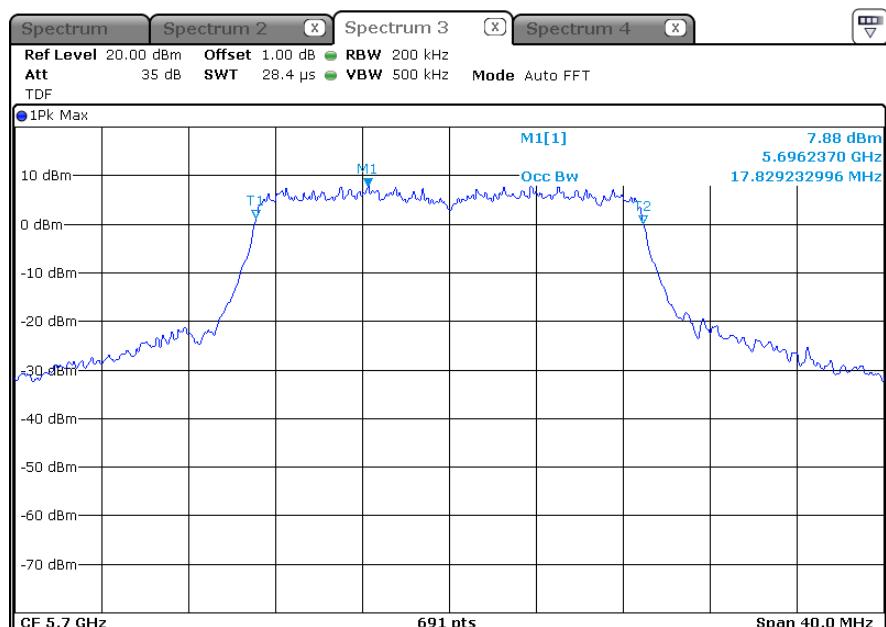


-5 700 MHz

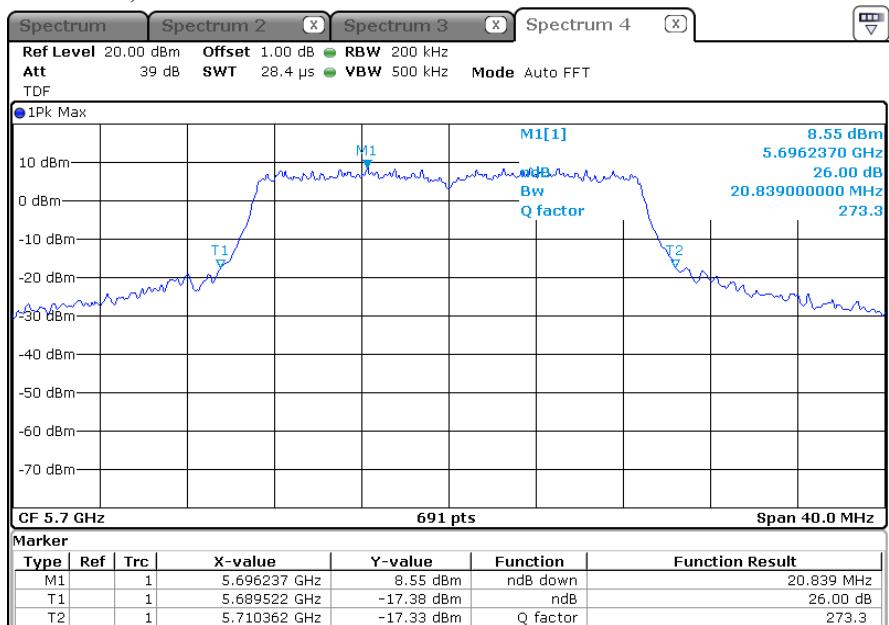
ANT 1(26 dB Bandwidth)



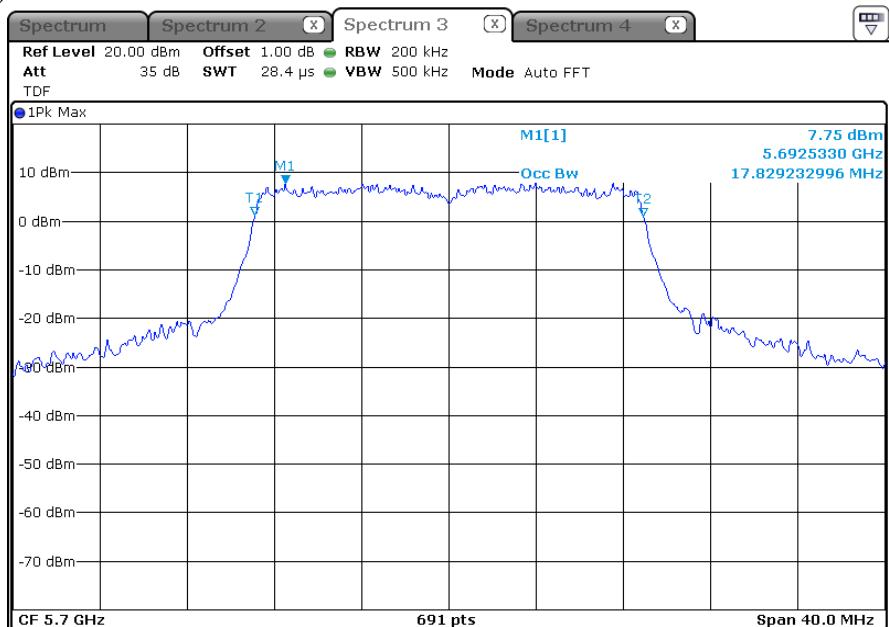
ANT 1(OBW)



ANT 2 (26 dB Bandwidth)



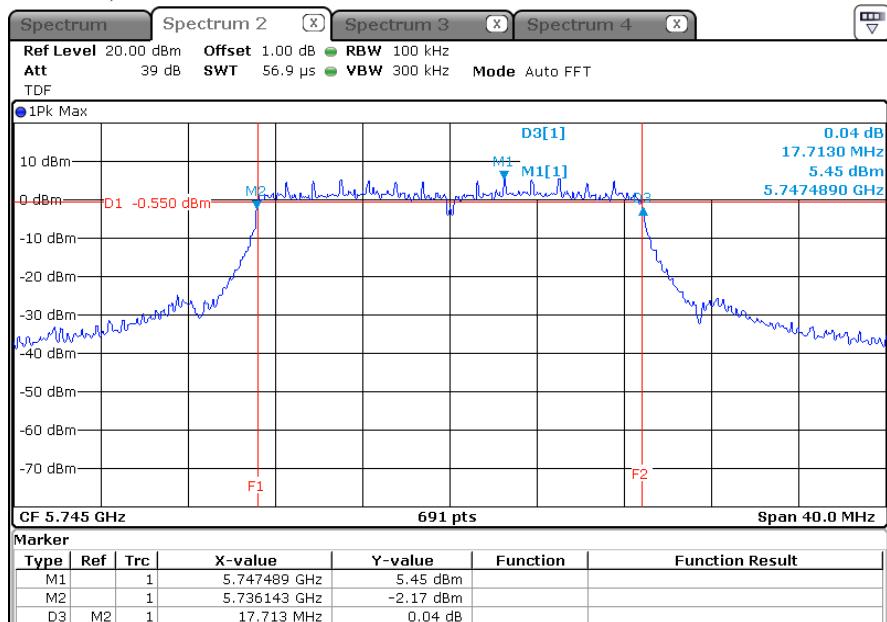
ANT 2 (OBW)



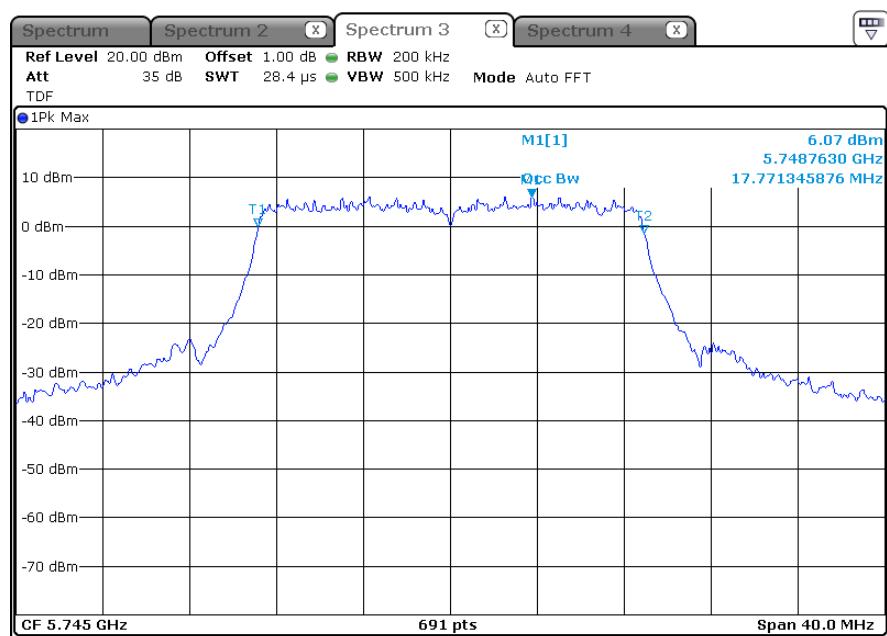
* 802.11n HT20_5 725 Band (6 dB Bandwidth)

-5 745 MHz

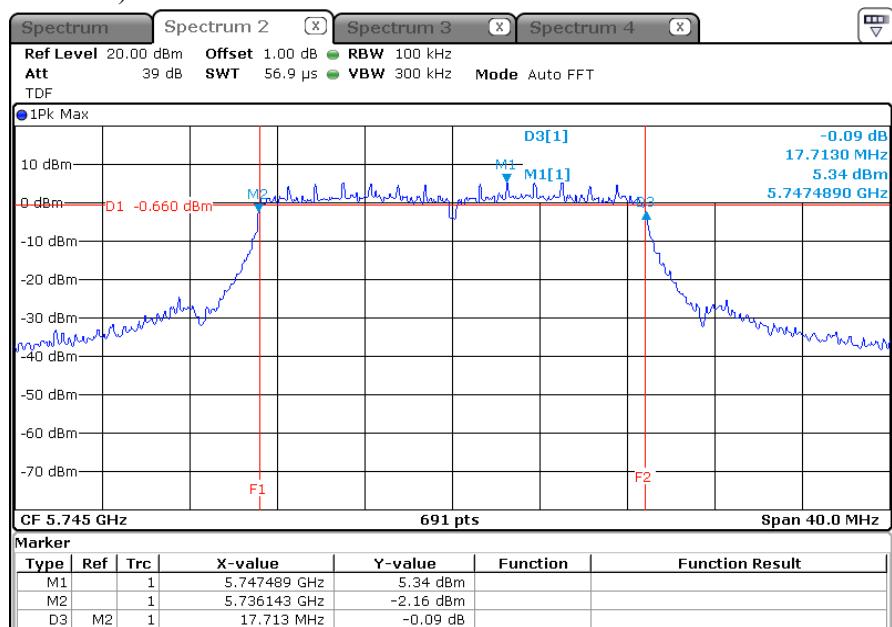
ANT 1(6 dB Bandwidth)



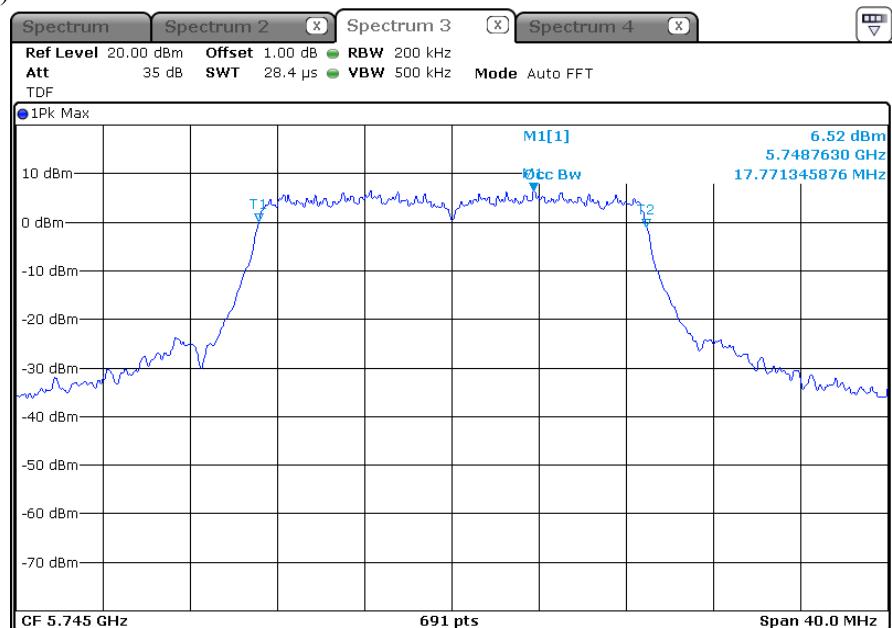
ANT 1(OBW)



ANT 2 (6 dB Bandwidth)

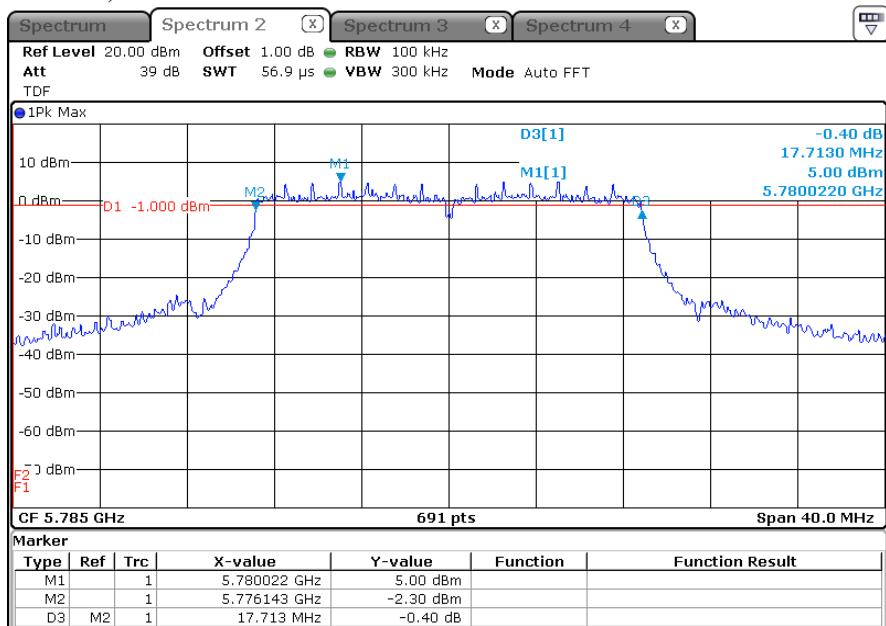


ANT 2 (OBW)

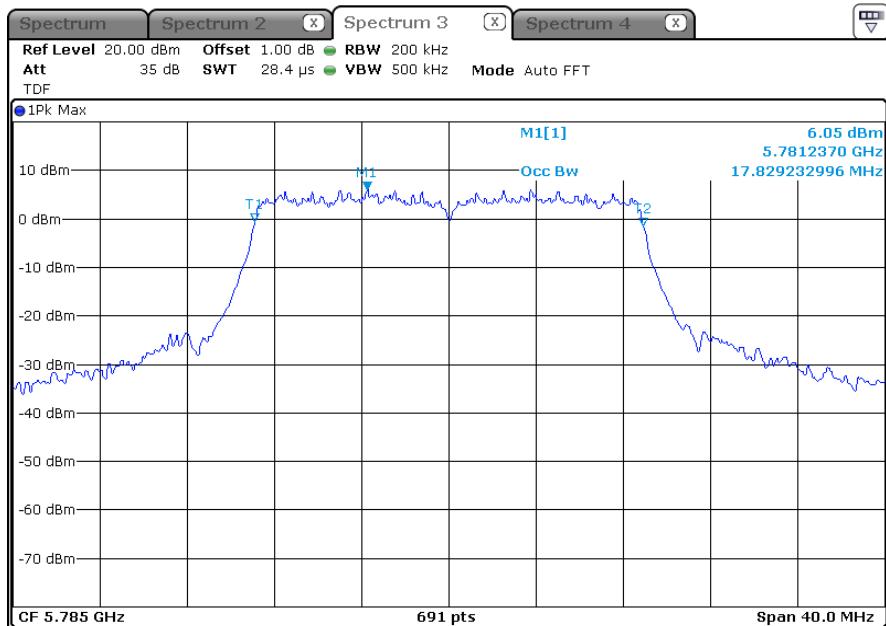


-5 785 MHz

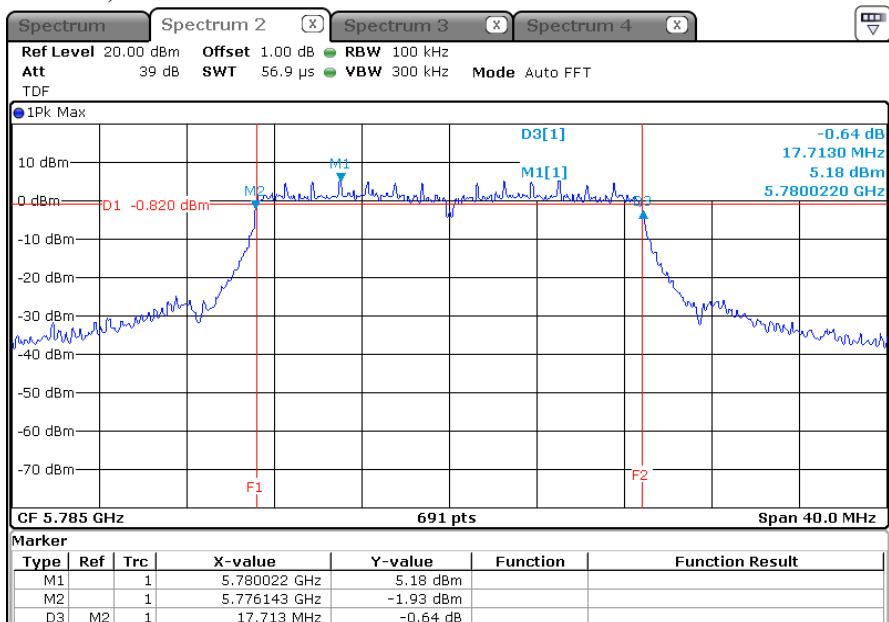
ANT 1(6 dB Bandwidth)



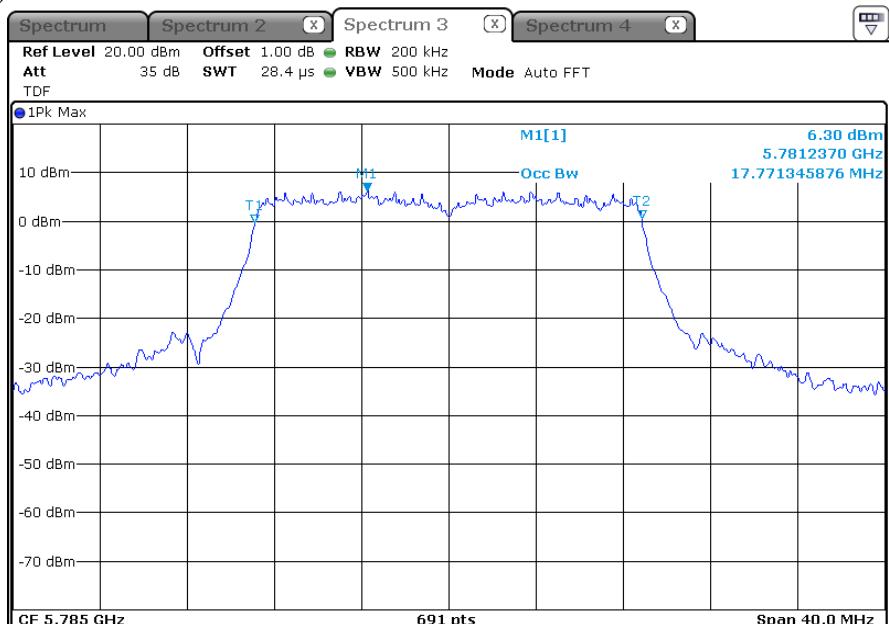
ANT 1(OBW)



ANT 2(6 dB Bandwidth)

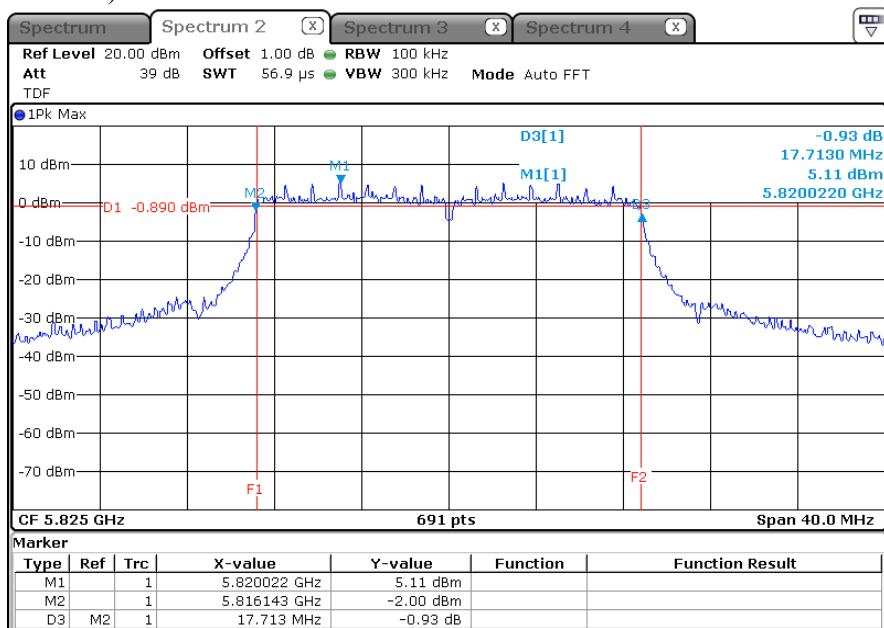


ANT 2 (OBW)

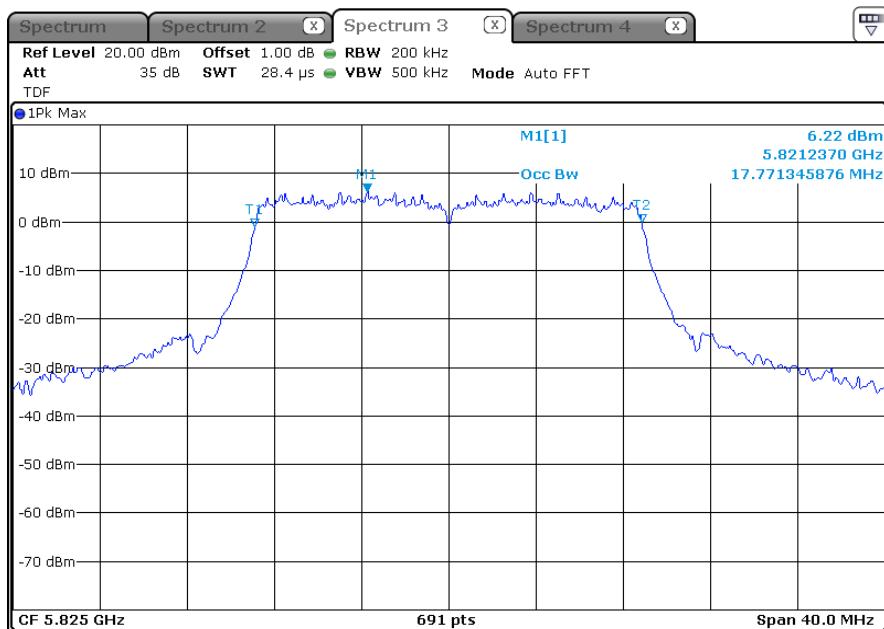


-5 825 MHz

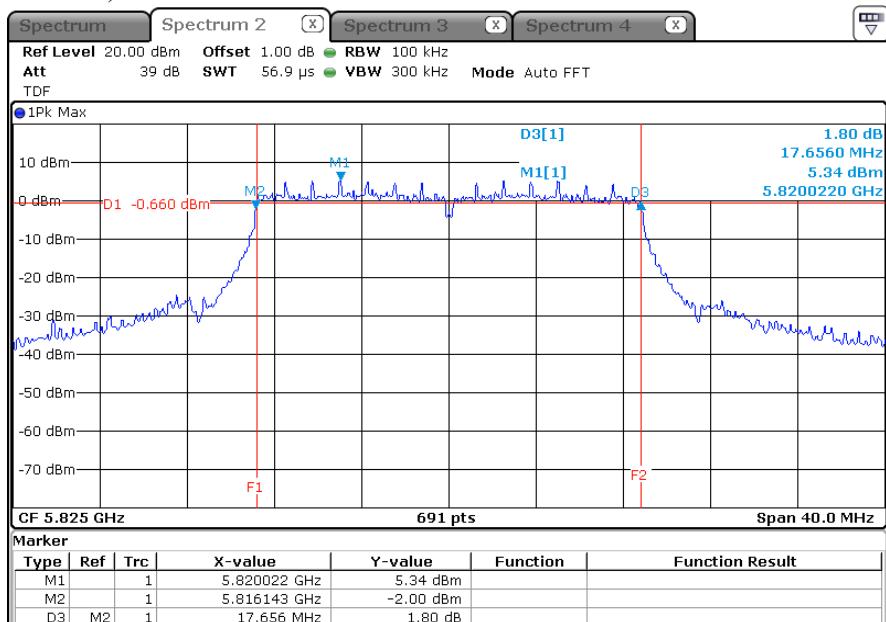
ANT 1(6 dB Bandwidth)



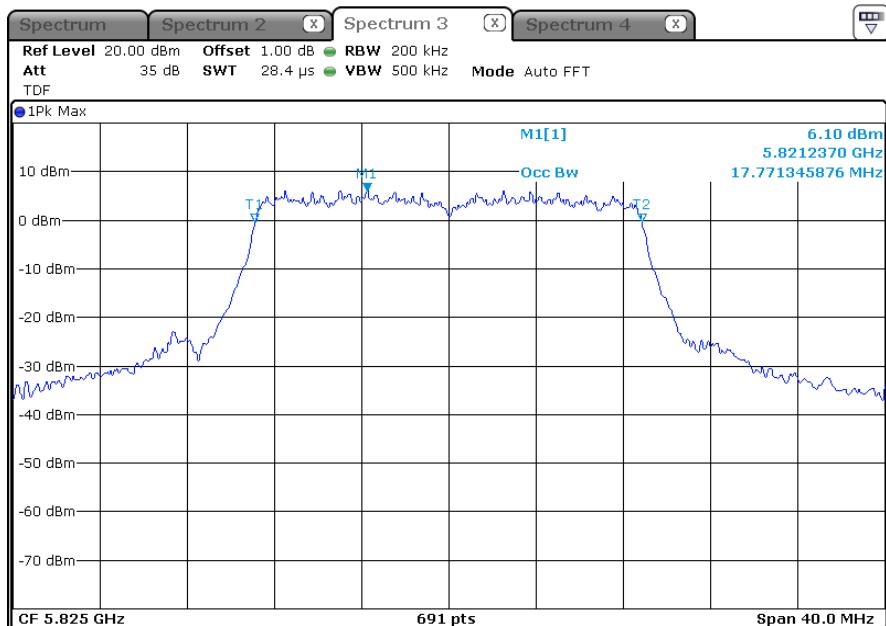
ANT 1(OBW)



ANT 2(6 dB Bandwidth)



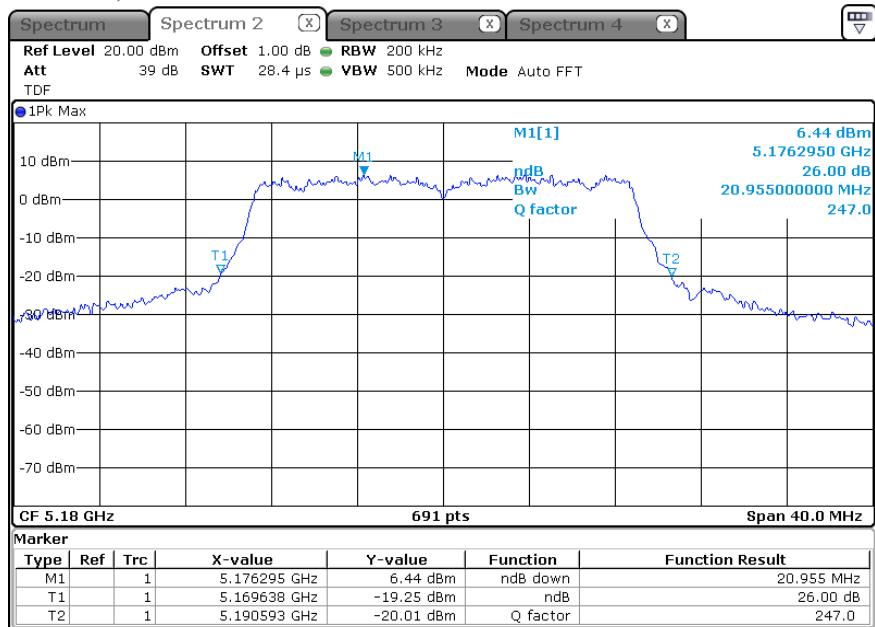
ANT 2(OBW)



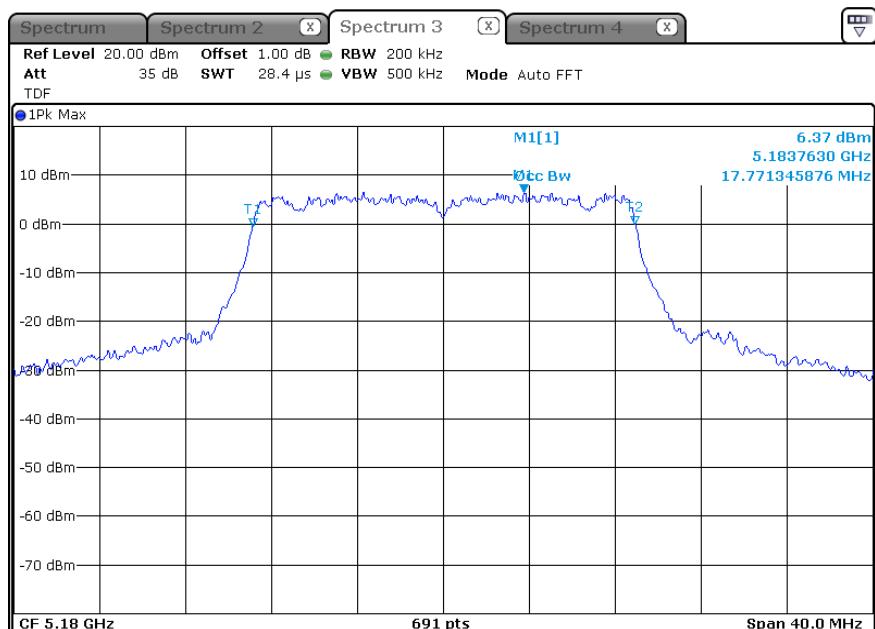
* 802.11n HT20_MIMO(ANT 1+2)_5 150 Band (26 dB Bandwidth)

-5 180 MHz

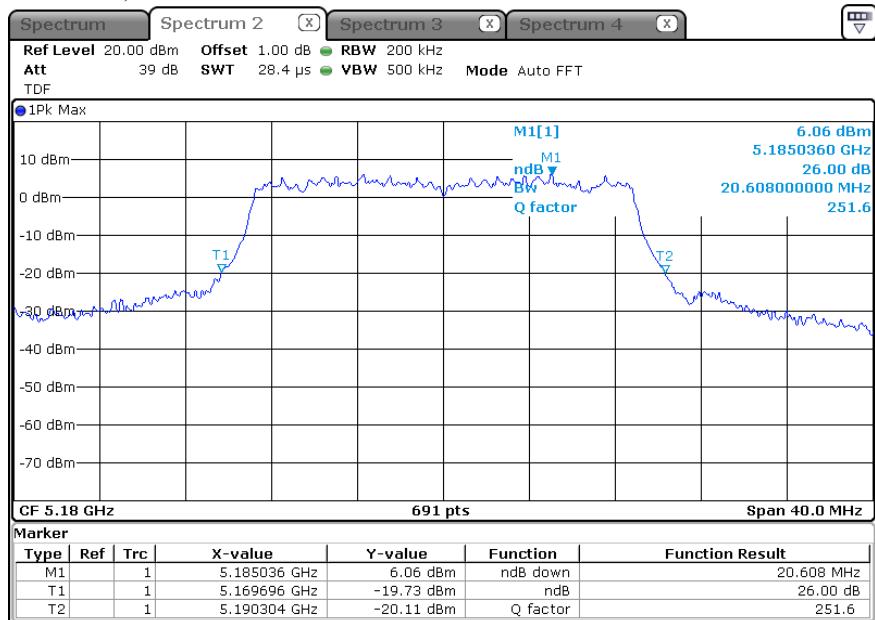
ANT 1(26 dB Bandwidth)



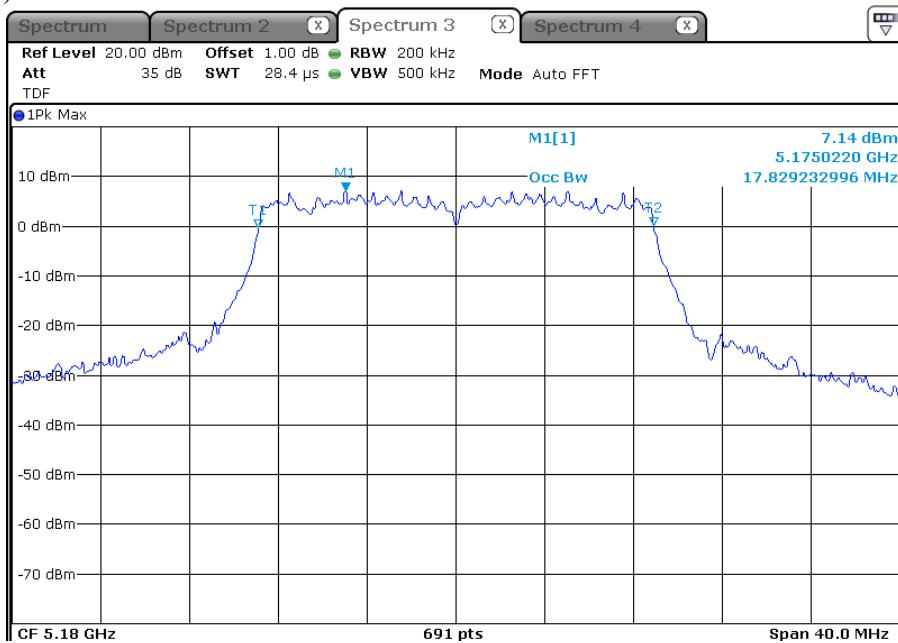
ANT 1(OBW)



ANT 2 (26 dB Bandwidth)

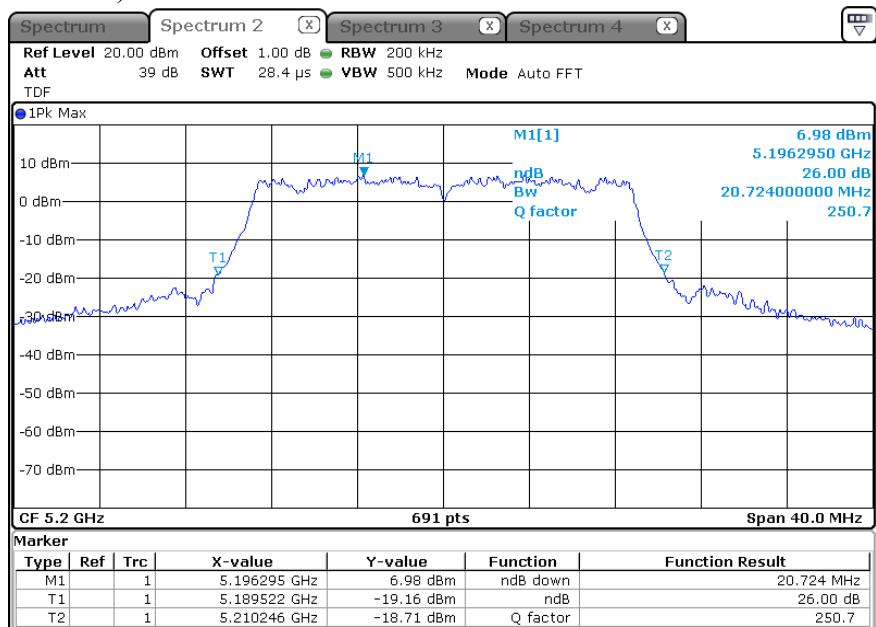


ANT 2 (OBW)

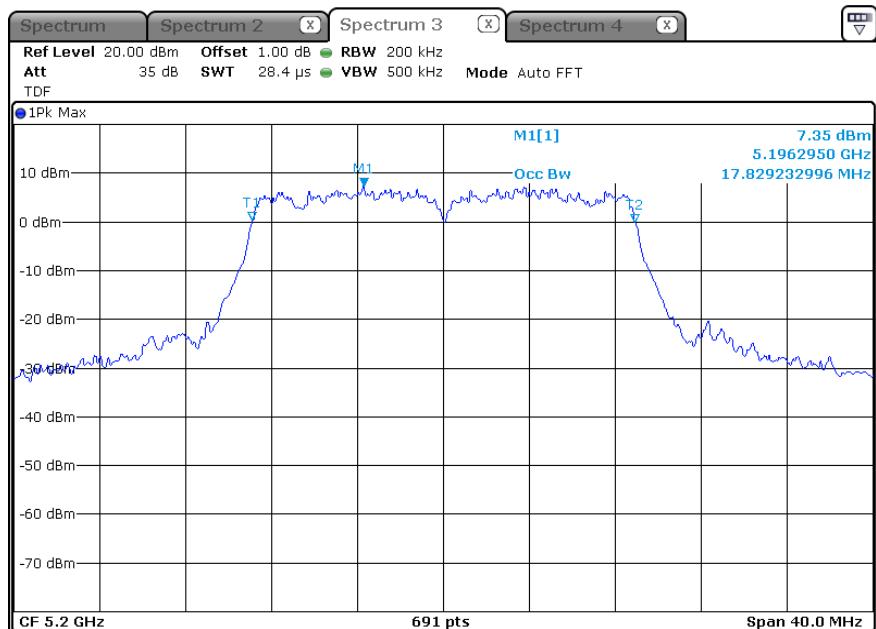


-5 200 MHz

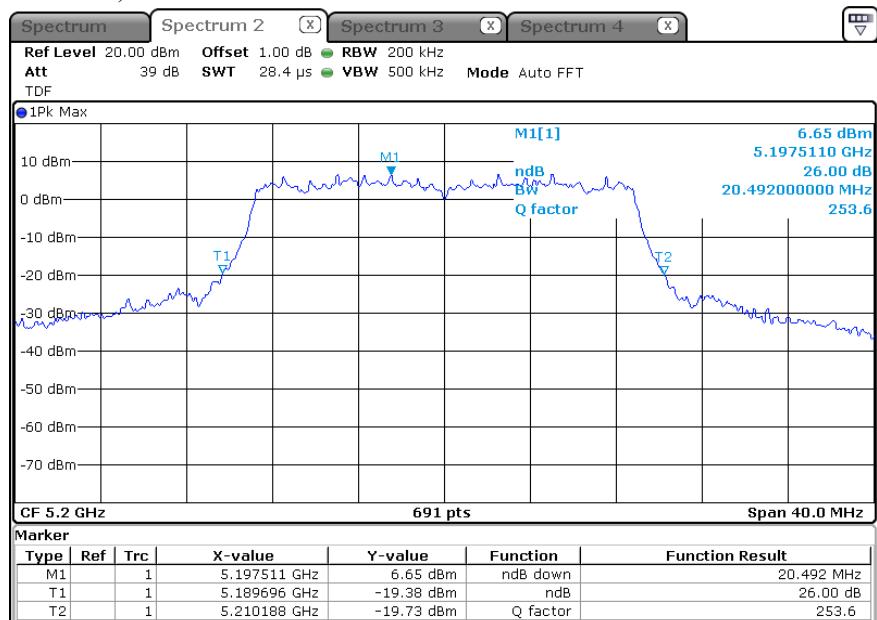
ANT 1(26 dB Bandwidth)



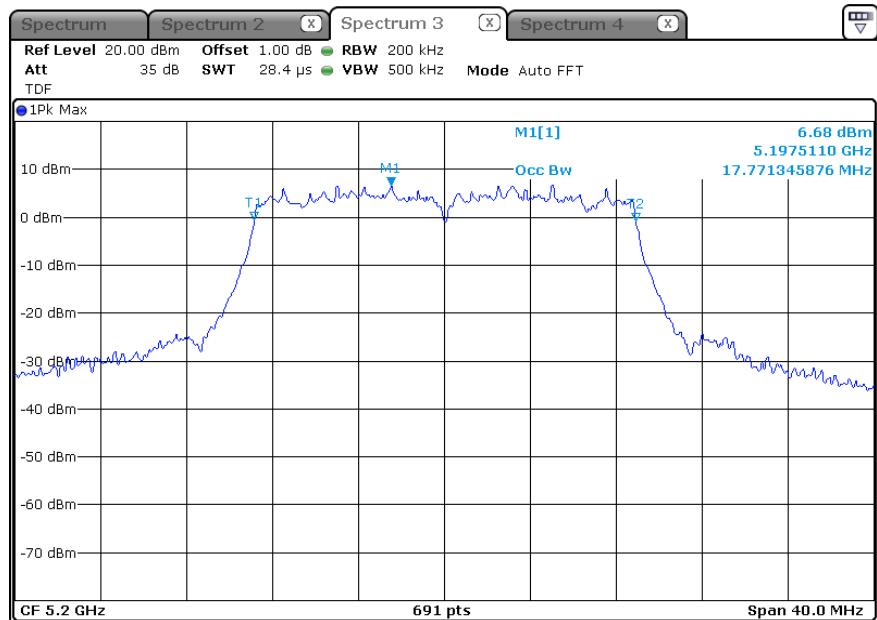
ANT 1(OBW)



ANT 2(26 dB Bandwidth)

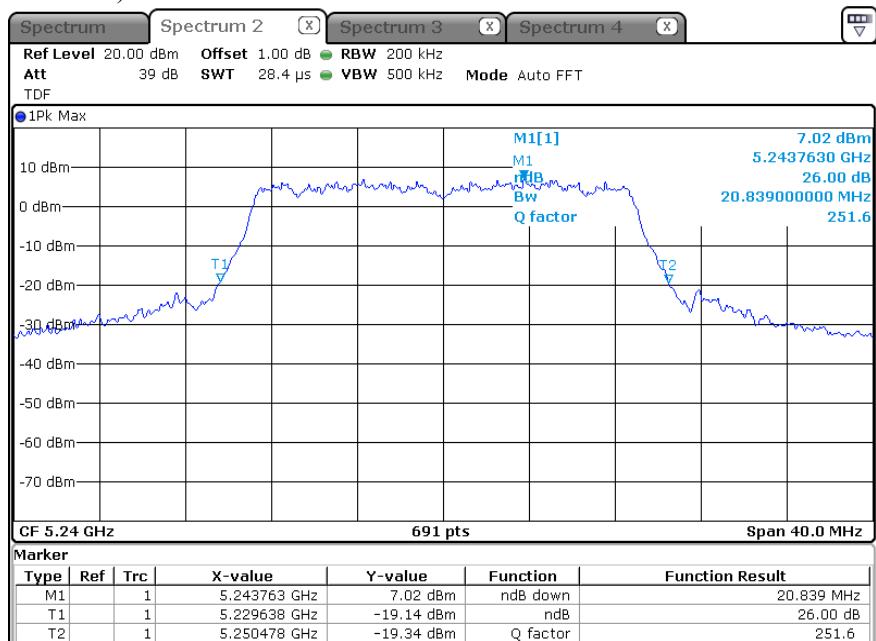


ANT 2(OBW)

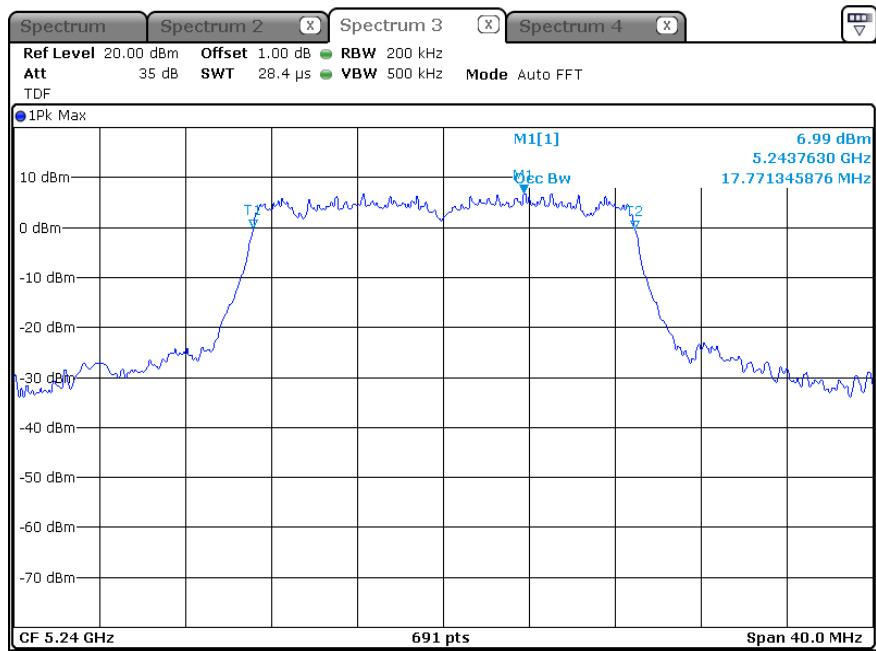


-5 240 MHz

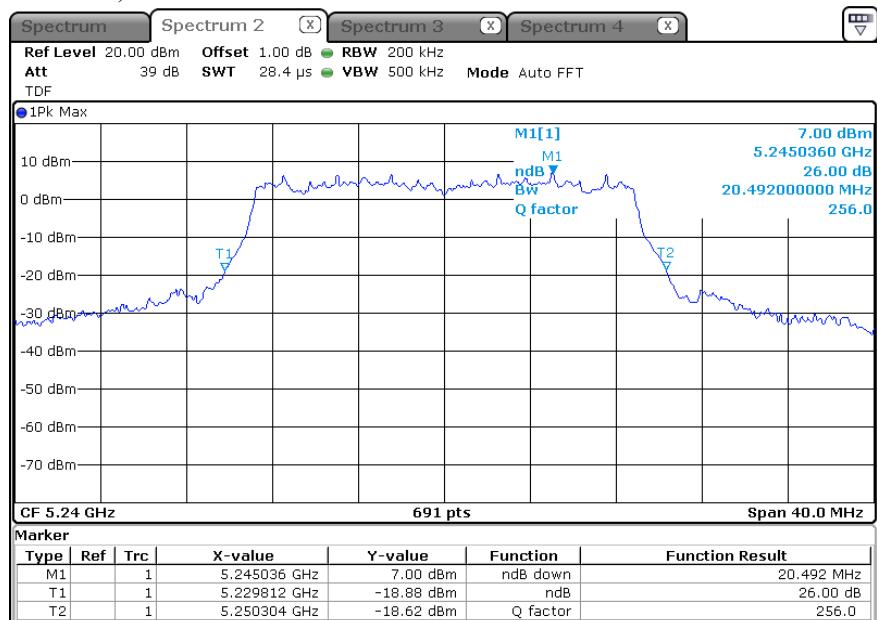
ANT 1(26 dB Bandwidth)



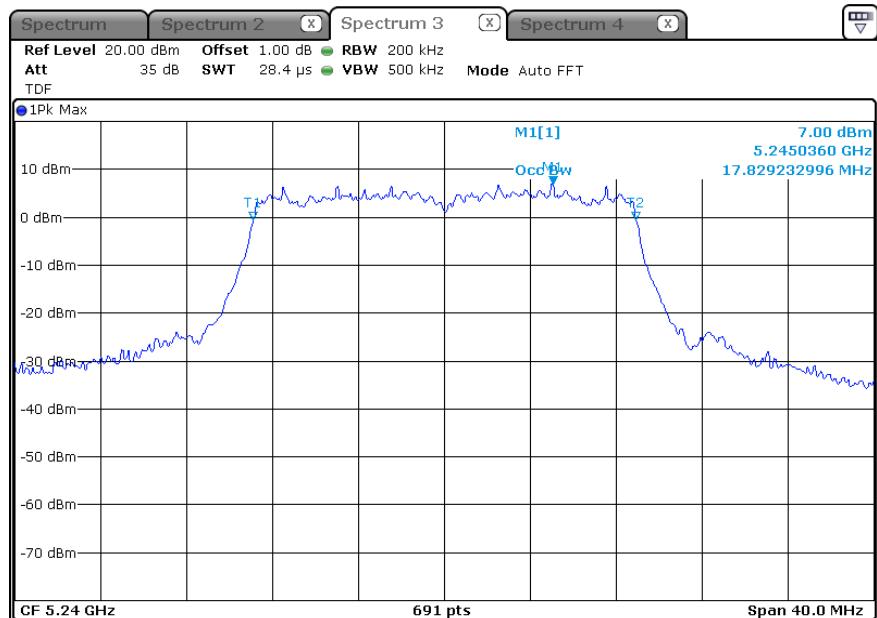
ANT 1(OBW)



ANT 2(26 dB Bandwidth)



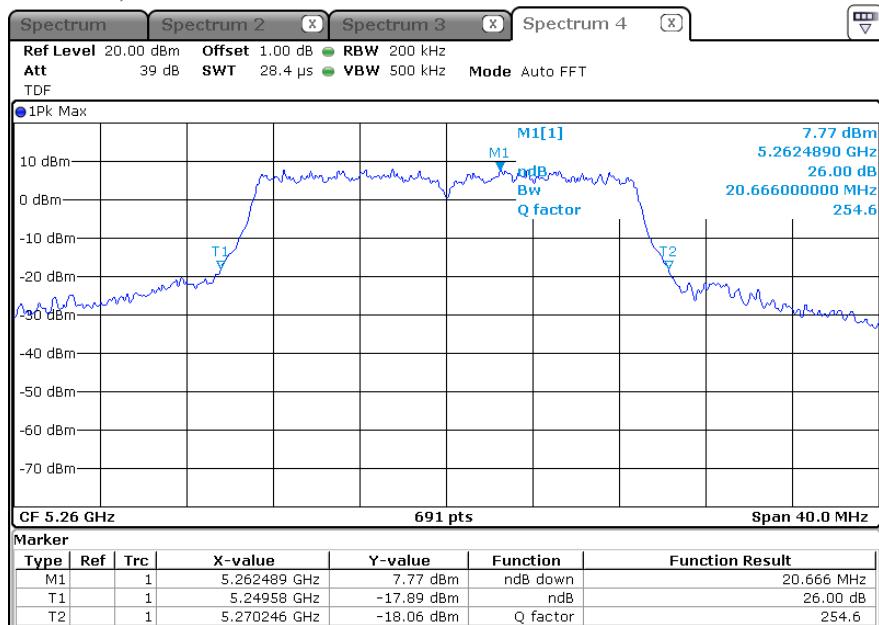
ANT 2(OBW)



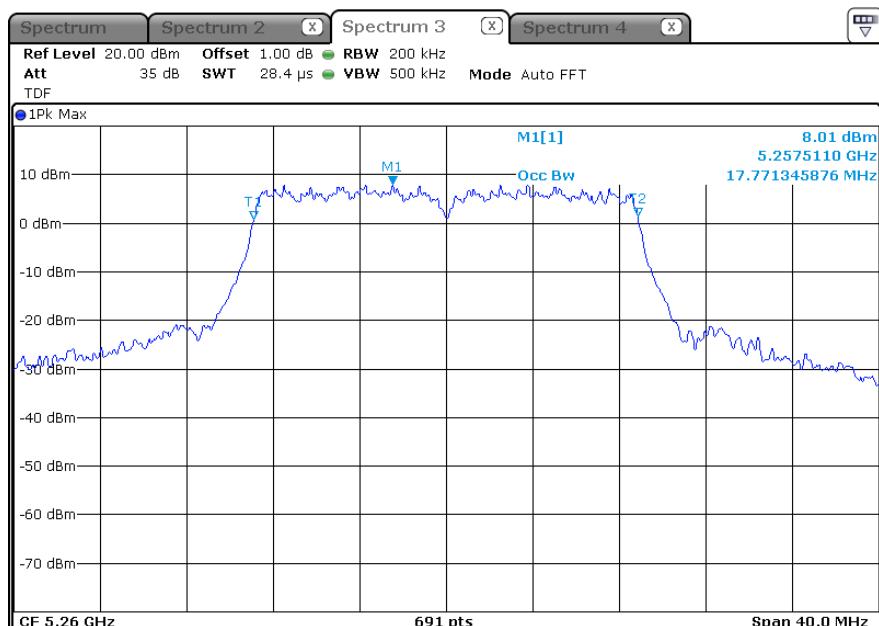
* 802.11n HT20_MIMO (ANT 1+2)_5 250 Band (26 dB Bandwidth)

-5260 MHz

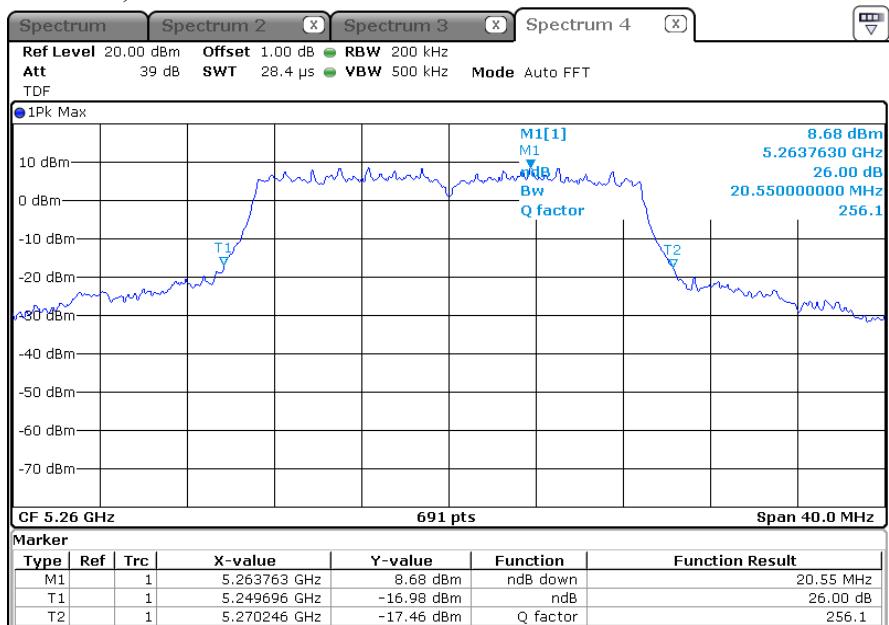
ANT 1(26 dB Bandwidth)



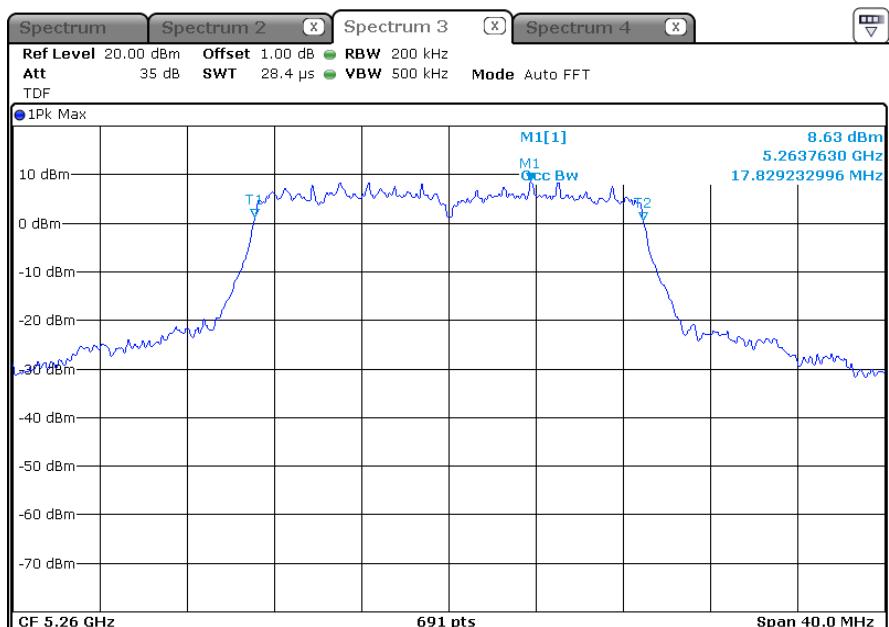
ANT 1(OBW)



ANT 2(26 dB Bandwidth)

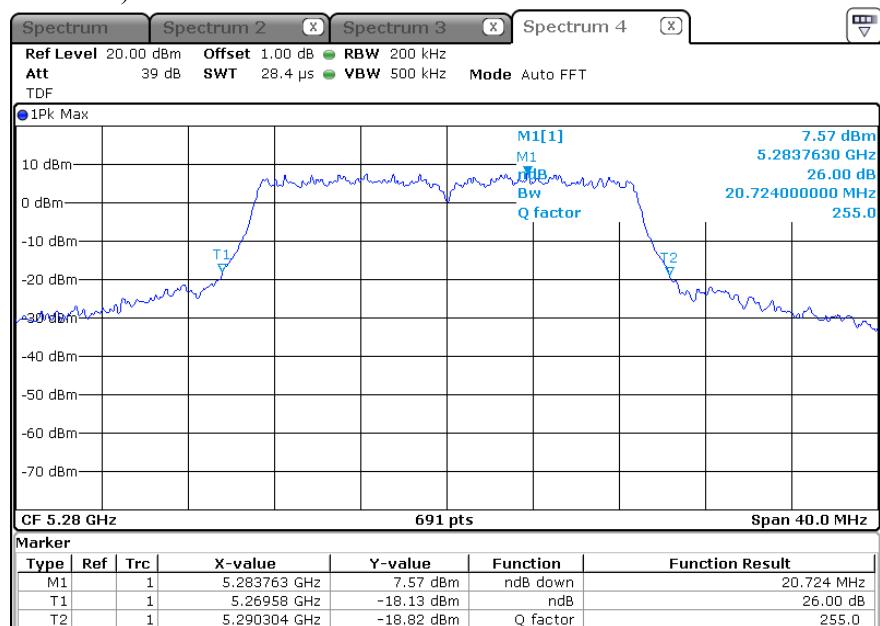


ANT 2(OBW)

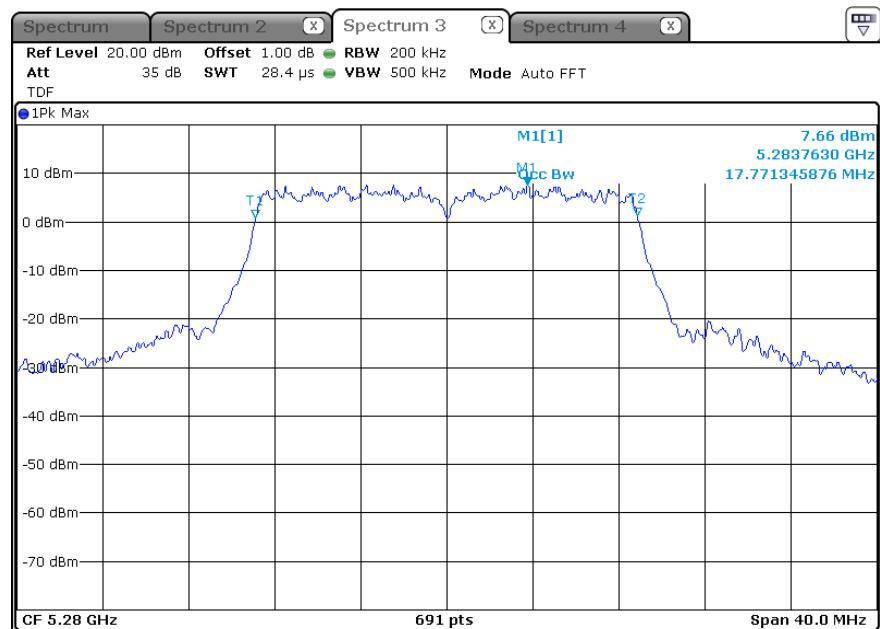


-5 280 MHz

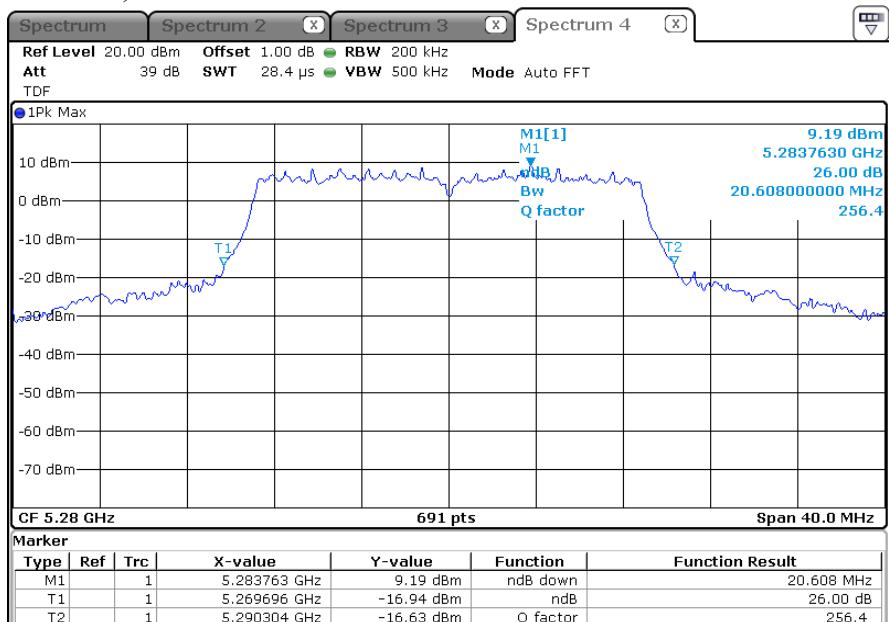
ANT 1(26 dB Bandwidth)



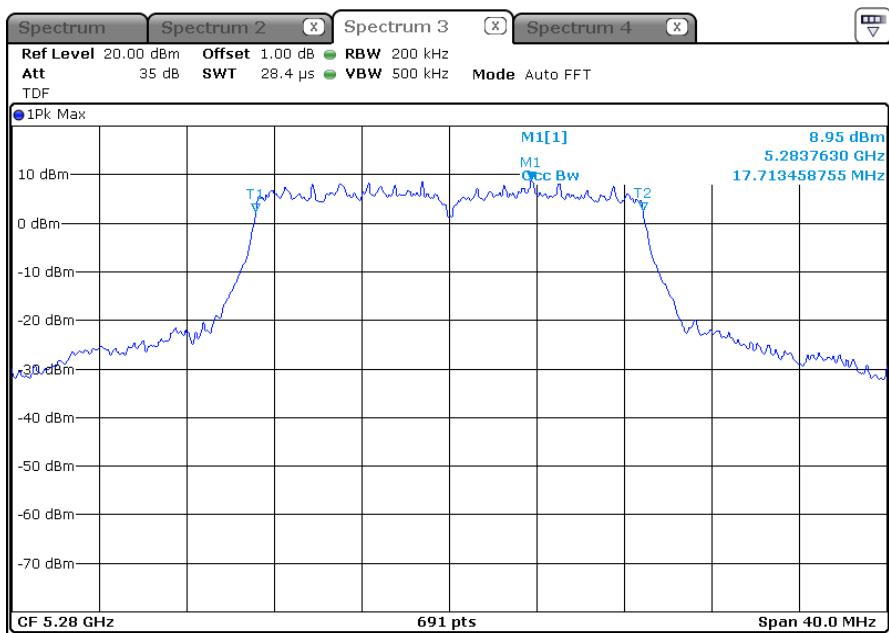
ANT 1(OBW)



ANT 2(26 dB Bandwidth)

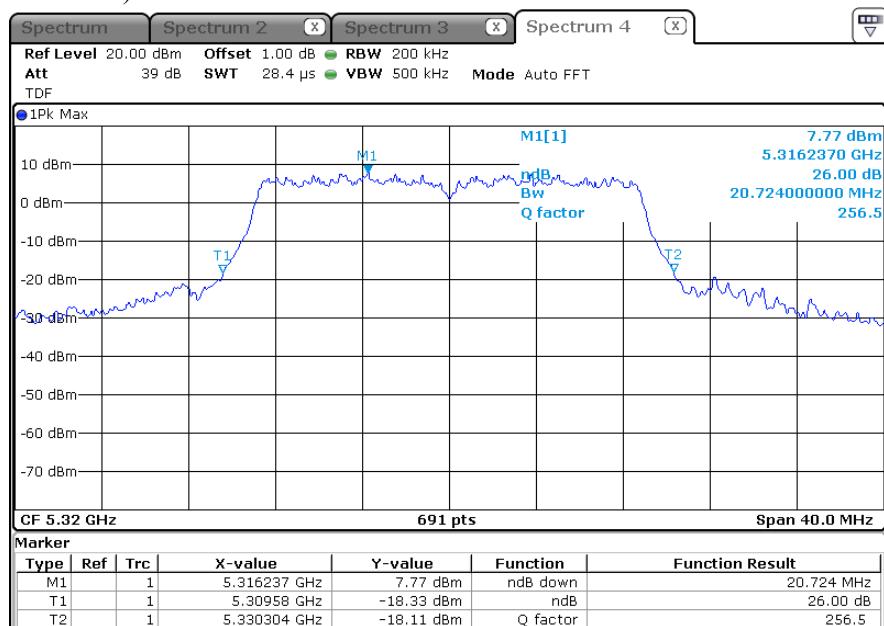


ANT 2(OBW)

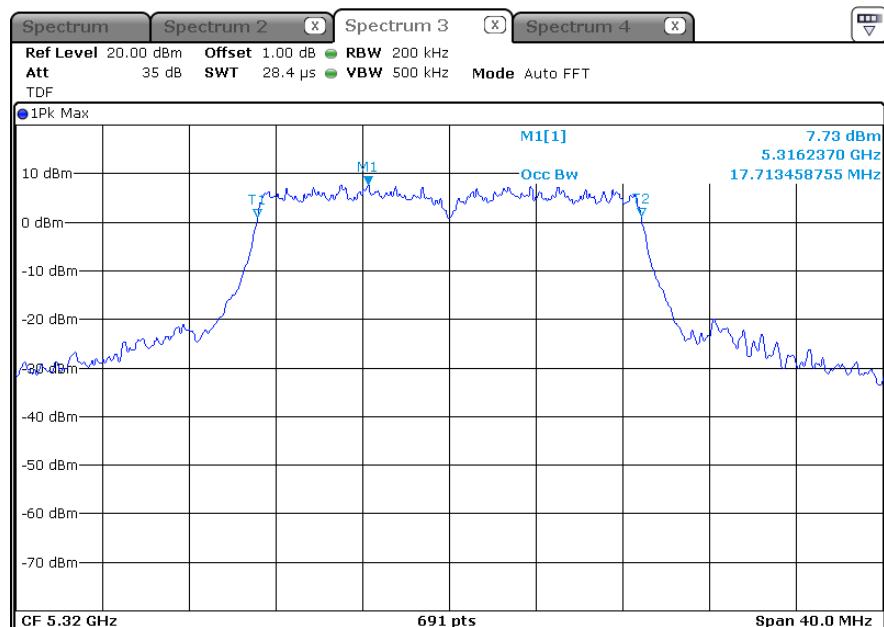


-5 320 MHz

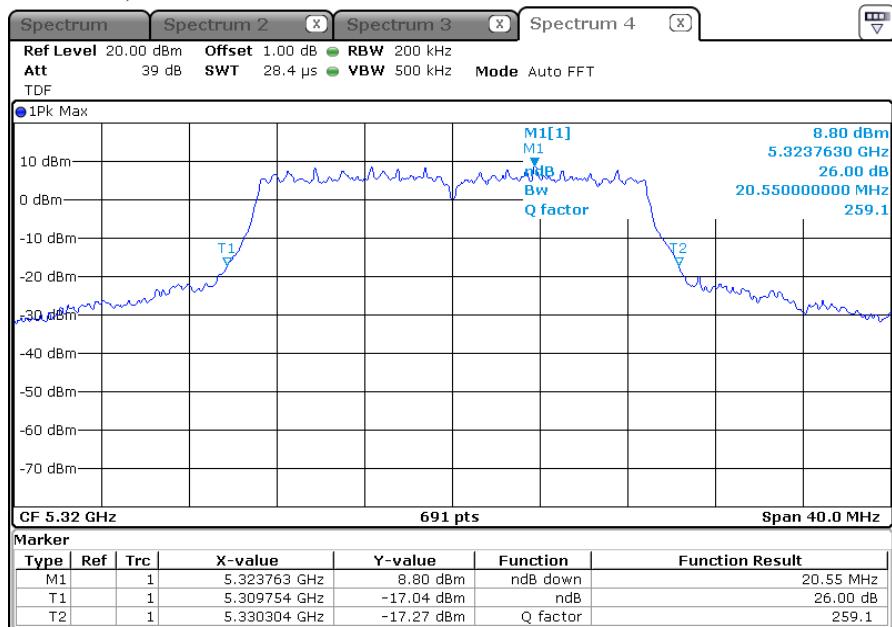
ANT 1(26 dB Bandwidth)



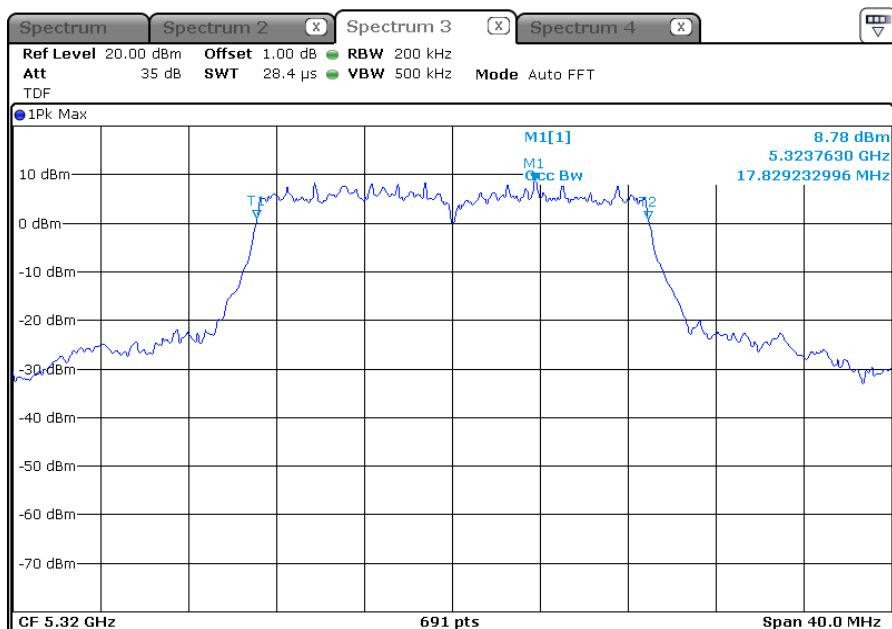
ANT 1(OBW)



ANT 2(26 dB Bandwidth)



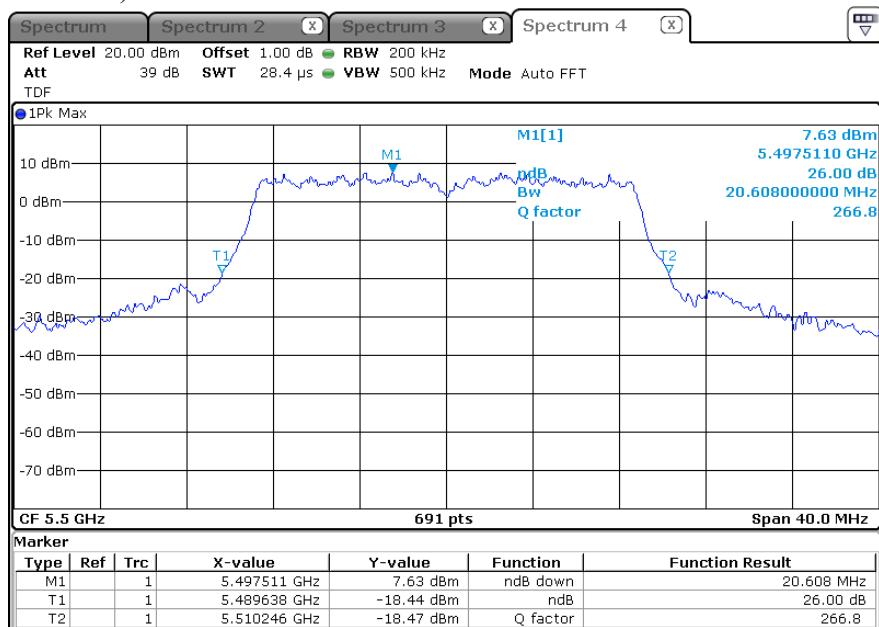
ANT 2(OBW)



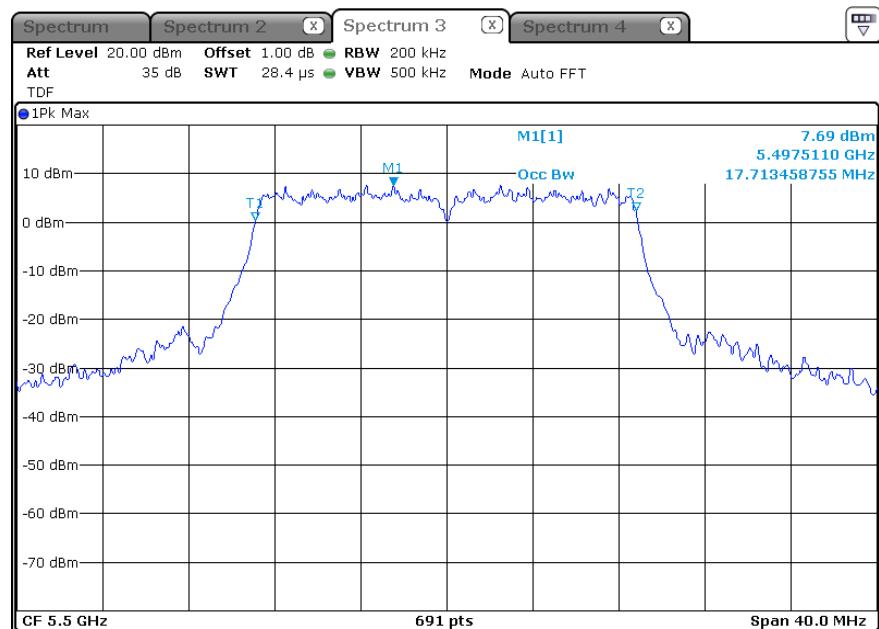
* 802.11n HT20_MIMO (ANT 1+2) 5 470 Band (26 dB Bandwidth)

-5 500 MHz

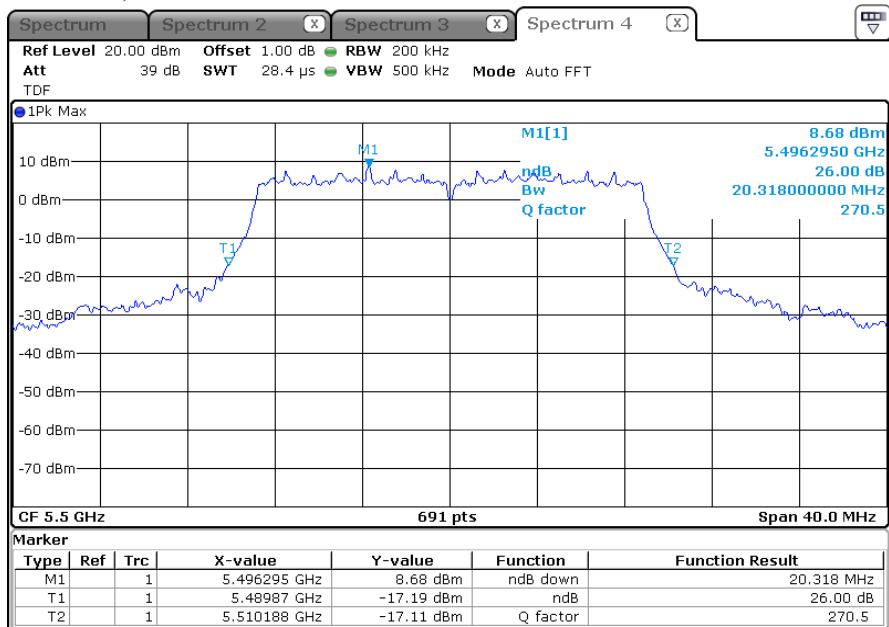
ANT 1(26 dB Bandwidth)



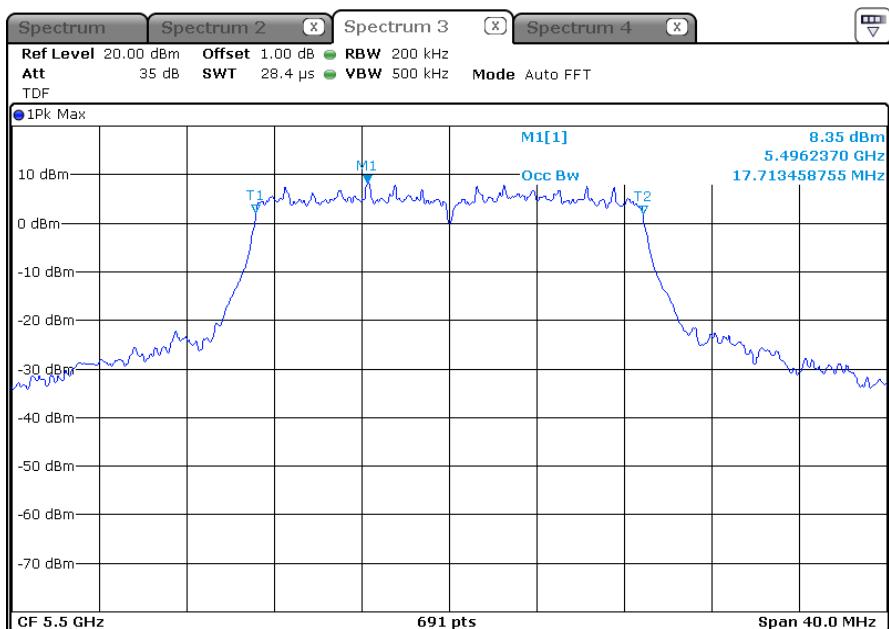
ANT 1(OBW)



ANT 2(26 dB Bandwidth)

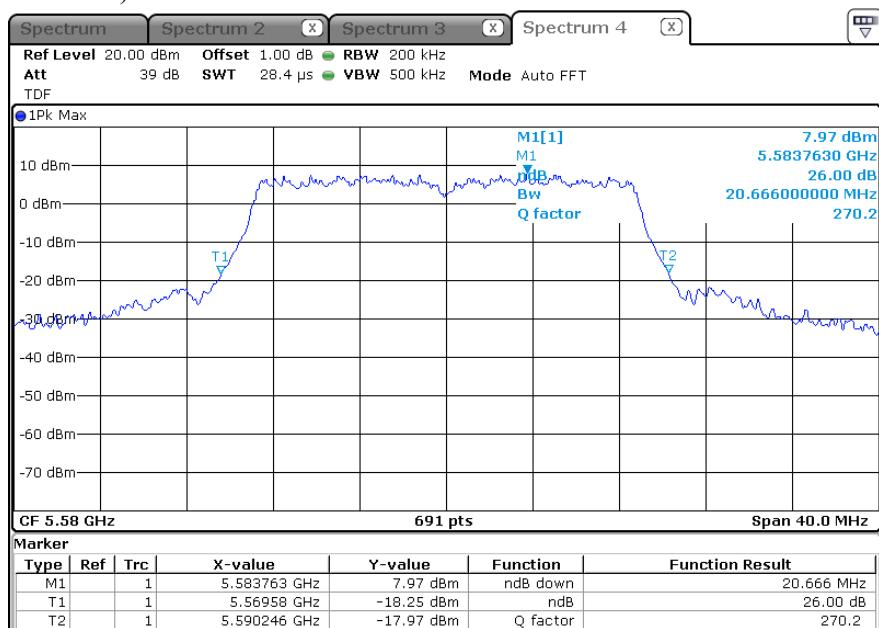


ANT 2(OBW)

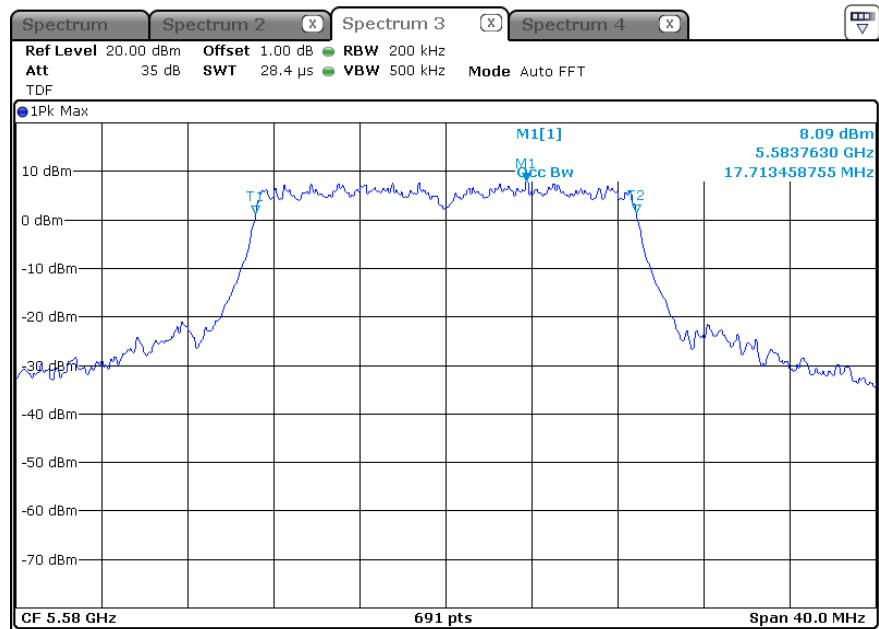


-5 580 MHz

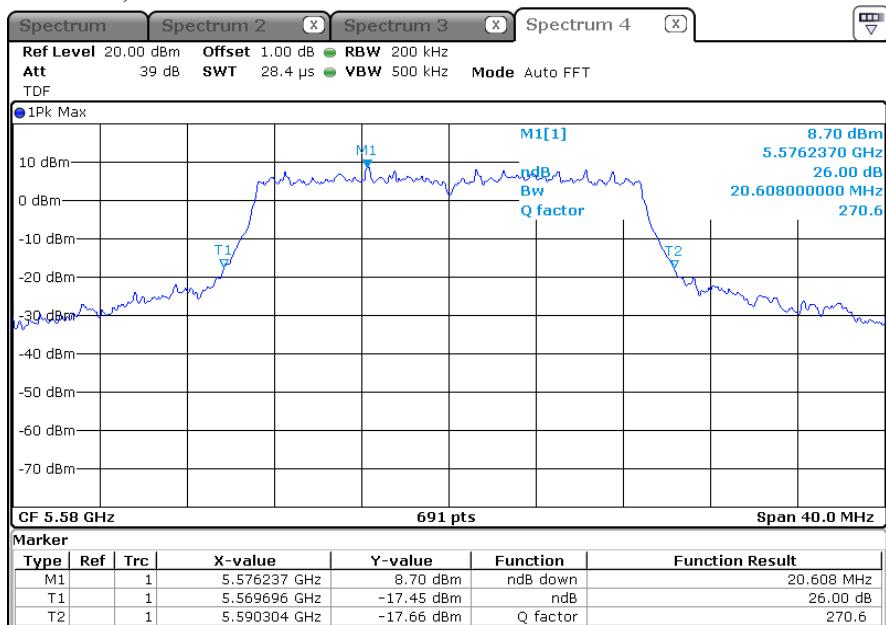
ANT 1(26 dB Bandwidth)



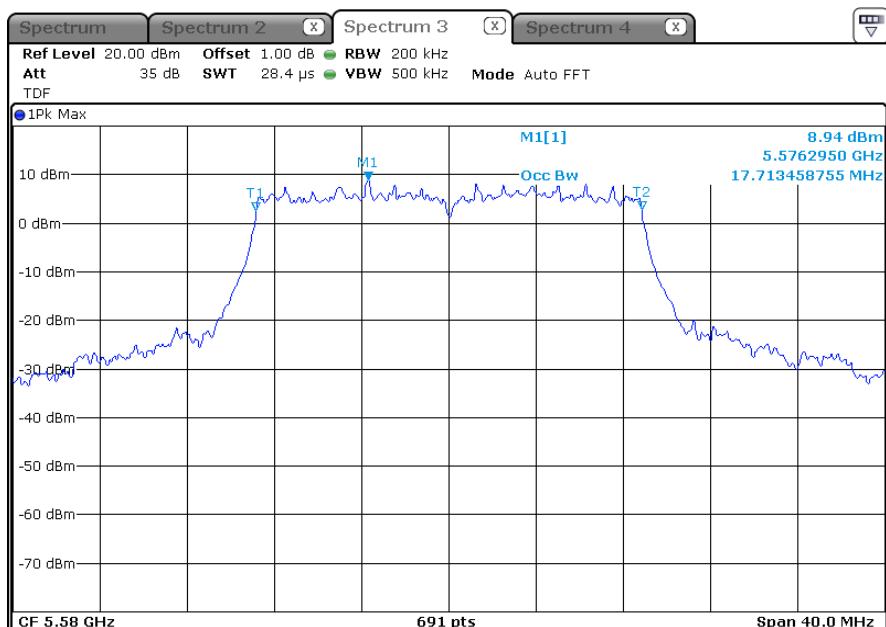
ANT 1(OBW)



ANT 2(26 dB Bandwidth)

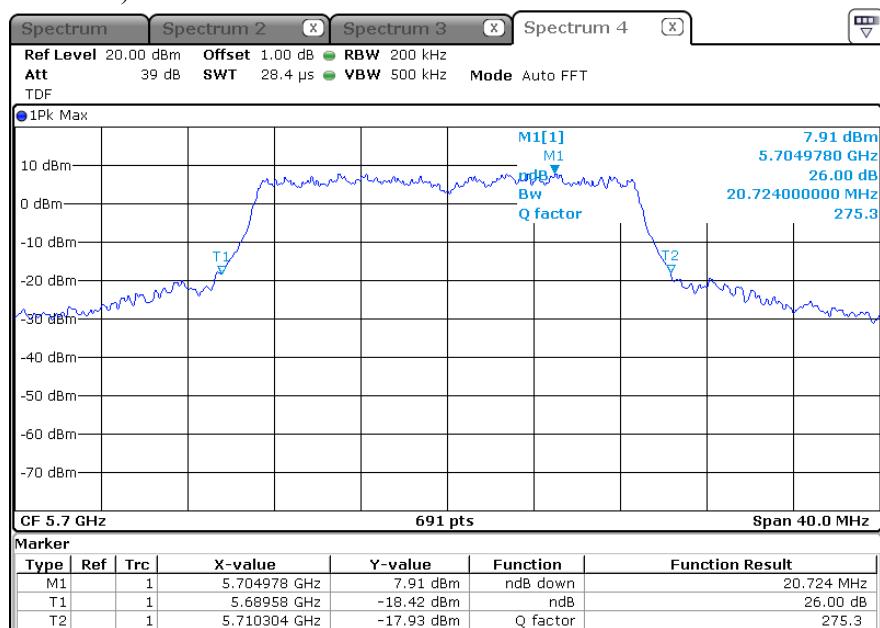


ANT 2(OBW)

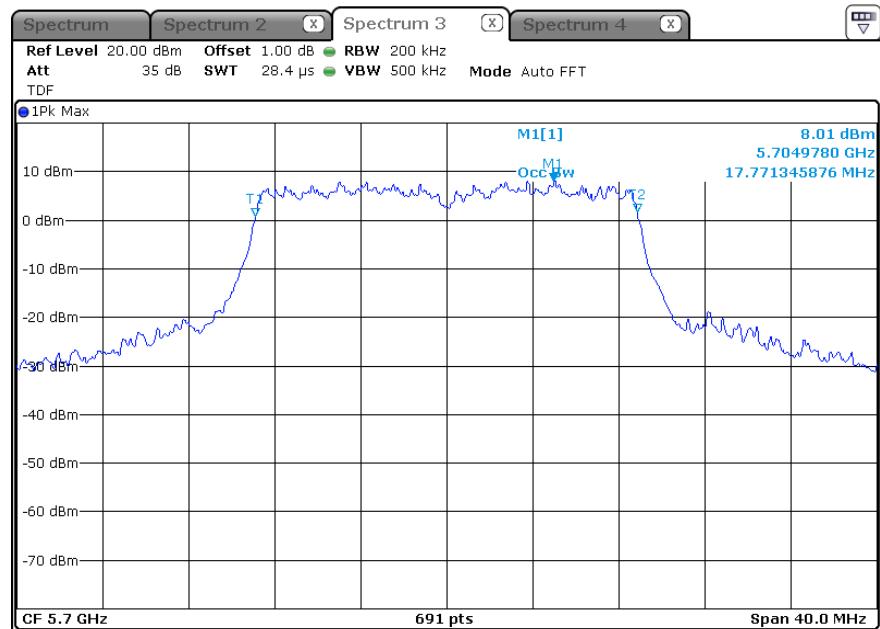


-5 700 MHz

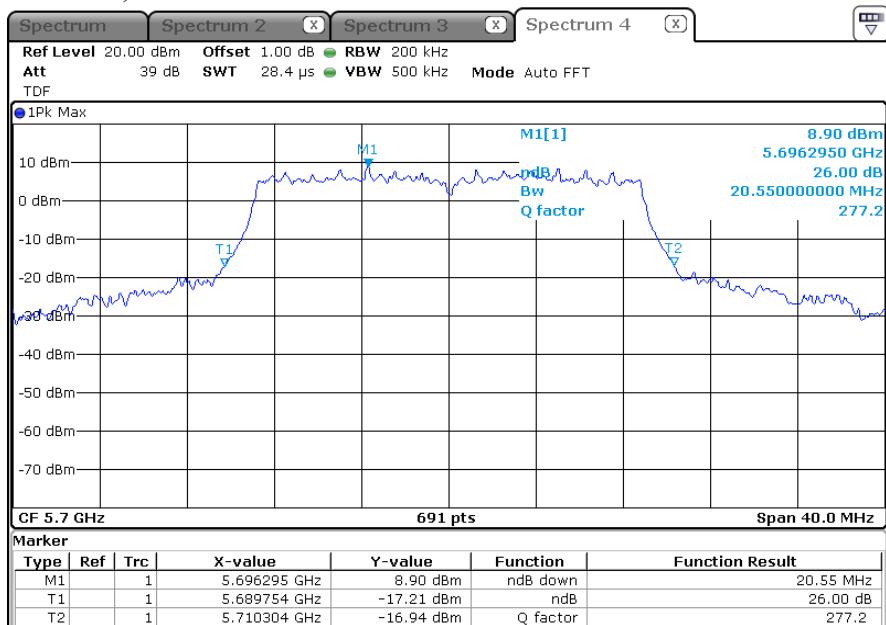
ANT 1(26 dB Bandwidth)



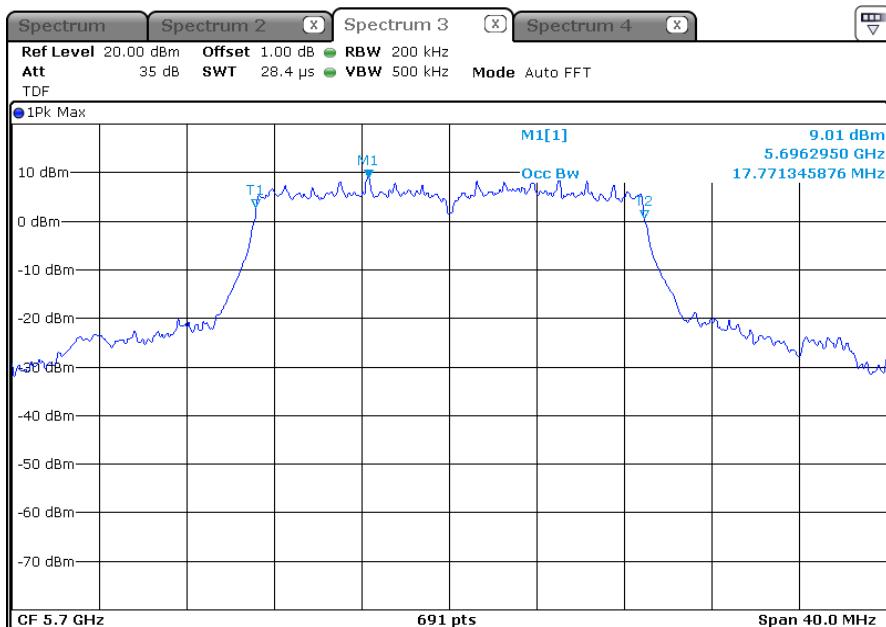
ANT 1(OBW)



ANT 2(26 dB Bandwidth)



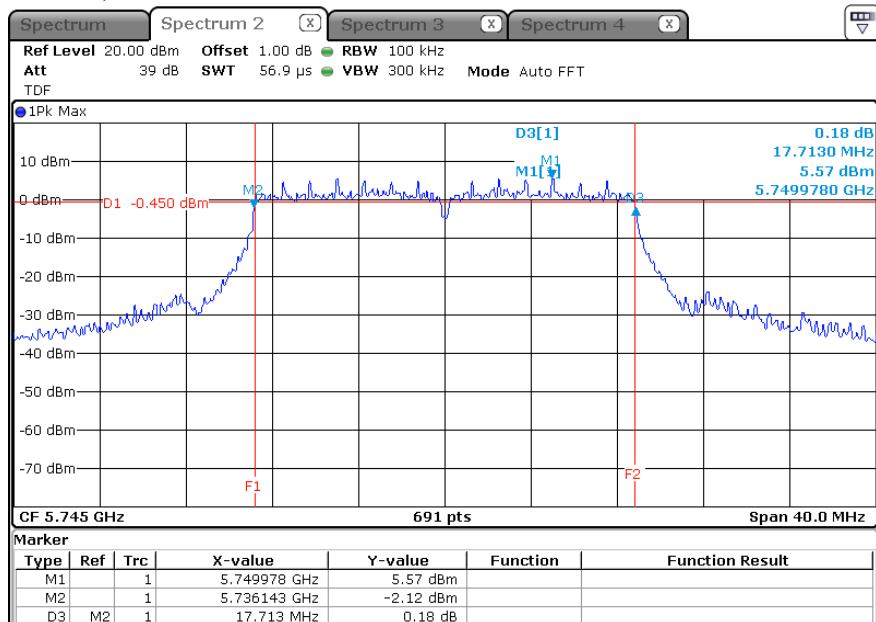
ANT 2(OBW)



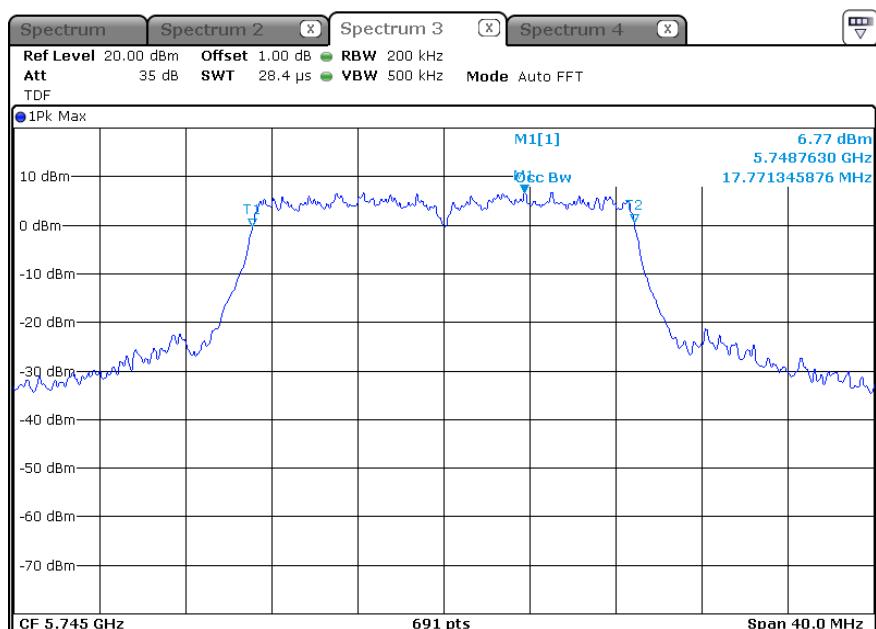
* 802.11n HT20_MIMO (ANT 1+2)_5 725 Band (6 dB Bandwidth)

-5 745 MHz

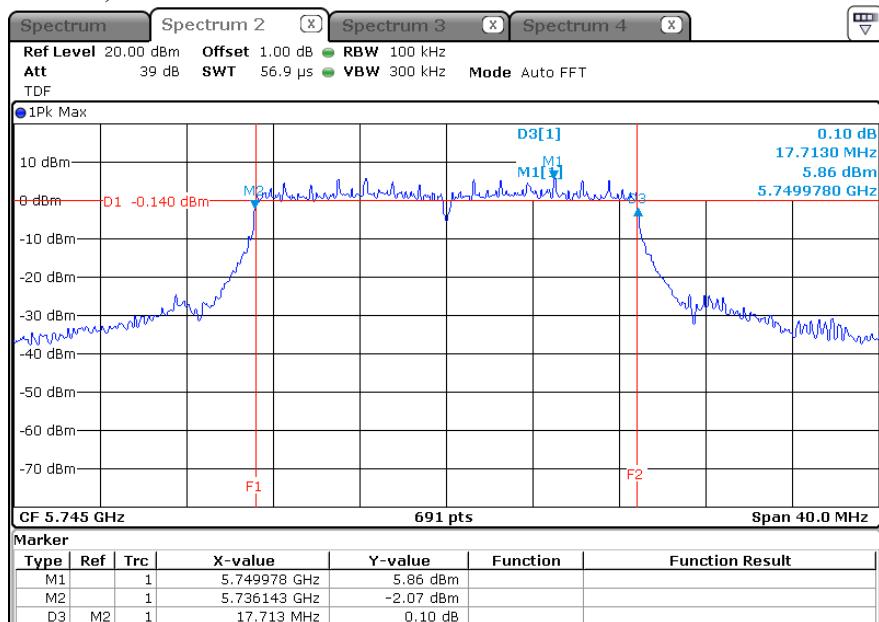
ANT 1(6 dB Bandwidth)



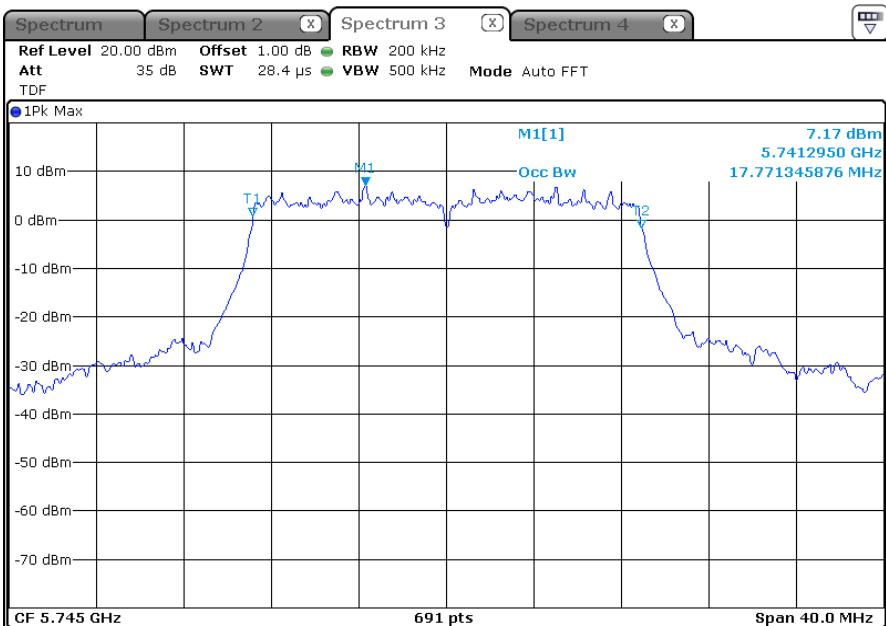
ANT 1(OBW)



ANT 2(6 dB Bandwidth)

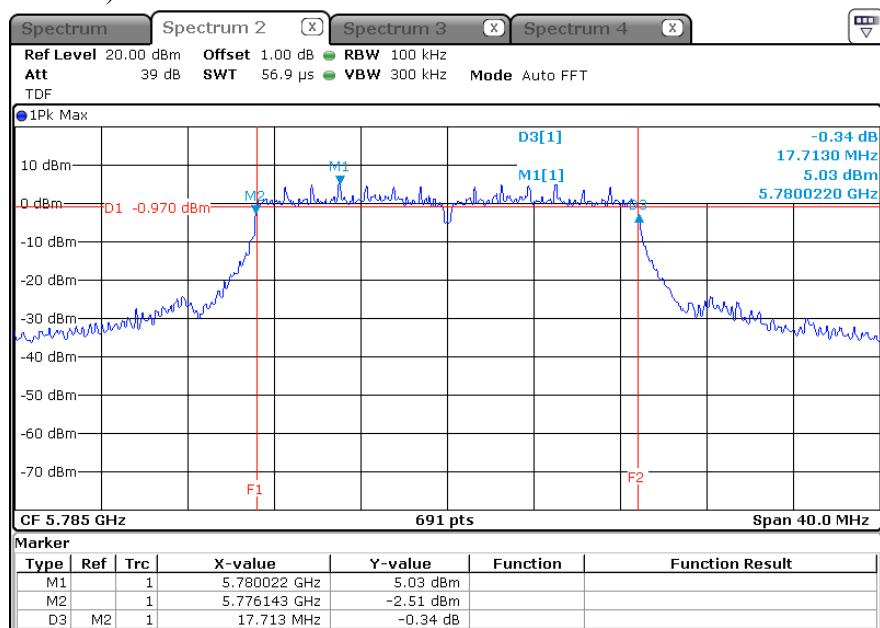


ANT 2(OBW)

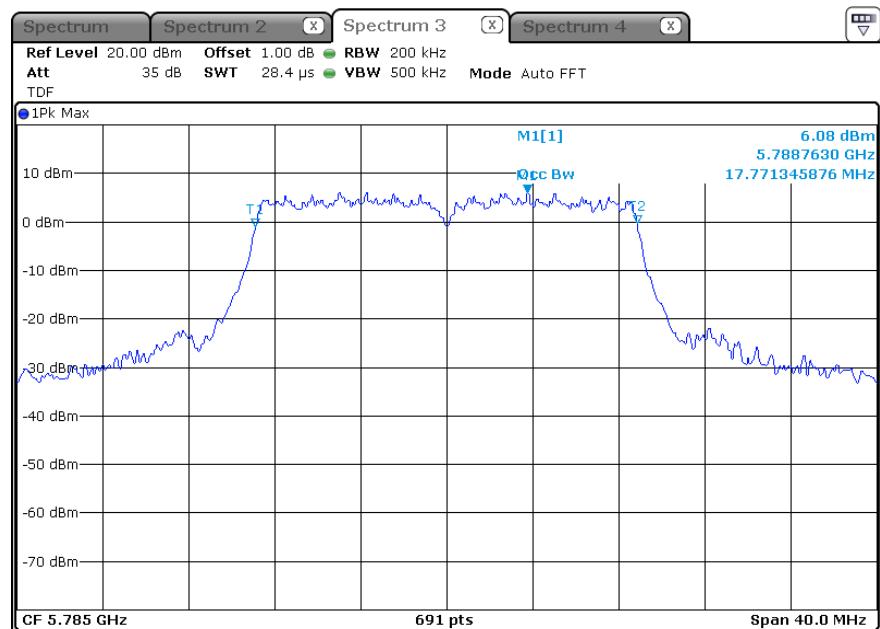


-5 785 MHz

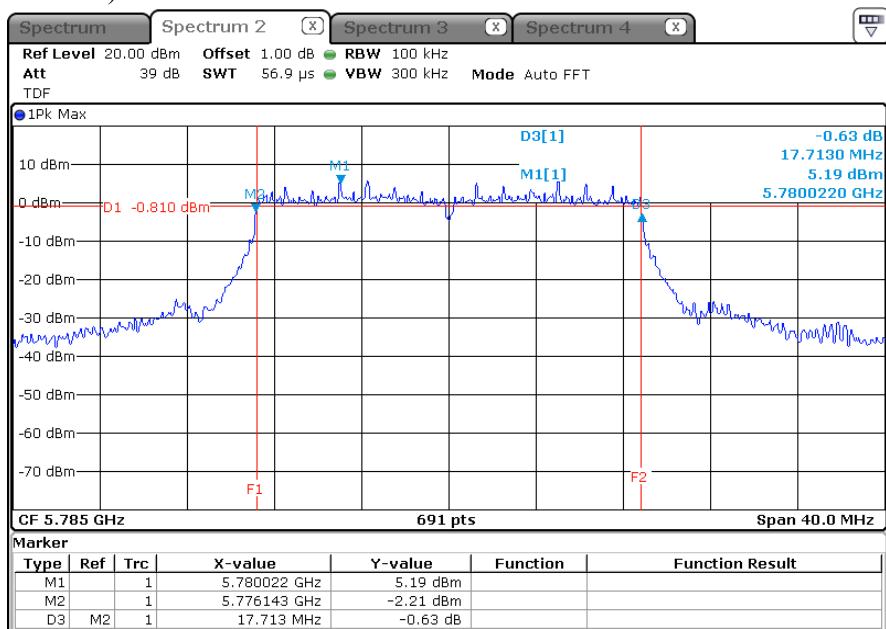
ANT 1(6 dB Bandwidth)



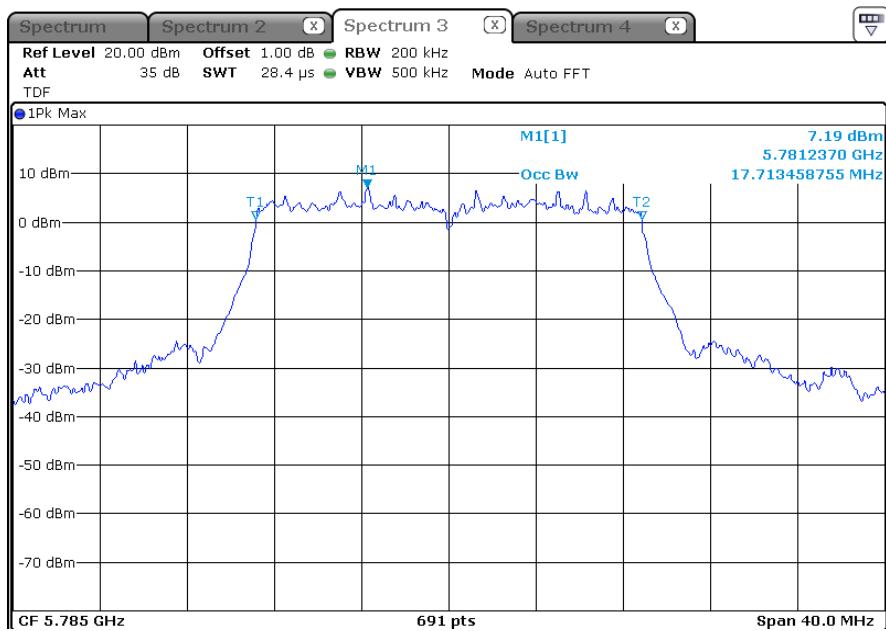
ANT 1(OBW)



ANT 2(6 dB Bandwidth)

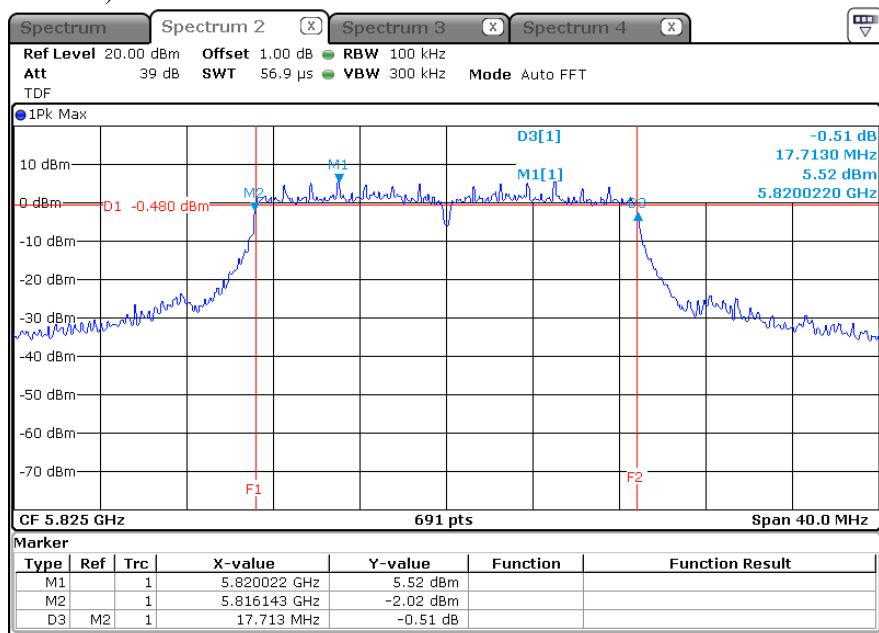


ANT 2(OBW)

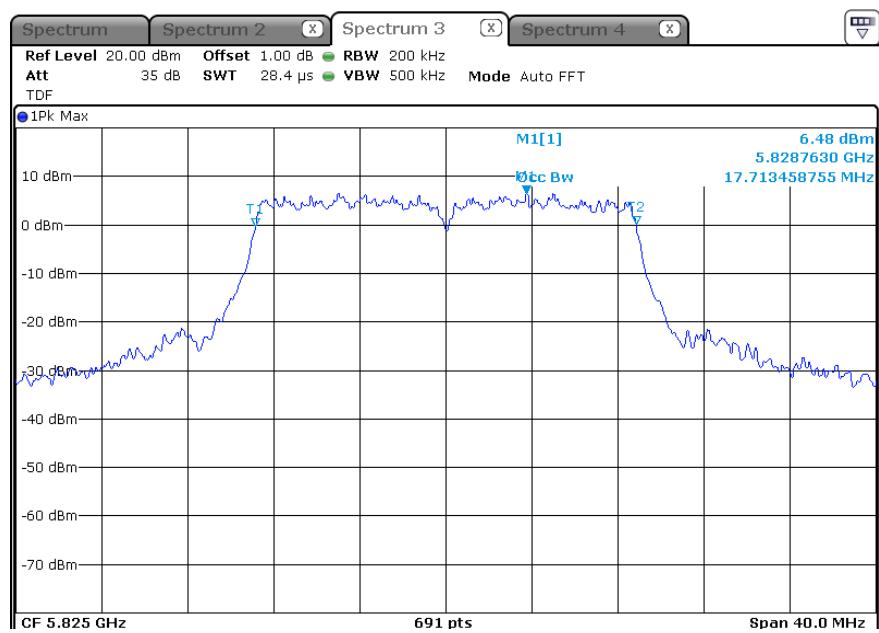


-5 825 MHz

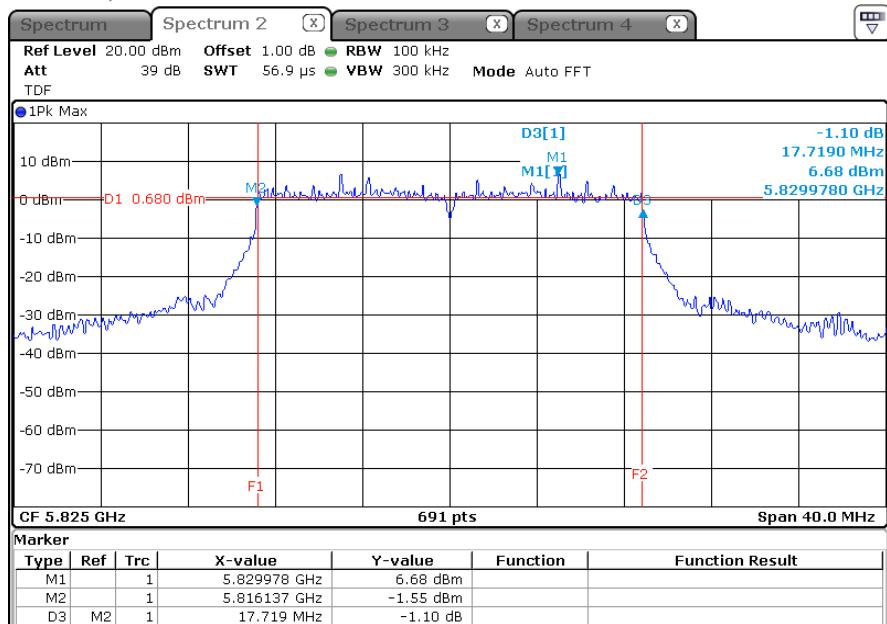
ANT 1(6 dB Bandwidth)



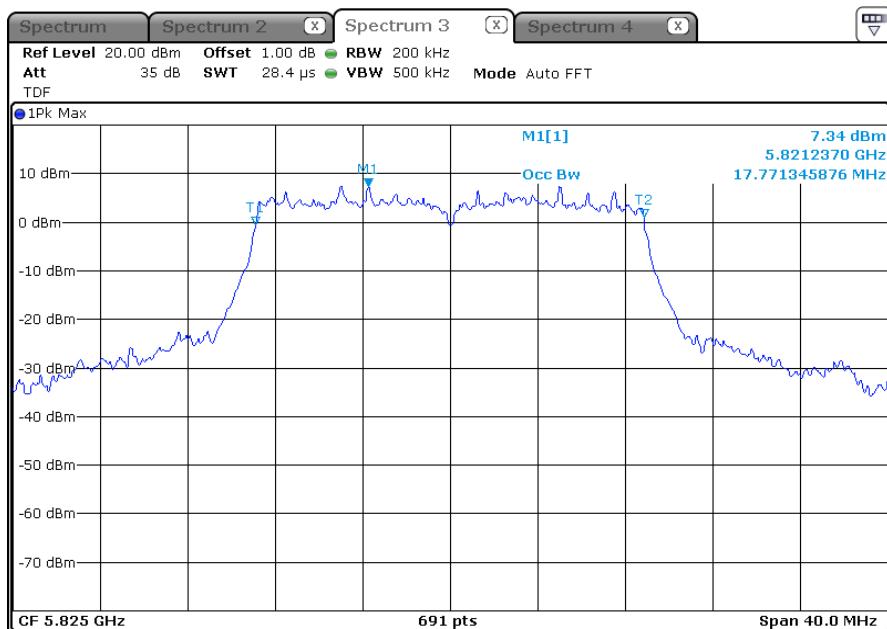
ANT 1(OBW)



ANT 2(6 dB Bandwidth)



ANT 2(OBW)



5.4 Peak Power Spectral Density

5.4.1 Regulation

According to §15.407(a) (1) (iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to §15.407(a) (2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to §15.407(a) (3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

5.4.2 Measurement Procedure

These test measurement settings are specified in section F of 789033 D02 General UNII Test Procedures New Rules v01.

5.4.2.1 Maximum power spectral density (PSD)

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power...”. (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
2. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
3. Make the following adjustments to the peak value of the spectrum, if applicable:
 - a) If Method SA-2 or SA-2 Alternative was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum.
 - b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
4. The result is the Maximum PSD over 1 MHz reference bandwidth.
5. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
 - a) Set RBW $\geq 1/T$, where T is defined in section II.B.1.a).
 - c) Set VBW ≥ 3 RBW.
 - d) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10\log(500\text{kHz}/\text{RBW})$ to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
 - e) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10\log(1\text{MHz}/\text{RBW})$ to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
 - f) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since RBW=100 kHz is available on nearly all spectrum analyzers.

5.4.3 Test Result

-Complied

802.11a

5 150 Band

Frequency (MHz)	Reading (dBm)		Duty Cycle (dB)	Total result (dBm)		Limit (dBm)	Margin (dB)	
	Ant 1	Ant 2		Ant 1	Ant 2		Ant 1	Ant 2
5 180	5.84	5.16	0.31	6.15	5.47	11.00	4.85	5.53
5 200	5.90	5.71	0.31	6.21	6.02	11.00	4.79	4.98
5 240	5.83	5.48	0.31	6.14	5.79	11.00	4.86	5.21

5 250 Band

Frequency (MHz)	Reading (dBm)		Duty Cycle (dB)	Total result (dBm)		Limit (dBm)	Margin (dB)	
	Ant 1	Ant 2		Ant 1	Ant 2		Ant 1	Ant 2
5 260	7.20	7.91	0.31	7.51	8.22	11.00	3.49	2.78
5 280	7.30	7.75	0.31	7.61	8.06	11.00	3.39	2.94
5 320	7.53	7.22	0.31	7.84	7.53	11.00	3.16	3.47

5 470 Band

Frequency (MHz)	Reading (dBm)		Duty Cycle (dB)	Total result (dBm)		Limit (dBm)	Margin (dB)	
	Ant 1	Ant 2		Ant 1	Ant 2		Ant 1	Ant 2
5 500	6.95	7.08	0.31	7.26	7.39	11.00	3.74	3.61
5 580	7.42	7.50	0.31	7.73	7.81	11.00	3.27	3.19
5 700	6.80	7.86	0.31	7.11	8.17	11.00	3.89	2.83

5 725 Band

Frequency (MHz)	Reading (dBm)		Duty Cycle (dB)	Total result (dBm)		Limit (dBm)	Margin (dB)	
	Ant 1	Ant 2		Ant 1	Ant 2		Ant 1	Ant 2
5 745	-0.65	-1.59	0.31	-0.34	-1.28	30.00	30.34	31.28
5 785	-0.83	-1.34	0.31	-0.52	-1.03	30.00	30.52	31.03
5 825	-1.70	-0.26	0.31	-1.39	0.05	30.00	31.39	29.95

802.11an HT20

5 150 Band

Frequency (MHz)	Reading (dBm)		Duty Cycle (dB)	Total result (dBm)		Limit (dBm)	Margin (dB)	
	Ant 1	Ant 2		Ant 1	Ant 2		Ant 1	Ant 2
5 180	6.09	5.67	0.34	6.43	6.01	11.00	4.57	4.99
5 200	5.58	5.58	0.34	5.92	5.92	11.00	5.08	5.08
5 240	5.38	5.93	0.34	5.72	6.27	11.00	5.28	4.73

5 250 Band

Frequency (MHz)	Reading (dBm)		Duty Cycle (dB)	Total result (dBm)		Limit (dBm)	Margin (dB)	
	Ant 1	Ant 2		Ant 1	Ant 2		Ant 1	Ant 2
5 260	7.64	6.82	0.34	7.98	7.16	11.00	3.02	3.84
5 280	7.01	7.45	0.34	7.35	7.79	11.00	3.65	3.21
5 320	6.68	7.02	0.34	7.02	7.36	11.00	3.98	3.64

5 470 Band

Frequency (MHz)	Reading (dBm)		Duty Cycle (dB)	Total result (dBm)		Limit (dBm)	Margin (dB)	
	Ant 1	Ant 2		Ant 1	Ant 2		Ant 1	Ant 2
5 500	6.92	6.69	0.34	7.26	7.03	11.00	3.74	3.97
5 580	7.15	7.32	0.34	7.49	7.66	11.00	3.51	3.34
5 700	6.83	7.32	0.34	7.17	7.66	11.00	3.83	3.34

5 725 Band

Frequency (MHz)	Reading (dBm)		Duty Cycle (dB)	Total result (dBm)		Limit (dBm)	Margin (dB)	
	Ant 1	Ant 2		Ant 1	Ant 2		Ant 1	Ant 2
5 745	-0.85	-0.17	0.34	-0.51	0.17	30.00	30.51	29.83
5 785	-1.65	-1.17	0.34	-1.31	-0.83	30.00	31.31	30.83
5 825	-1.94	-1.14	0.34	-1.60	-0.80	30.00	31.60	30.80

802.11an HT20_MIMO (ANT 1+2)

5 150 Band

Frequency (MHz)	Reading (dBm)		Duty Cycle (dB)	Total result (dBm)	Limit (dBm)	Margin (dB)
	Ant 1	Ant 2				
5 180	5.72	4.29	0.34	8.41	11.00	2.59
5 200	5.13	4.52	0.34	8.19	11.00	2.81
5 240	5.53	4.89	0.34	8.57	11.00	2.43

5 250 Band

Frequency (MHz)	Reading (dBm)		Duty Cycle (dB)	Total result (dBm)	Limit (dBm)	Margin (dB)
	Ant 1	Ant 2				
5 260	6.77	7.01	0.34	10.24	11.00	0.76
5 280	6.43	7.03	0.34	10.09	11.00	0.91
5 320	6.85	6.59	0.34	10.07	11.00	0.93

5 470 Band

Frequency (MHz)	Reading (dBm)		Duty Cycle (dB)	Total result (dBm)	Limit (dBm)	Margin (dB)
	Ant 1	Ant 2				
5 500	6.08	6.72	0.34	9.76	11.00	1.24
5 580	7.16	6.77	0.34	10.32	11.00	0.68
5 700	6.58	7.41	0.34	10.37	11.00	0.63

5 725 Band

Frequency (MHz)	Reading (dBm)		Duty Cycle (dB)	Total result (dBm)	Limit (dBm)	Margin (dB)
	Ant 1	Ant 2				
5 745	-3.04	-2.72	0.34	0.47	30.00	29.53
5 785	-3.12	-3.66	0.34	-0.03	30.00	30.03
5 825	-1.88	-4.04	0.34	0.52	30.00	29.48

-NOTE:

1. Since the directional gain of the Embedded antenna declared by the manufacturer (GANT =2.8 dB i), does not exceed 6.0 dB i, Therefore it doesn't need to reduce the Power Spectral Density.
2. Total PSD calculation = $10\log(10^{(Ant1 PSD / 10)} + 10^{(Ant2 PSD / 10)})$
3. 802.11a: 5 180: Duty cycle = 0.932 1, Duty cycle factor = $10\log(1/duty cycle) = 10\log(0.932 1) = 0.31$ dB.
4. Result = Ant1 Total PSD calculation + C.L + Duty Factor

5.4.4 Test Plot

Figure 2. Plot of the Power Spectral Density

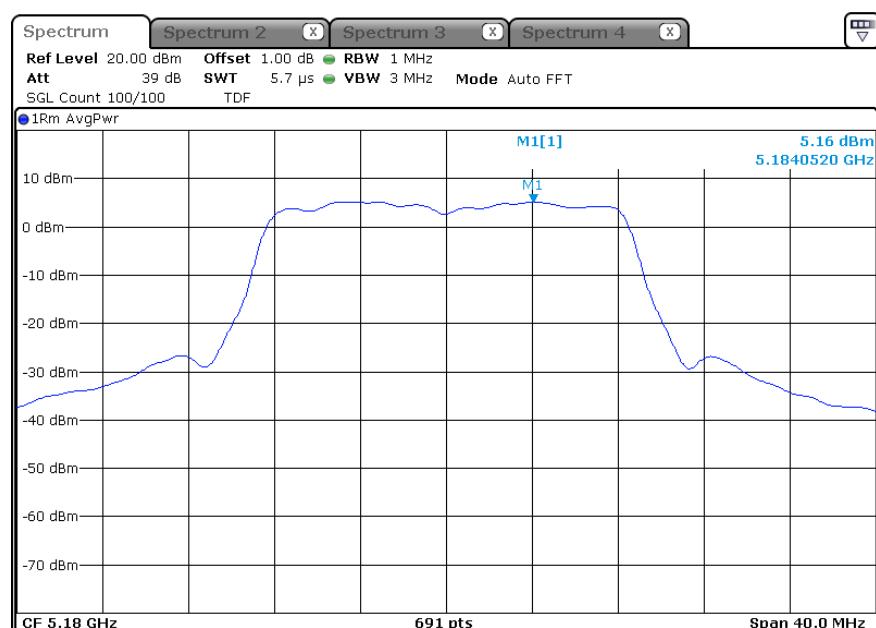
* 802.11a_5 150 Band

-5 180 MHz

ANT 1

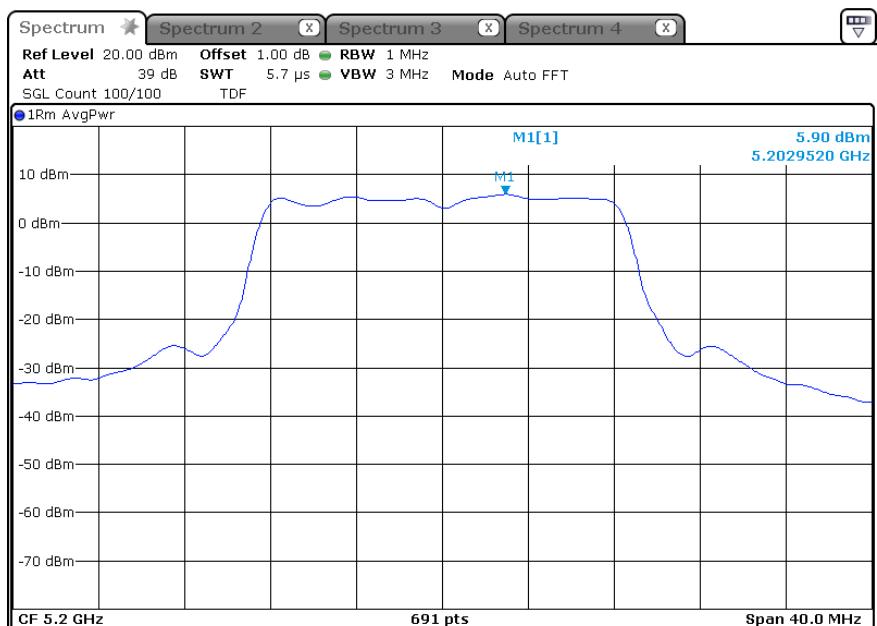


ANT 2

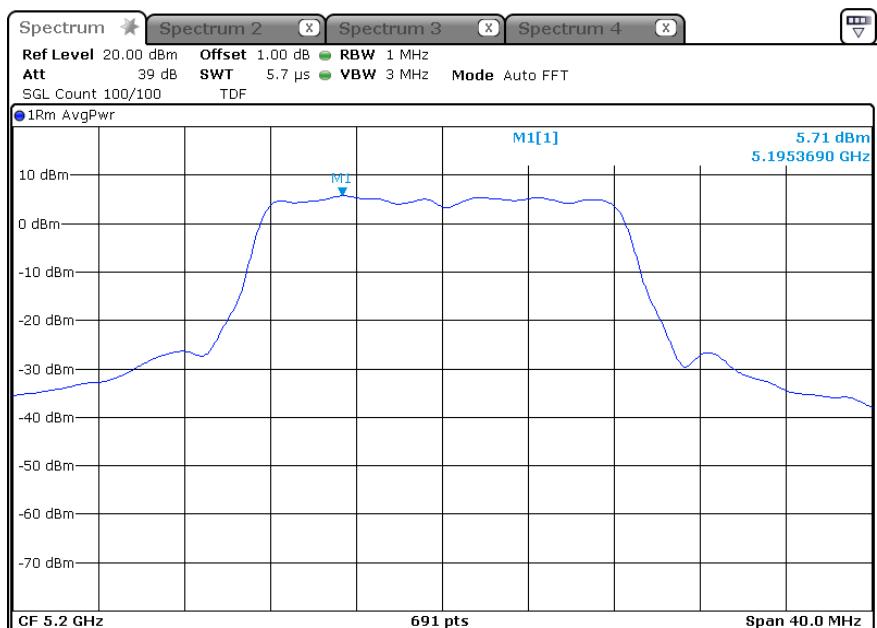


-5 200 MHz

ANT 1

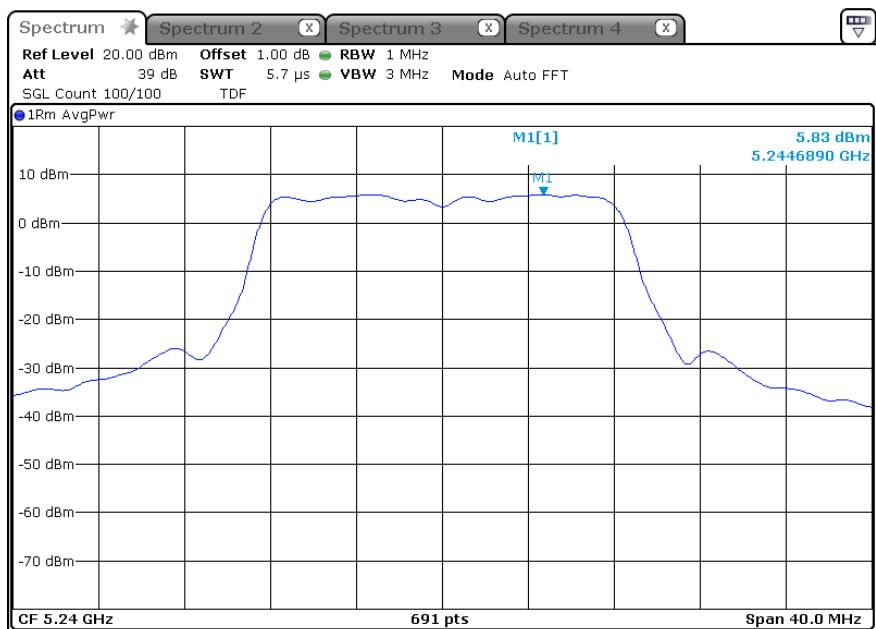


ANT 2



-5 240 MHz

ANT 1



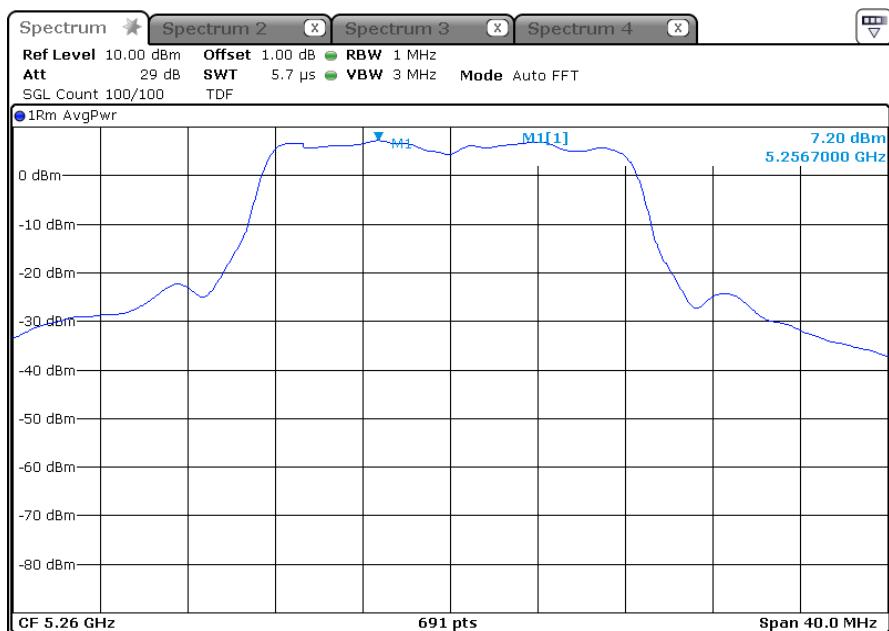
ANT 2



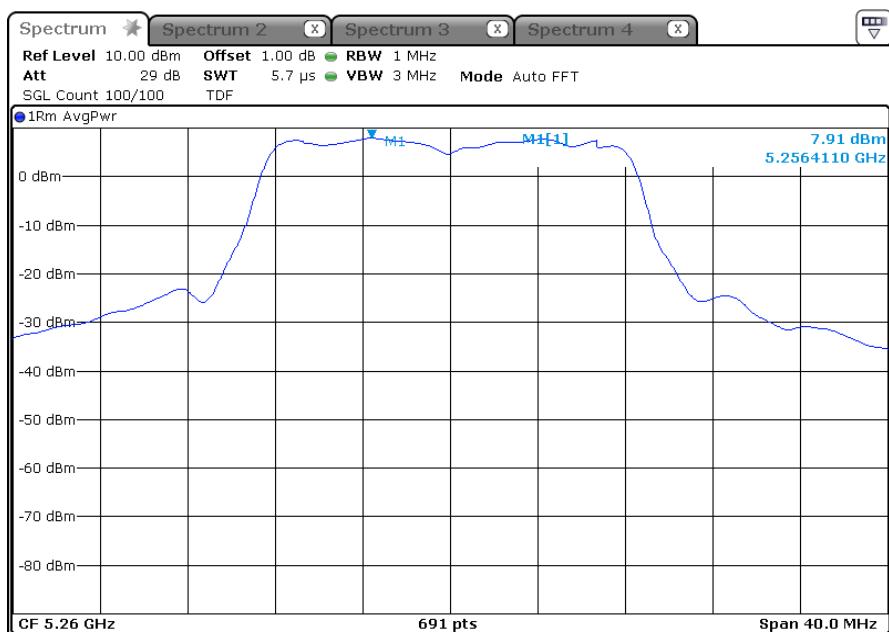
* 802.11a_5 250 Band

-5 260 MHz

ANT 1

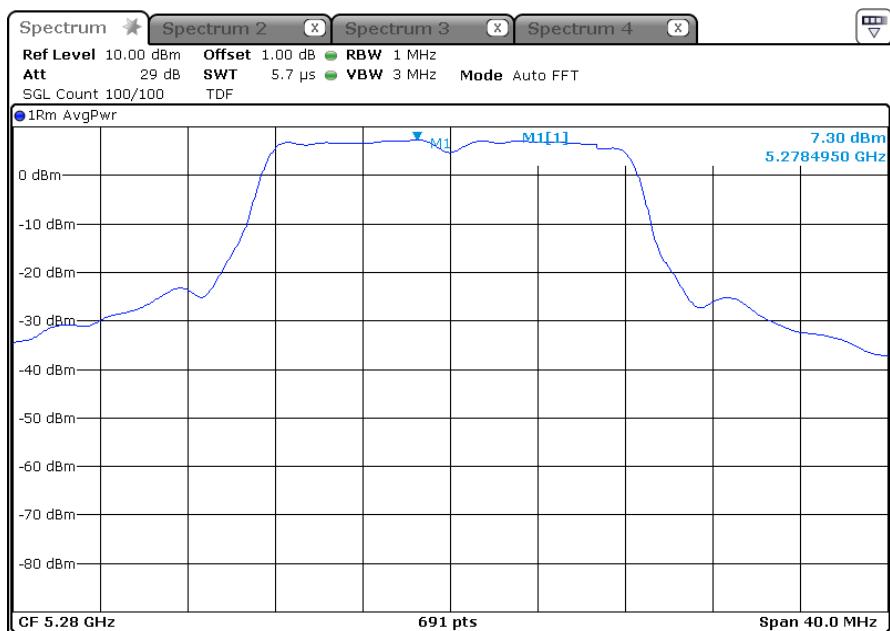


ANT 2

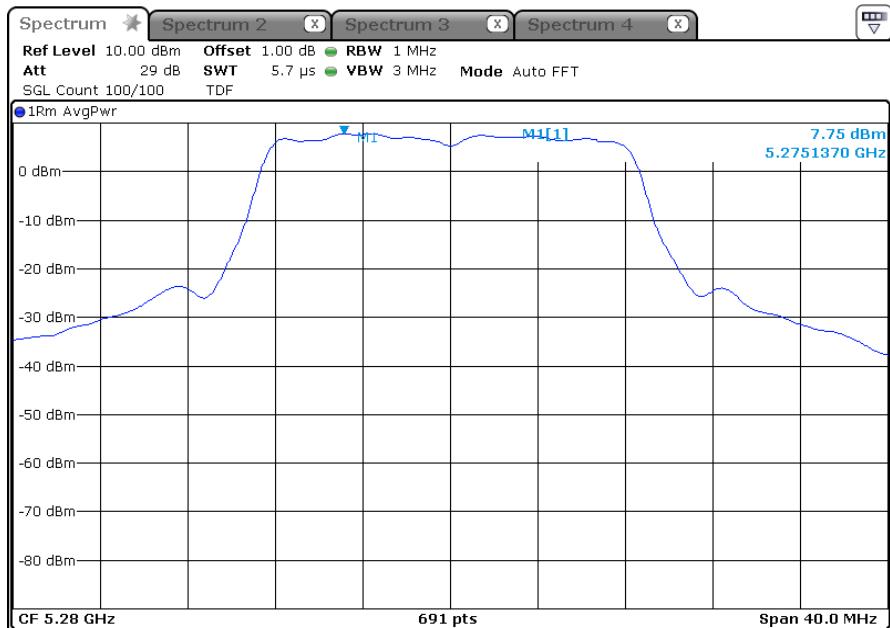


-5 280 MHz

ANT 1

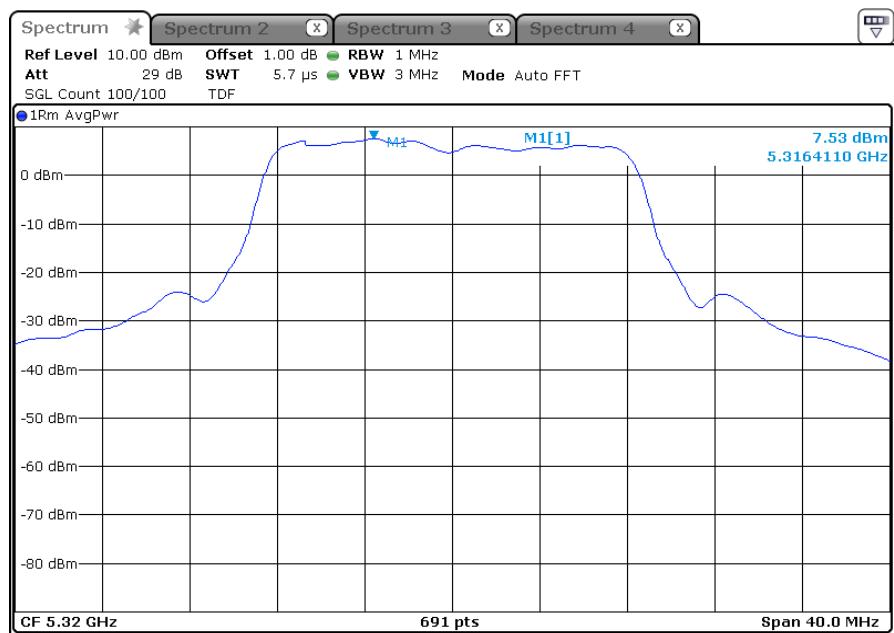


ANT 2



-5 320 MHz

ANT 1



ANT 2



* 802.11a_5 470 Band

-5 500 MHz

ANT 1

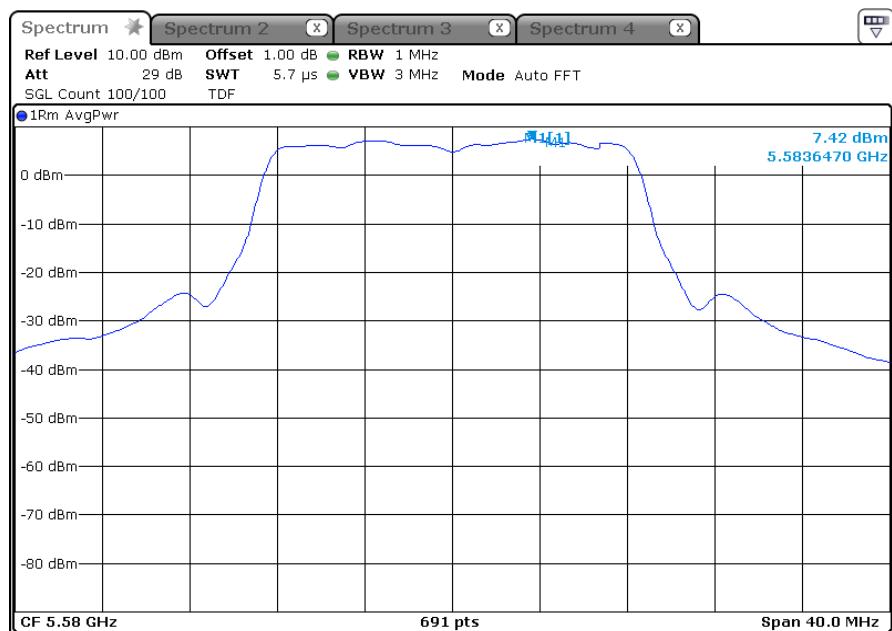


ANT 2

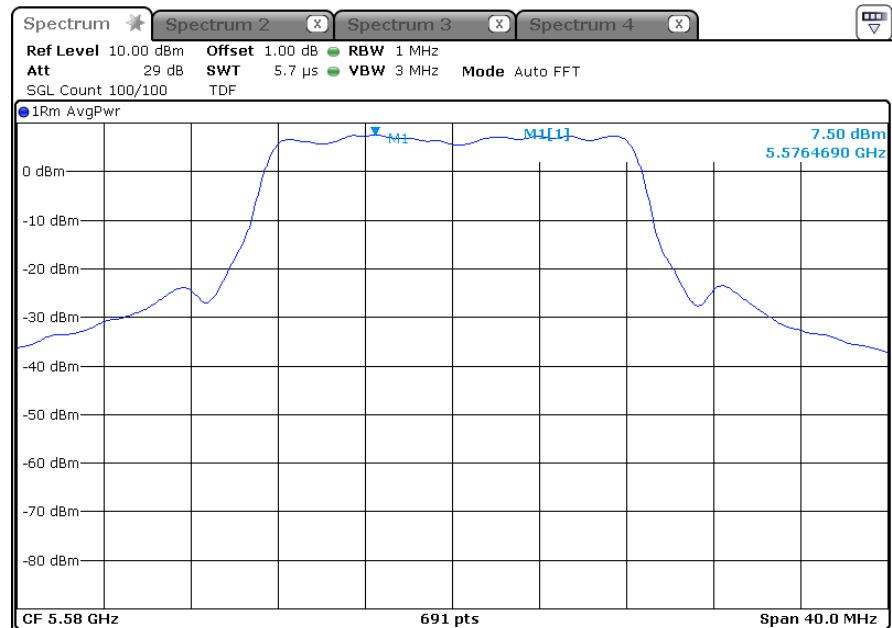


-5 580 MHz

ANT 1

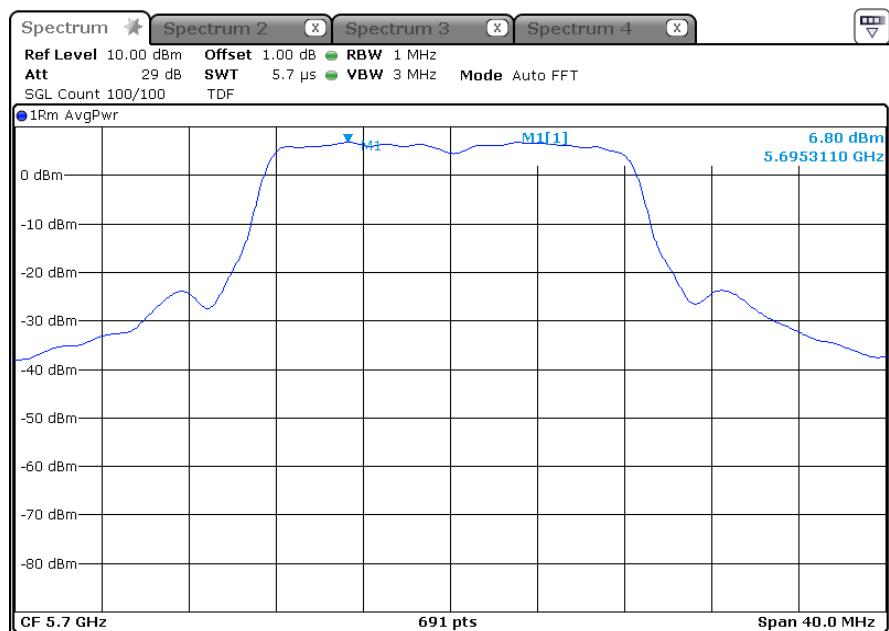


ANT 2

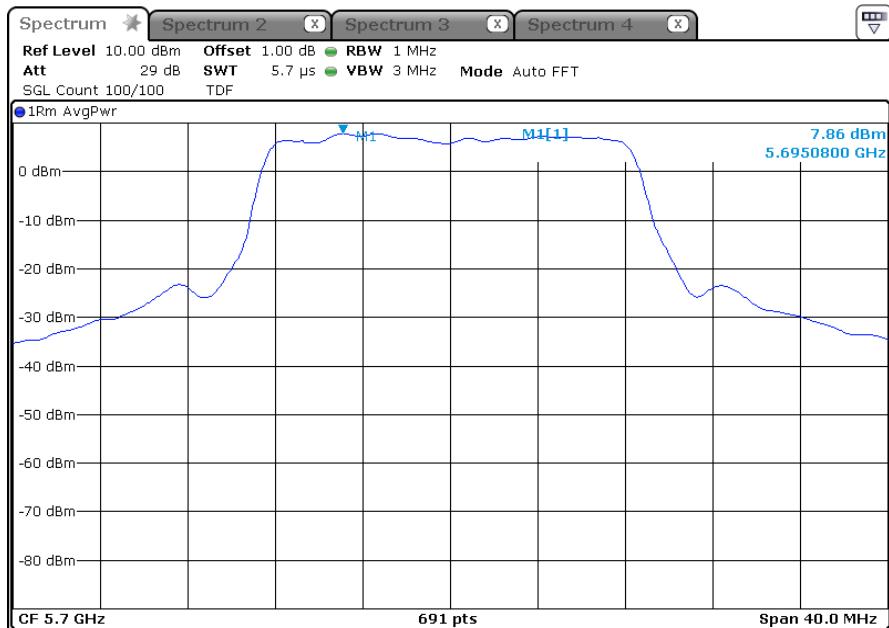


-5 700 MHz

ANT 1



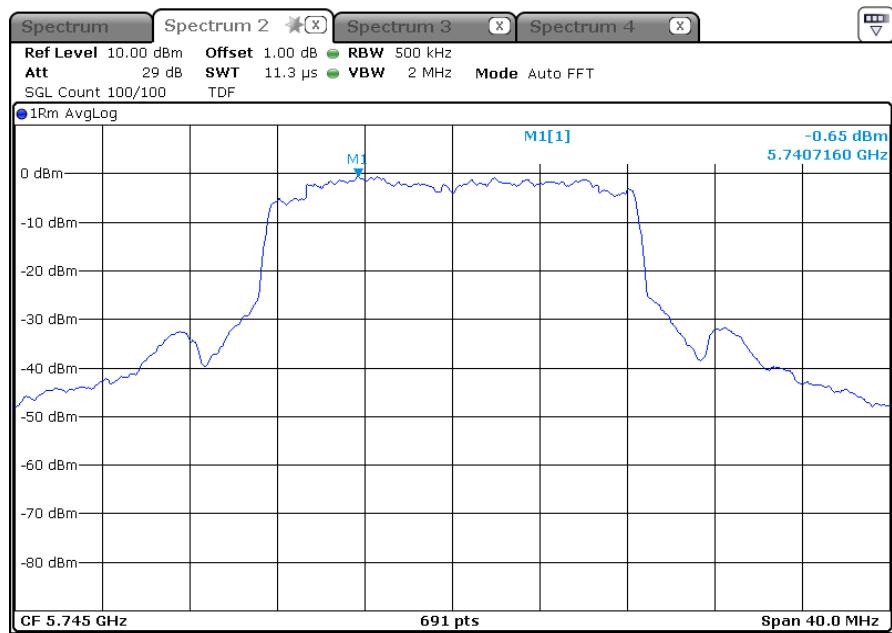
ANT 2



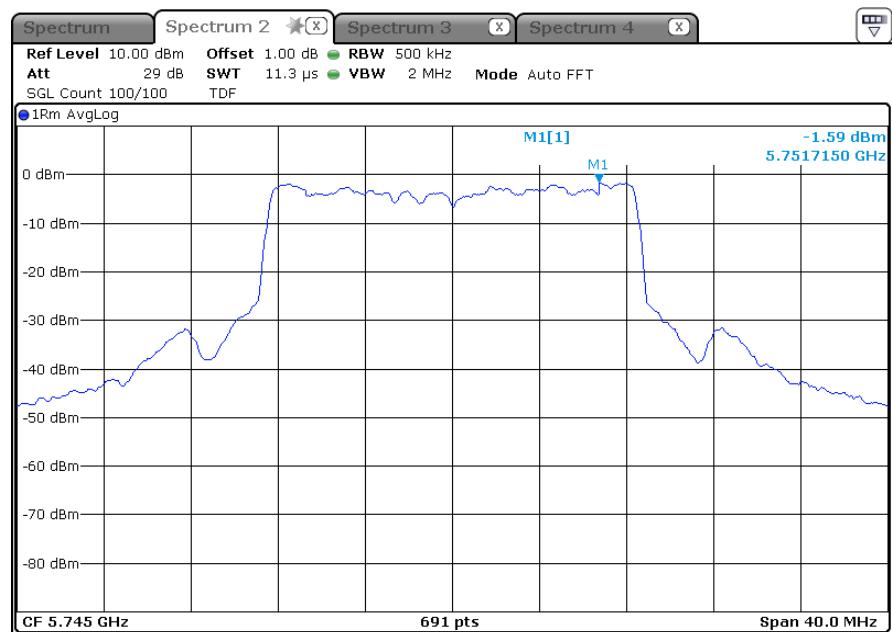
* 802.11a_5 725 Band

-5 745 MHz

ANT 1

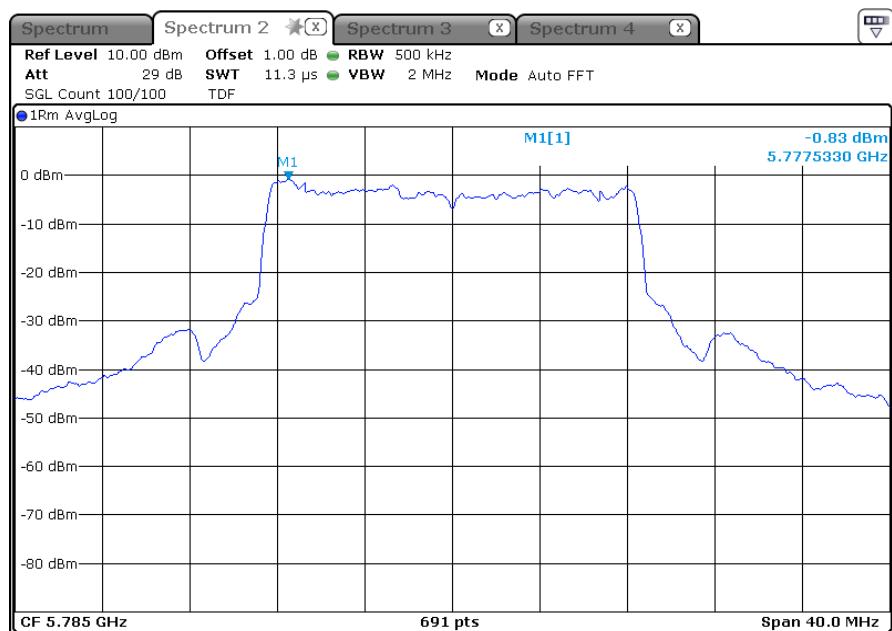


ANT 2

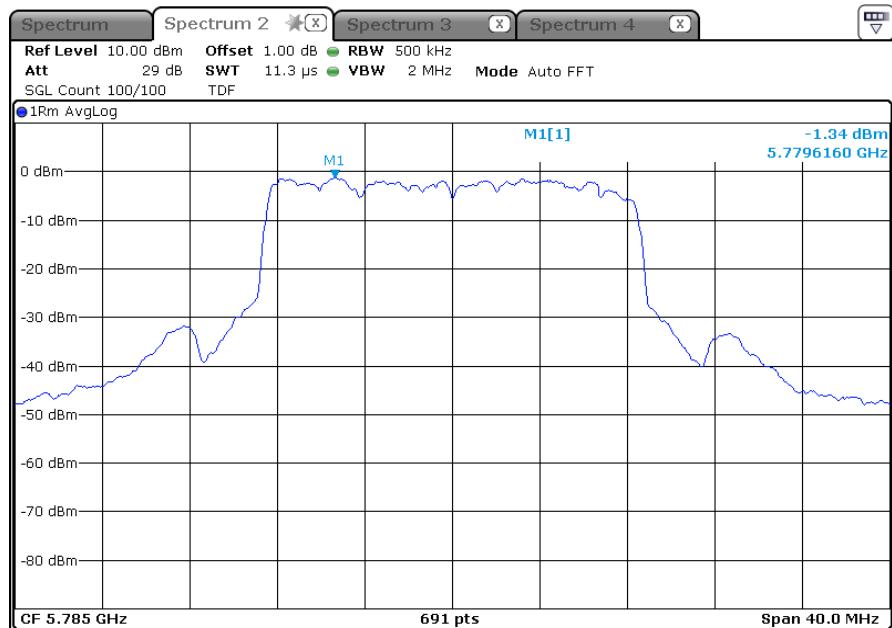


-5 785 MHz

ANT 1

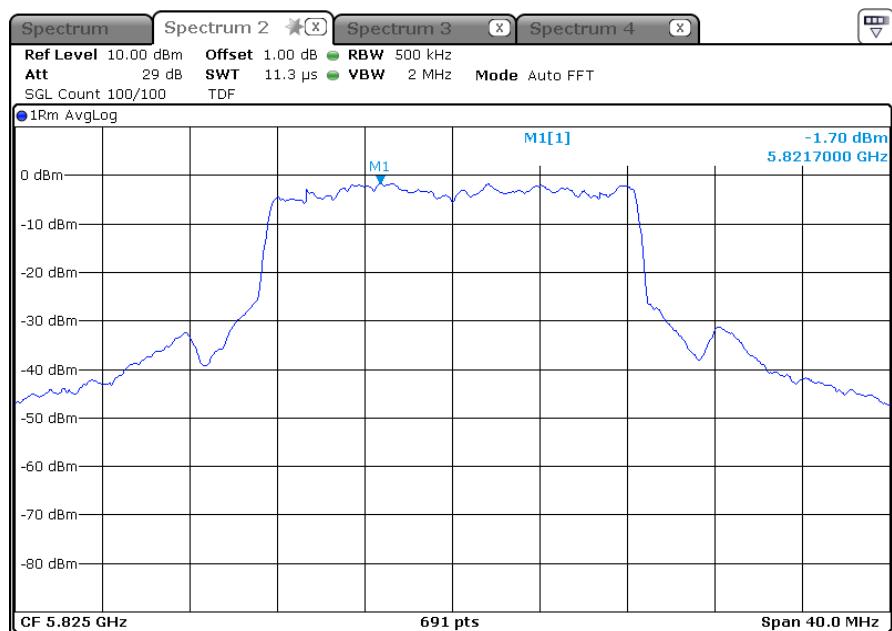


ANT 2

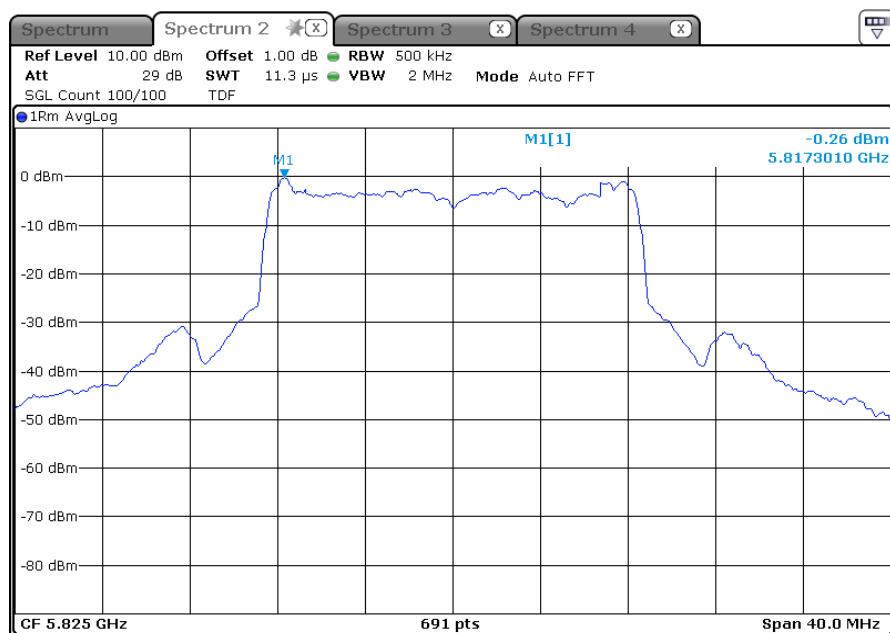


-5 825 MHz

ANT 1



ANT 2



* 802.11n HT20_5 150 Band

-5 180 MHz

ANT 1

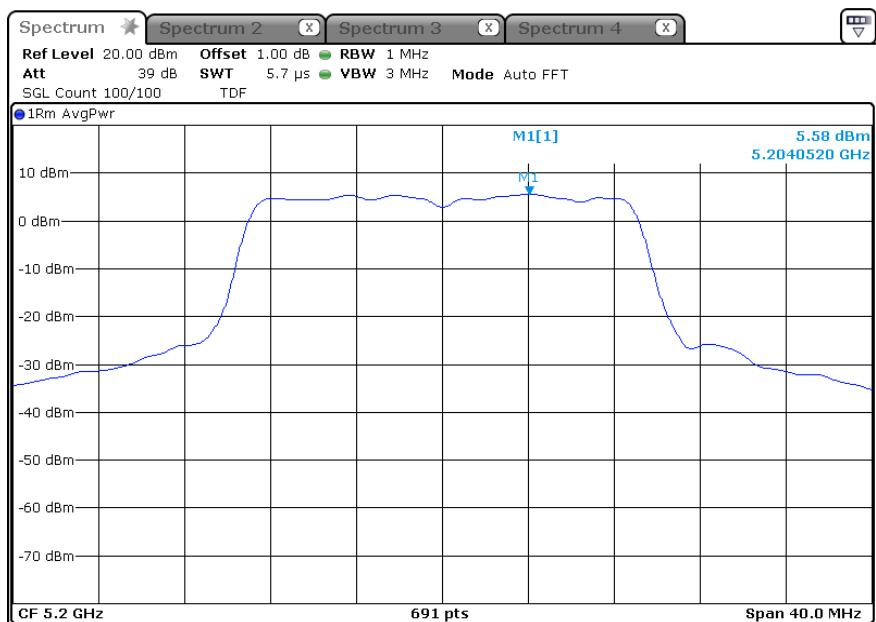


ANT 2



-5 200 MHz

ANT 1

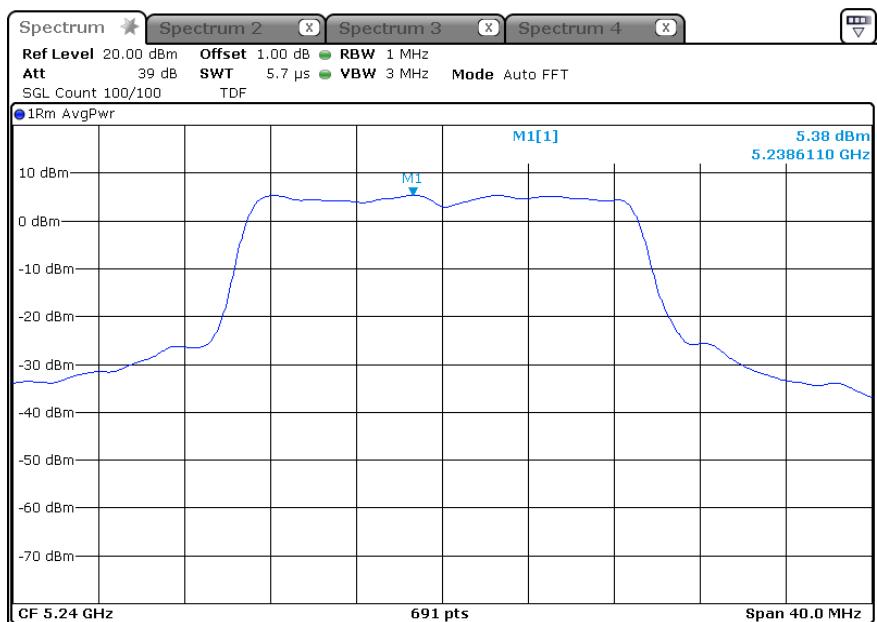


ANT 2

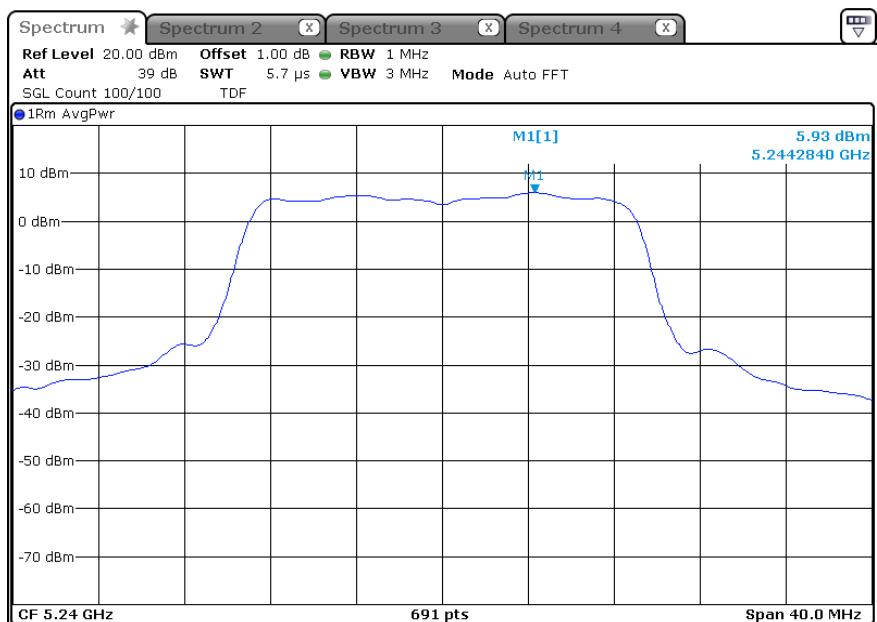


-5 240 MHz

ANT 1



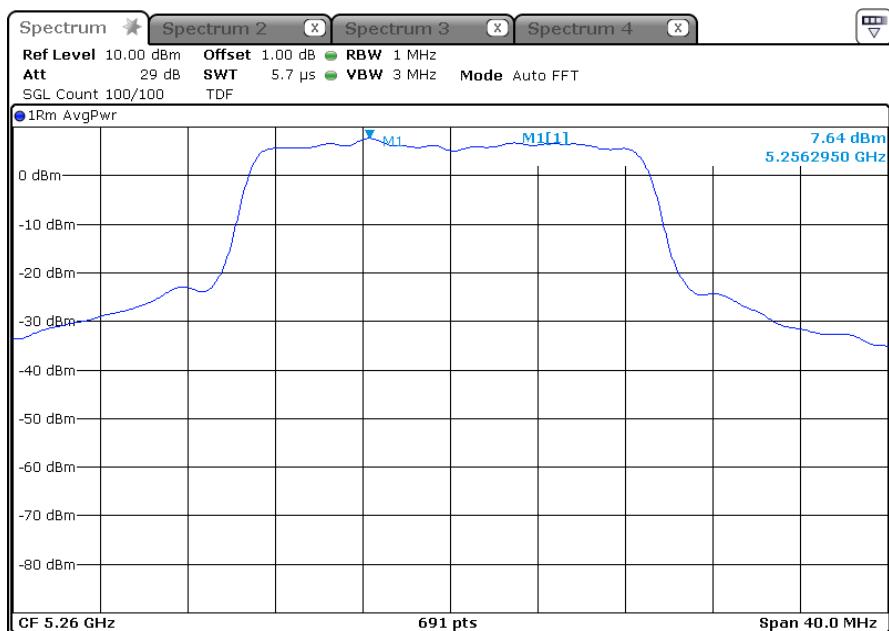
ANT 2



* 802.11an HT20_5 250 Band

-5 260 MHz

ANT 1

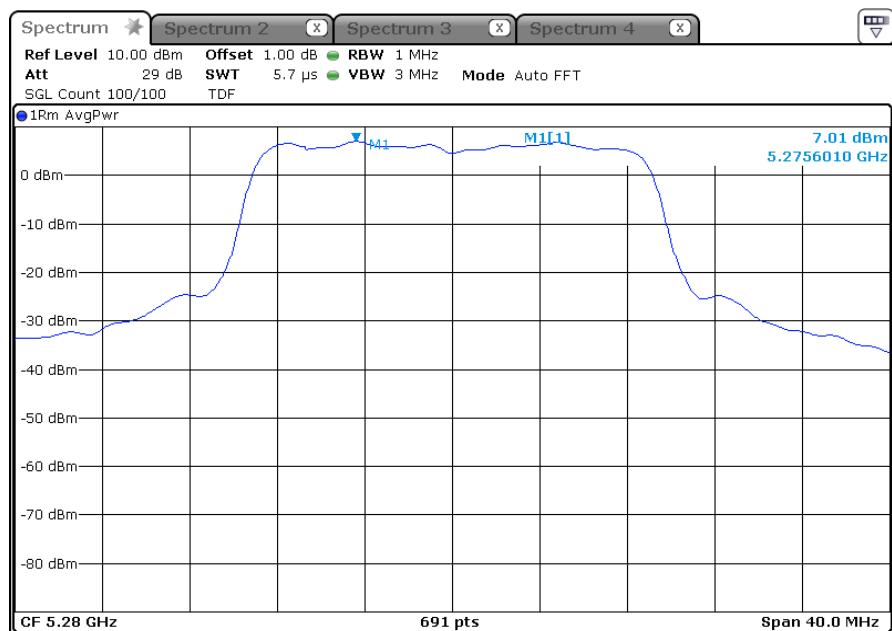


ANT 2

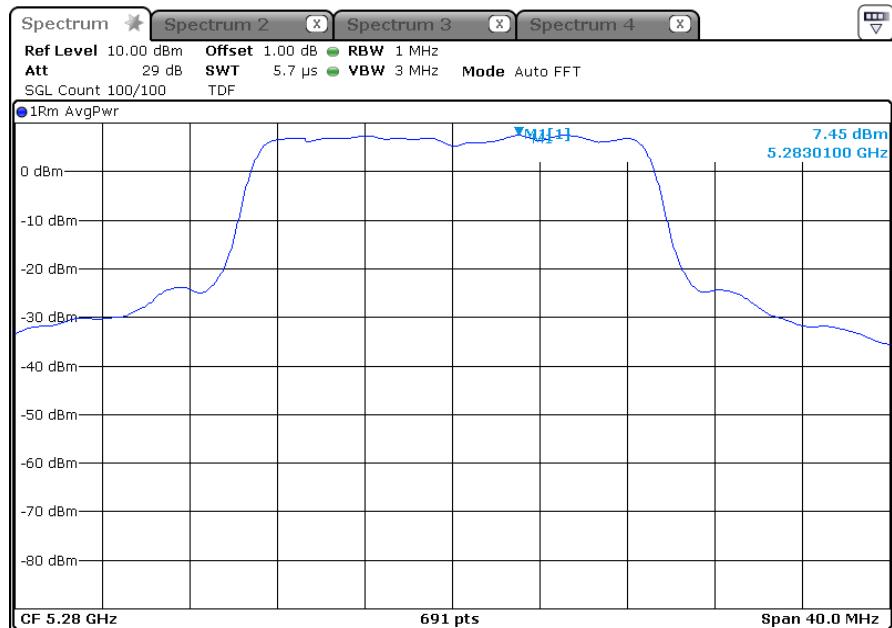


-5 280 MHz

ANT 1



ANT 2

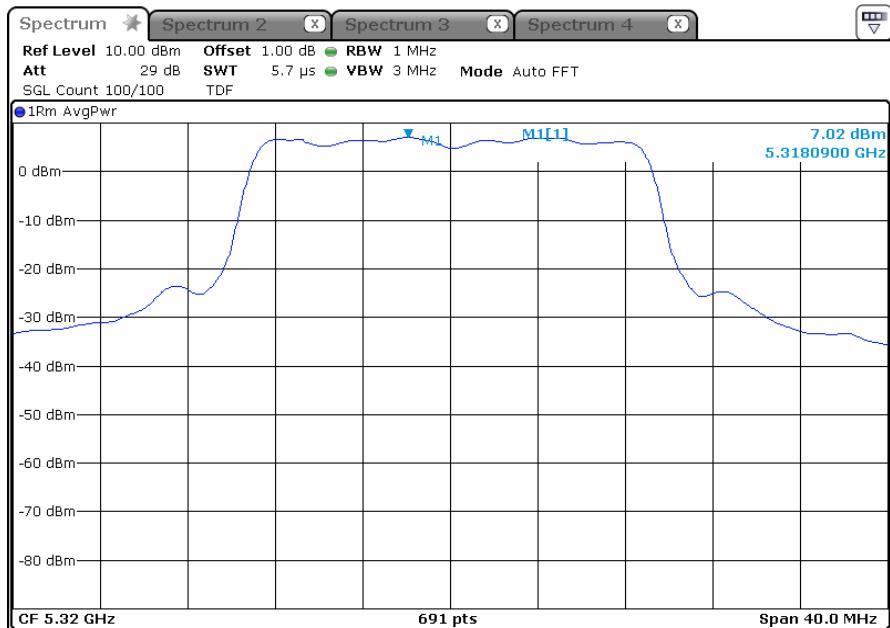


-5 320 MHz

ANT 1



ANT 2



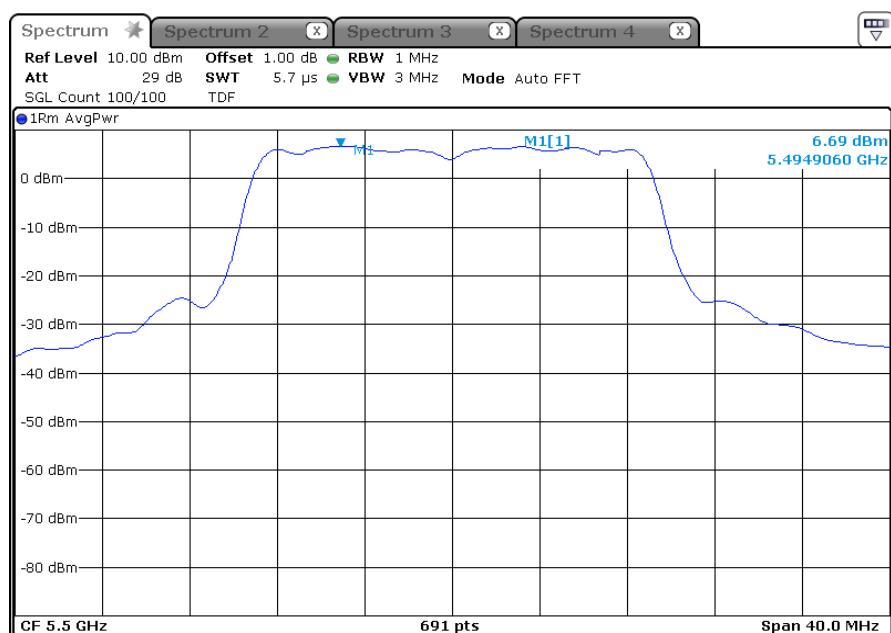
* 802.11n HT20_5 470 Band

-5 500 MHz

ANT 1

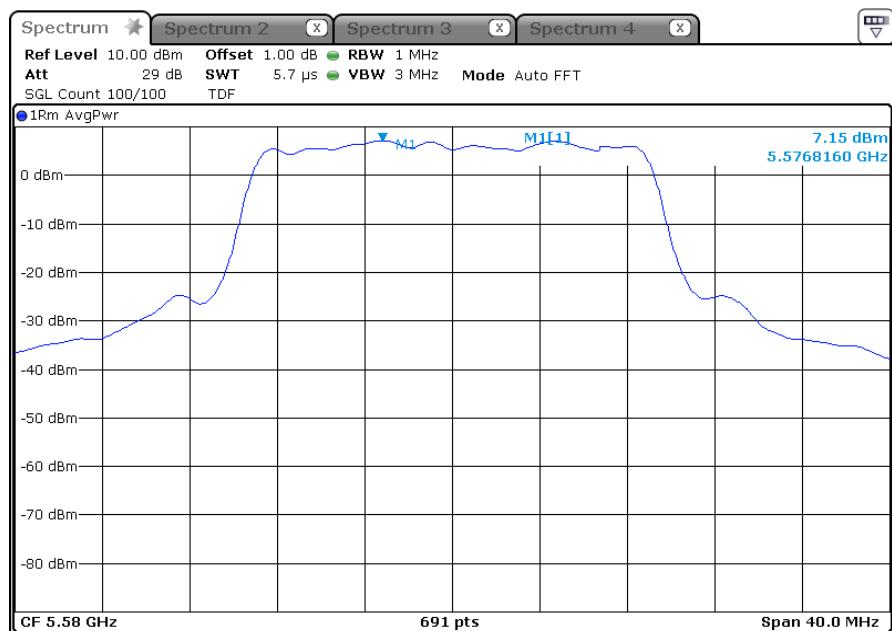


ANT 2

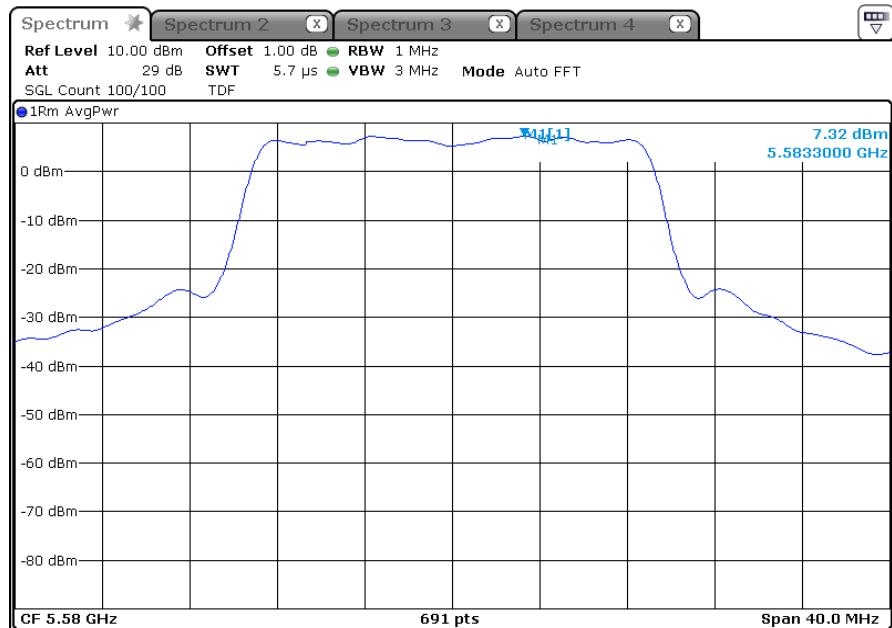


-5 580 MHz

ANT 1

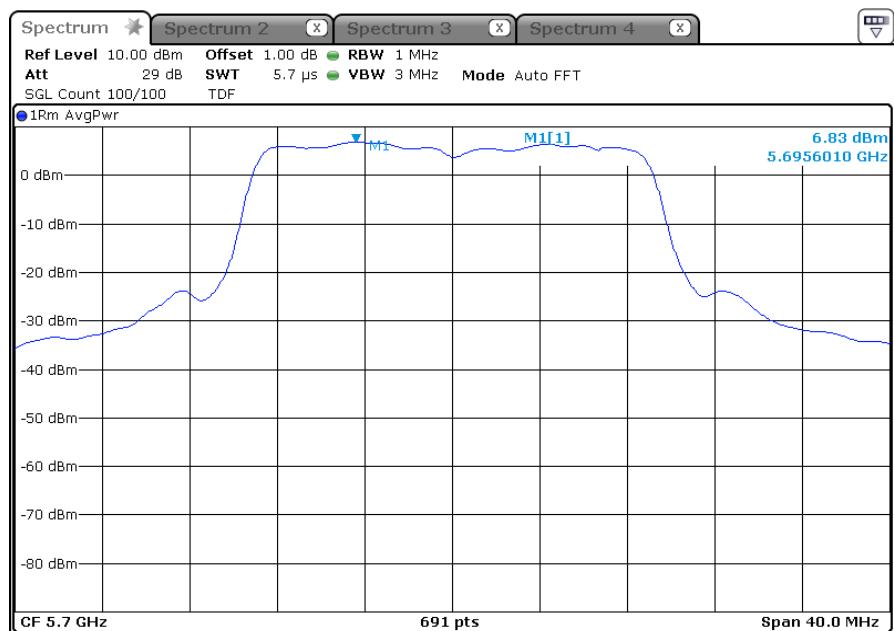


ANT 2



-5 700 MHz

ANT 1



ANT 2



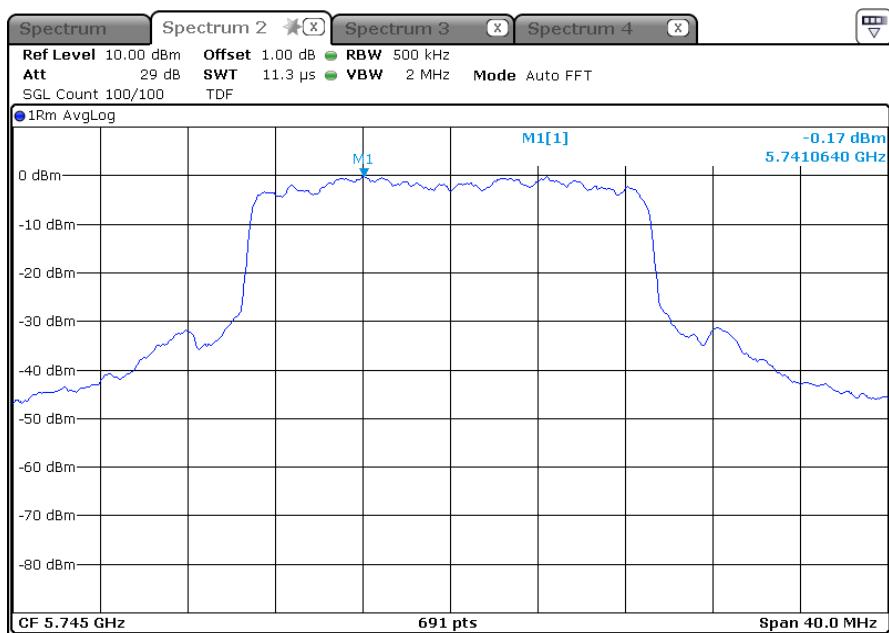
* 802.11n HT20_5 725 Band

-5 745 MHz

ANT 1

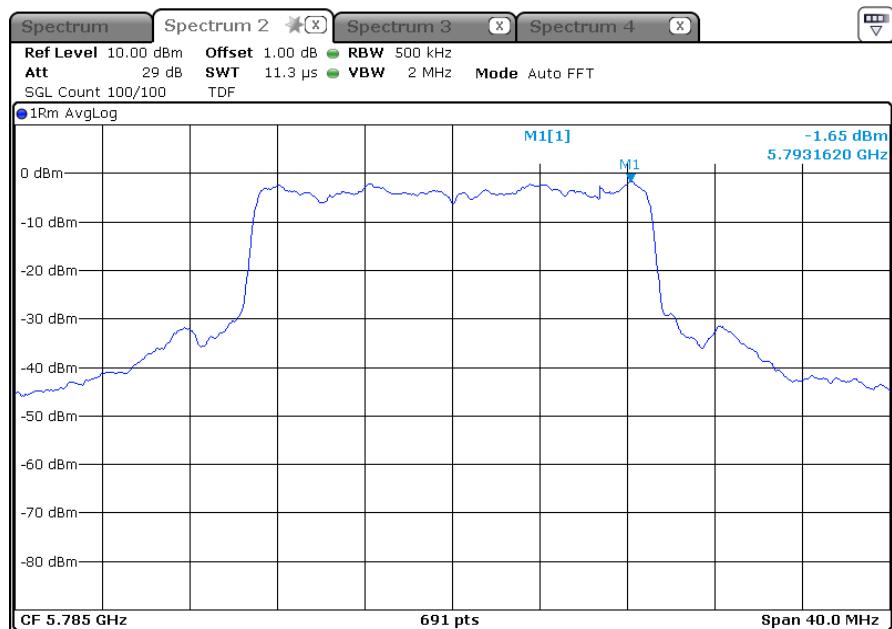


ANT 2

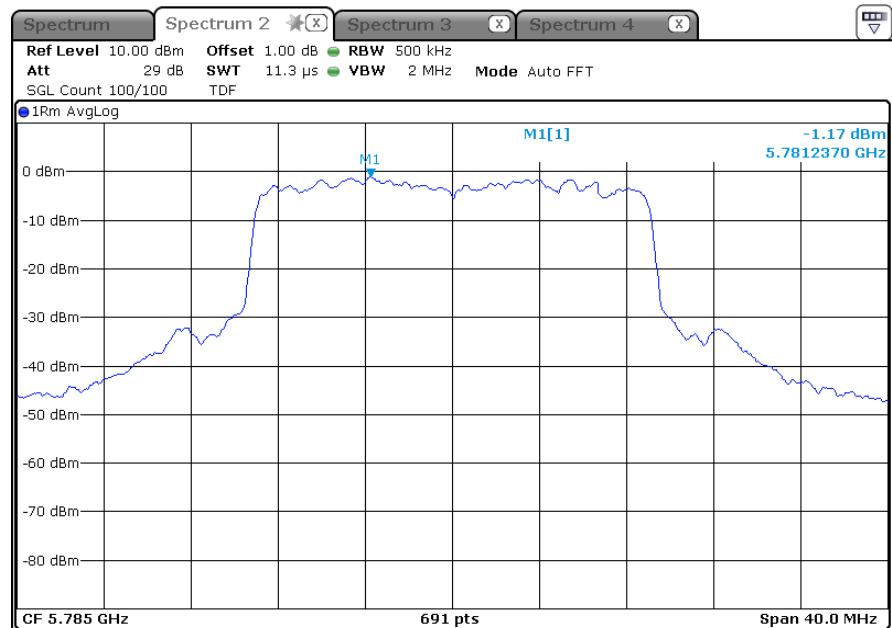


-5 785 MHz

ANT 1

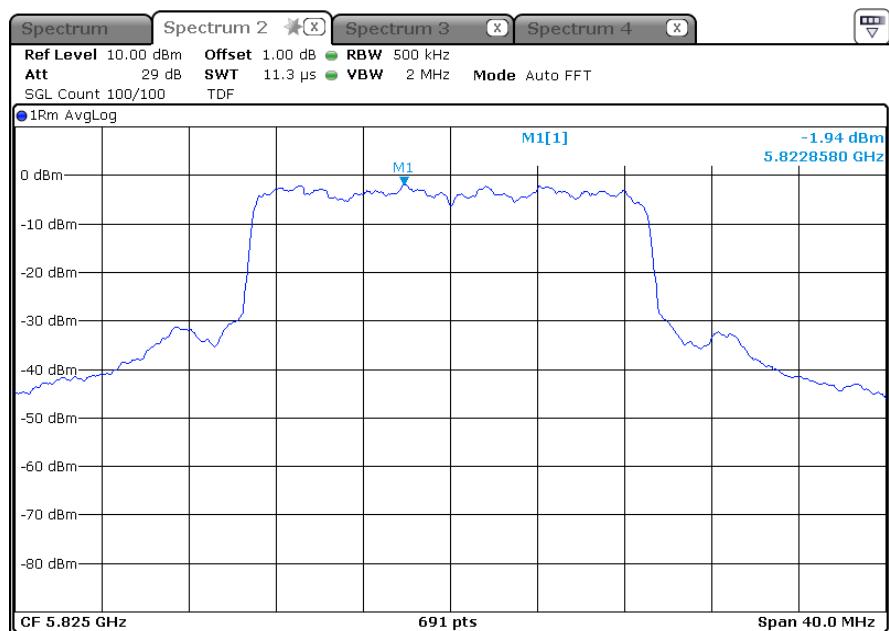


ANT 2

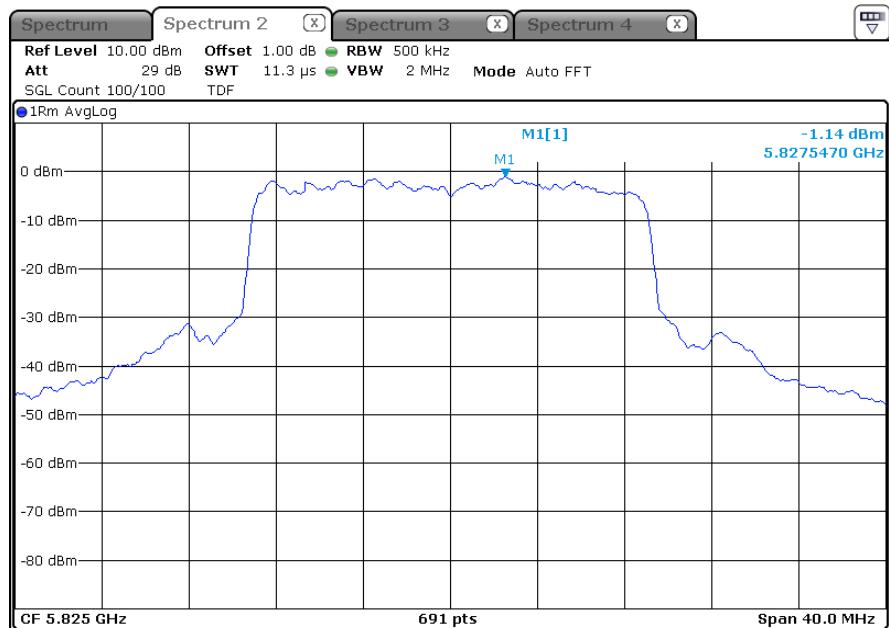


-5 825 MHz

ANT 1



ANT 2



* 802.11an HT20_MIMO(ANT 1+2)_5 150 Band

-5 180 MHz

ANT 1



ANT 2

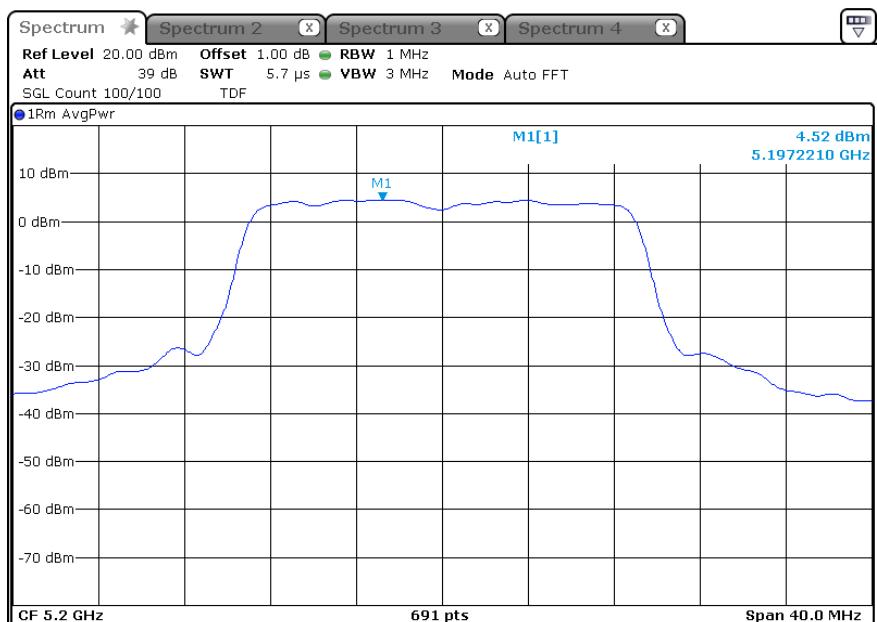


-5 200 MHz

ANT 1

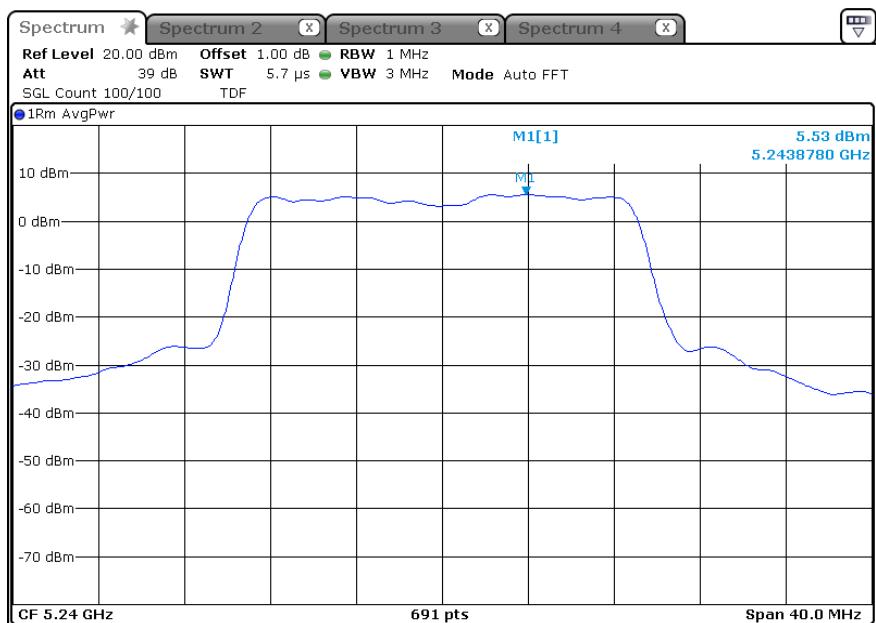


ANT 2



-5 240 MHz

ANT 1



ANT 2



* 802.11n HT20_MIMO(ANT 1+2)_5 250 Band

-5 260 MHz

ANT 1

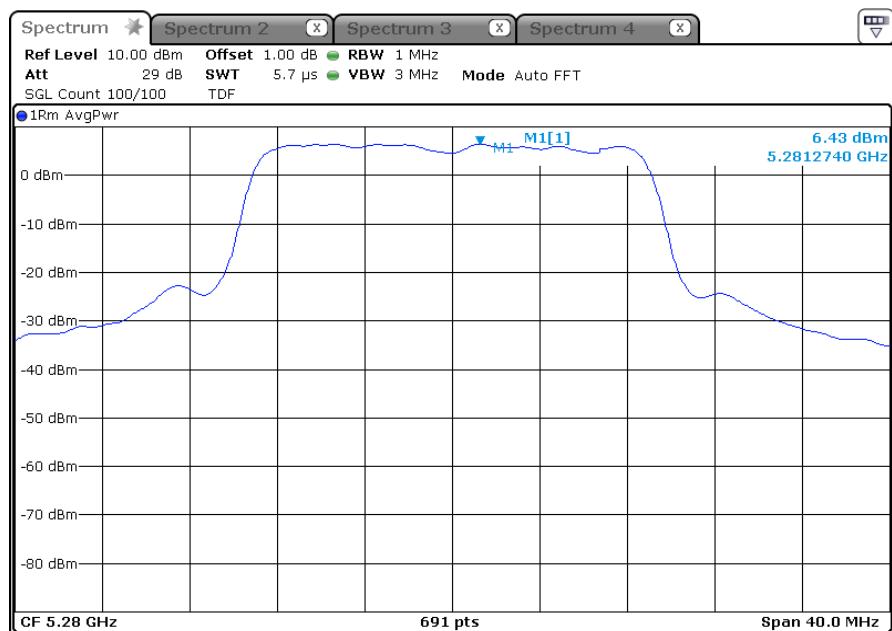


ANT 2



-5 280 MHz

ANT 1



ANT 2

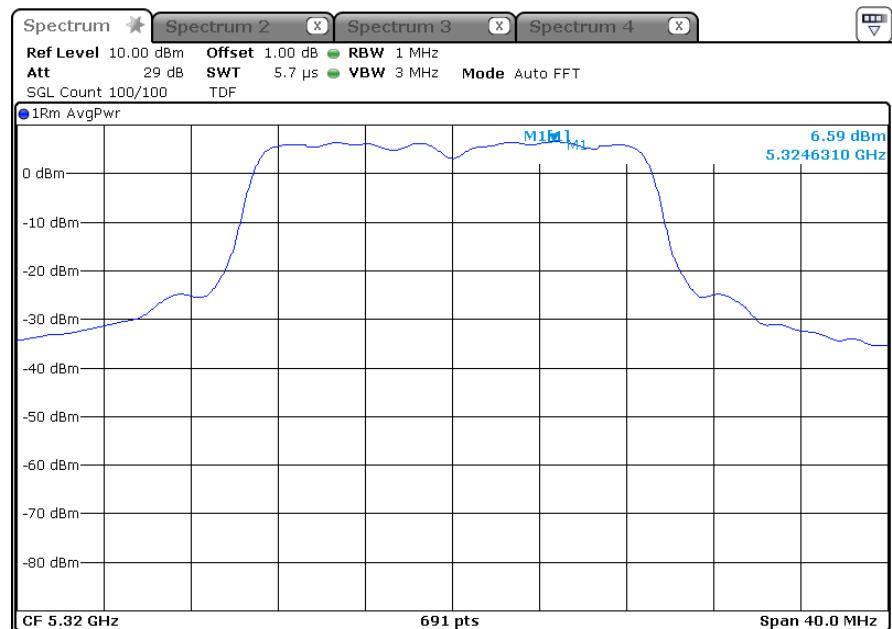


-5 320 MHz

ANT 1



ANT 2



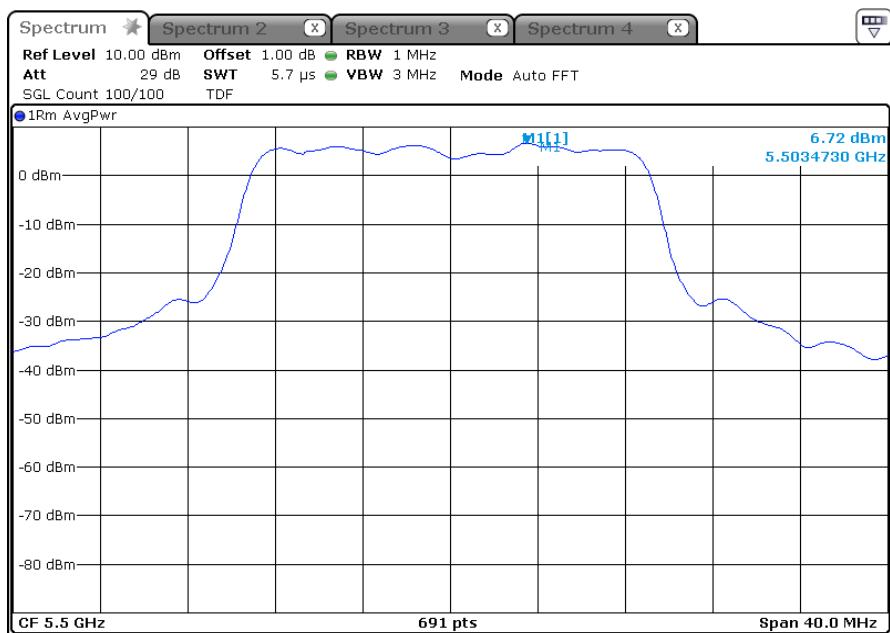
* 802.11n HT20_MIMO(ANT 1+2)_5 470 Band

-5 500 MHz

ANT 1



ANT 2



-5 580 MHz

ANT 1

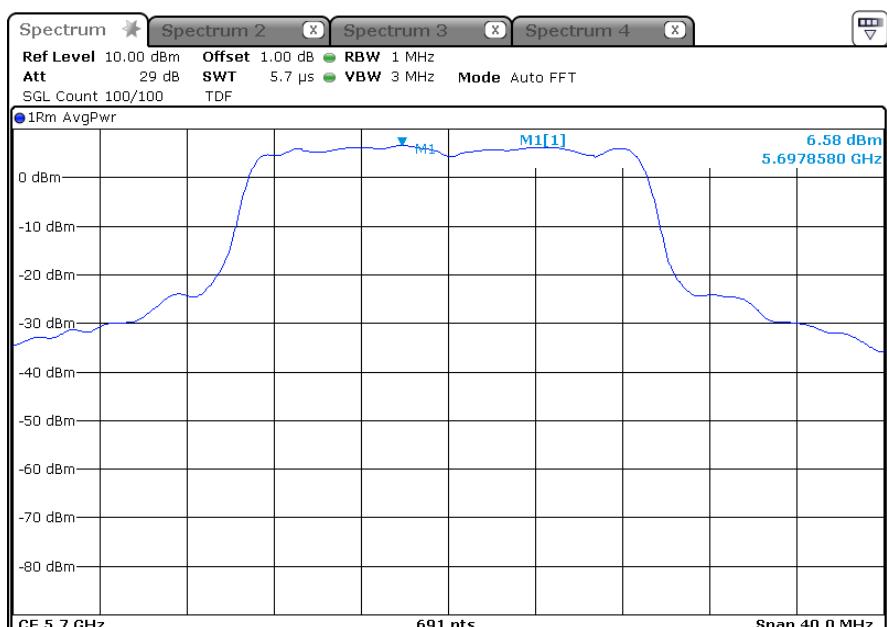


ANT 2



-5 700 MHz

ANT 1



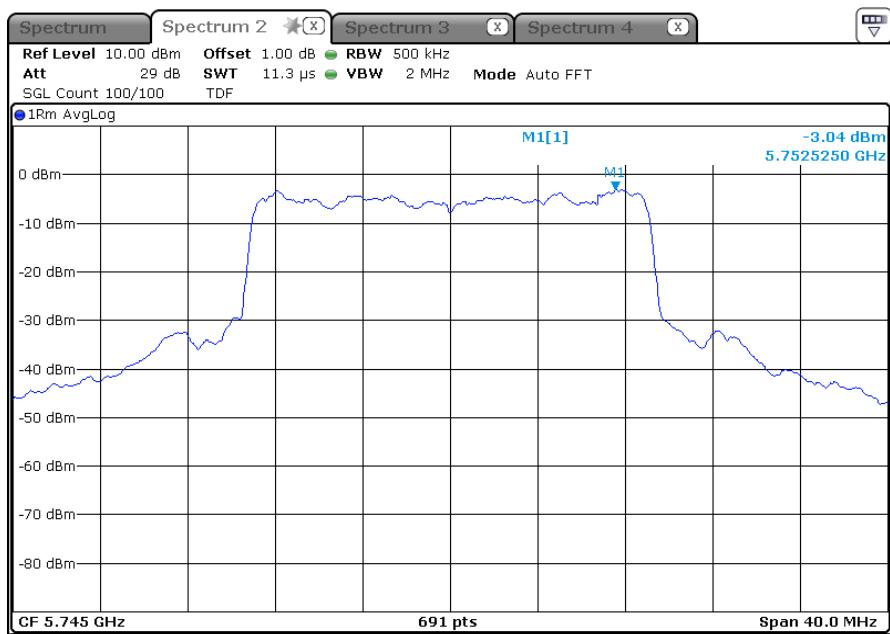
ANT 2



* 802.11n HT20_MIMO(ANT 1+2)_5 725 Band

-5 745 MHz

ANT 1

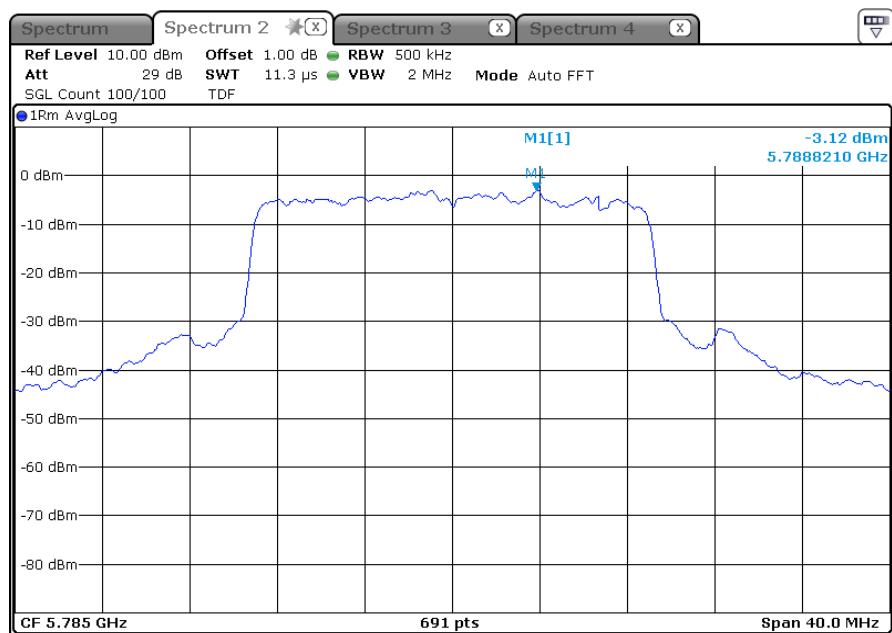


ANT 2



-5 785 MHz

ANT 1

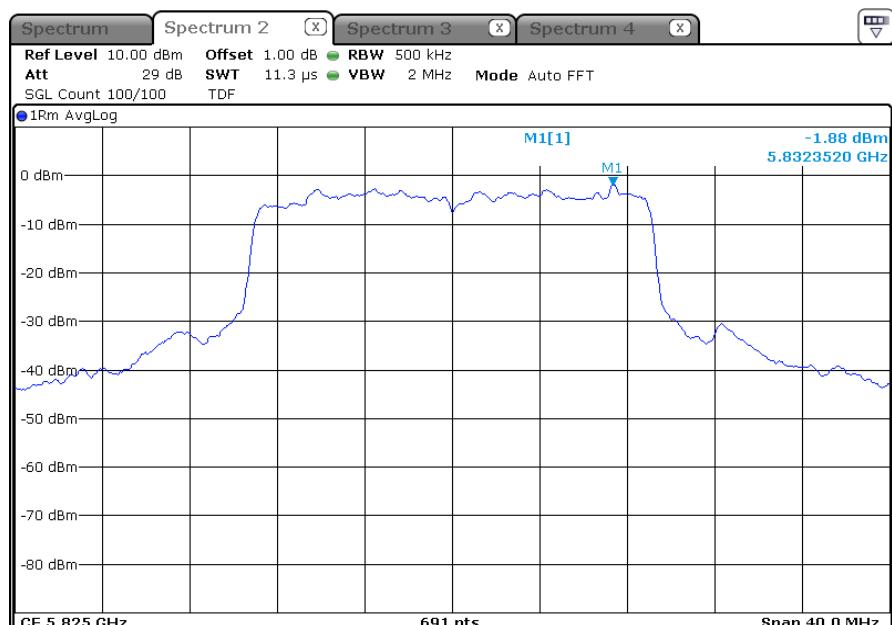


ANT 2

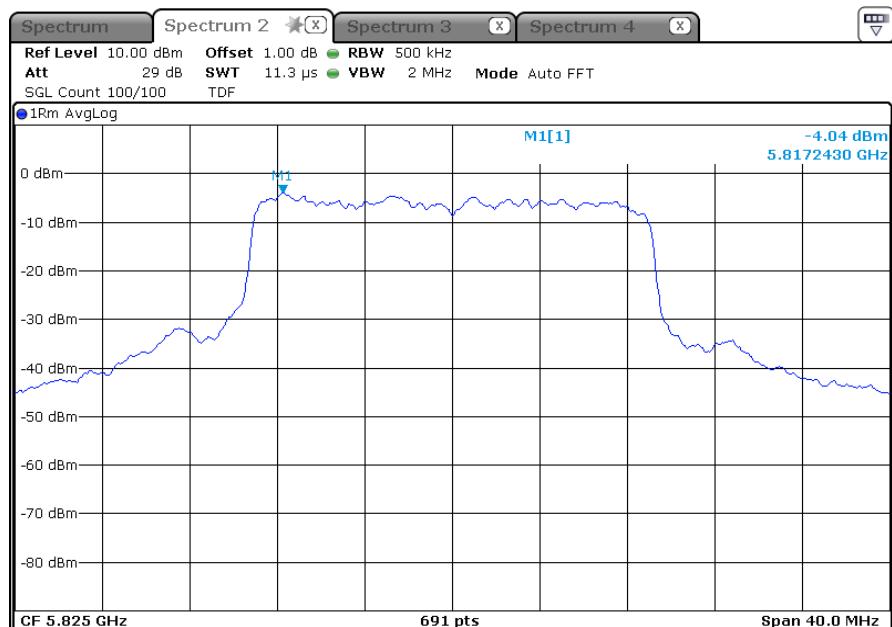


-5.825 MHz

ANT 1



ANT 2



5.6 Spurious Emission, Band Edge And Restricted Bands

5.6.1 Regulation

According to §15.407(b)(1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

According to §15.407(b) (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

According to §15.407(b) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

According to §15.407(b) (4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

According to §15.407(b)(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

According to §15.209(a), Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (μ V/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

** The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector and above 1000 MHz are based on the average value of measured emissions.

According to §15.407(b)(7) The provisions of §15.205 apply to intentional radiators operating under this section.

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

5.6.2 Measurement Procedure

These test measurement settings are specified in section G of 789033 D02 General UNII Test Procedures New Rules v01.

For all radiated emissions tests, measurements must correspond to the direction of maximum emission level for each measured emission (see ANSI C63.10 for guidance).

5.6.2.1 Unwanted Emissions in the Restricted Bands & Outside of the Restricted Bands

- (1) For all measurements, follow the requirements in section II.G.3.,
“General Requirements for Unwanted Emissions Measurements”.
- (2) At frequencies below 1000 MHz, use the procedure described in section II.G.4.,
“Procedure for Unwanted Emissions Measurements Below 1000 MHz”.
- (3) At frequencies above 1000 MHz, measurements performed using the peak and average measurement procedures described in sections II.G.5. and II.G.6, respectively, must satisfy the respective peak and average limits. If all peak measurements satisfy the average limit, then average measurements are not required.
- (4) Unwanted Emissions that fall Outside of the Restricted Bands

As specified in § 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a maximum emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in § 15.407(b)(4)).

However, an out-of-band emission that complies with both the peak and average limits of § 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz maximum emission limit.

- a) If radiated measurements are performed, field strength is then converted to EIRP as follows:

(i) $EIRP = ((E^2 \cdot d) / 30)$
where: • E is the field strength in V/m; • d is the measurement distance in meters;
• EIRP is the equivalent isotropically radiated power in watts.

(ii) Working in dB units, the above equation is equivalent to:

$$EIRP[\text{dBm}] = E[\text{dB}\mu\text{V/m}] + 20 \log(d[\text{meters}]) - 104.77$$

(iii) Or, if d is 3 meters:

$$EIRP[\text{dBm}] = E[\text{dB}\mu\text{V/m}] - 95.2$$

5.6.2.2 Spurious Radiated Emissions:

1. The preliminary and final radiated measurements were performed to determine the frequency producing the maximum emissions in a 10m anechoic chamber. The EUT was tested at a distance 3 meters.
2. The EUT was placed on the top of the 0.8-meter height, 1 × 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°.
3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 9 kHz to 30 MHz using the loop antenna, and from 30 to 1000 MHz using the TRILOG broadband antenna, and from 1 000 MHz to 40 000 MHz using the horn antenna.
4. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

Note

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1 kHz($\geq 1/T$) for Average detection (AV) at frequency above 1 GHz. (where T = pulse width)

5.6.3 Test Result

-complied

1. Band-edge & Conducted Spurious Emissions was shown in figure 3.
Note: We took the insertion loss of the cable into consideration within the measuring instrument.
2. Measured value of the Field strength of spurious Emissions (Radiated)
3. It tested x,y and z – 3 axis each, mentioned only worst case data at this report.

*** Below 1 GHz data (Worst-case: 5 250 Band_Middle channel)**

802.11n HT20_MIMO (ANT 1+2) (5 250 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol.	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 30 MHz (3m Distance)							
below 30 MHz	Not Detected	-	-	-	-	-	-
Quasi-Peak DATA. Emissions below 1 GHz							
46.01	120	V	50.9	-14.3	36.6	40.0	3.4
216.00	120	H	51.0	-16.0	35.0	43.5	8.5
250.80	120	H	56.6	-14.2	42.4	46.0	3.6
501.66	120	H	41.9	-6.9	35.0	46.0	11.0
668.87	120	V	46.5	-3.7	42.8	46.0	3.2
899.85	120	H	39.7	0.4	40.1	46.0	5.9
919.73	120	H	37.7	0.8	38.5	46.0	7.5

*** Above 1 GHz data_5 150 Band**

802.11a_ANT 1 (5 180 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol.	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 493.13	1 000	V	63.0	-4.4	58.6	74.0	15.4
* 5 150.00	1 000	H	52.2	8.1	60.3	74.0	13.7
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 493.13	1 000	V	45.9	-4.4	41.5	54.0	12.5
* 5 150.00	1 000	H	37.6	8.1	45.7	54.0	8.3
Above 6 GHz	Not Detected	-	-	-	-	-	-

* This asterisk means restricted band.

802.11a_ANT 1 (5 200 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol.	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 493.13	1 000	V	64.1	-4.4	59.7	74.0	14.3
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 493.13	1 000	V	44.5	-4.4	40.1	54.0	13.9
Above 6 GHz	Not Detected	-	-	-	-	-	-

802.11a_ANT 1 (5 240 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol.	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 035.63	1 000	H	59.0	-5.5	53.5	74.0	20.5
1 493.75	1 000	V	63.6	-4.4	59.2	74.0	14.8
5 648.75	1 000	H	48.5	8.9	57.4	74.0	16.6
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 035.63	1 000	H	38.4	-5.5	32.9	54.0	21.1
1 493.75	1 000	V	43.3	-4.4	38.9	54.0	15.1
5 648.75	1 000	H	36.2	8.9	45.1	54.0	8.9
Above 6 GHz	Not Detected	-	-	-	-	-	-

802.11a_ANT 2 (5 180 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 492.50	1 000	V	64.6	-4.4	60.2	74.0	13.8
* 5 149.38	1 000	H	48.6	8.1	56.7	74.0	17.3
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 492.50	1 000	V	43.6	-4.4	39.2	54.0	14.8
* 5 149.38	1 000	H	35.7	8.1	43.8	54.0	10.2
Above 6 GHz	Not Detected	-	-	-	-	-	-

* This asterisk means restricted band.

802.11a_ANT 2 (5 200 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 493.75	1 000	V	64.5	-4.4	60.1	74.0	13.9
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 493.75	1 000	V	43.3	-4.4	38.9	54.0	15.1
Above 6 GHz	Not Detected	-	-	-	-	-	-

802.11a_ANT 2 (5 240 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 496.25	1 000	V	64.3	-4.4	59.9	74.0	14.1
5 599.38	1 000	H	46.6	8.8	55.4	74.0	18.6
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 496.25	1 000	V	43.7	-4.4	39.3	54.0	14.7
5 599.38	1 000	H	34.4	8.8	43.2	54.0	10.8
Above 6 GHz	Not Detected	-	-	-	-	-	-

802.11n HT20_ANT 1 (5 180 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 498.13	1 000	H	60.8	-4.4	56.4	74.0	17.6
* 5 143.75	1 000	H	51.7	8.0	59.7	74.0	14.3
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 498.13	1 000	H	42.7	-4.4	38.3	54.0	15.7
* 5 143.75	1 000	H	36.6	8.0	44.6	54.0	9.4
Above 6 GHz	Not Detected	-	-	-	-	-	-

* This asterisk means restricted band.

802.11n HT20_ANT 1 (5 200 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 500.00	1 000	V	61.0	-4.4	56.6	74.0	17.4
Above 2 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 500.00	1 000	V	41.5	-4.4	37.1	54.0	16.9
Above 2 GHz	Not Detected	-	-	-	-	-	-

802.11n HT20_ANT 1 (5 240 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 500.00	1 000	H	60.9	-4.4	56.5	74.0	17.5
5 624.38	1 000	H	46.2	8.8	55.0	74.0	19.0
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 500.00	1 000	H	42.8	-4.4	38.4	54.0	15.6
5 624.38	1 000	H	33.5	8.8	42.3	54.0	11.7
Above 6 GHz	Not Detected	-	-	-	-	-	-

802.11n HT20_ANT 2 (5 180 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 498.13	1 000	V	61.1	-4.4	56.7	74.0	17.3
* 5 150.00	1 000	H	49.8	8.1	57.9	74.0	16.1
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 498.13	1 000	V	41.7	-4.4	37.3	54.0	16.7
* 5 150.00	1 000	H	34.9	8.1	43.0	54.0	11.0
Above 6 GHz	Not Detected	-	-	-	-	-	-

* This asterisk means restricted band.

802.11n HT20_ANT 2 (5 200 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 500.00	1 000	V	61.2	-4.4	56.8	74.0	17.2
Above 2 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 500.00	1 000	V	44.7	-4.4	40.3	54.0	13.7
Above 2 GHz	Not Detected	-	-	-	-	-	-

802.11n HT20_ANT 2 (5 240 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 500.00	1 000	H	61.3	-4.4	56.9	74.0	17.1
Above 2 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 500.00	1 000	H	42.3	-4.4	37.9	54.0	16.1
Above 2 GHz	Not Detected	-	-	-	-	-	-

802.11n HT20_MIMO (ANT 1+2) (5 180 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 496.88	1 000	V	60.9	-4.4	56.5	74.0	17.5
* 5 148.13	1 000	H	51.0	8.1	59.1	74.0	14.9
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 496.88	1 000	V	41.3	-4.4	36.9	54.0	17.1
* 5 148.13	1 000	H	35.9	8.1	44.0	54.0	10.0
Above 6 GHz	Not Detected	-	-	-	-	-	-

* This asterisk means restricted band.

802.11n HT20_MIMO (ANT 1+2) (5 200 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 499.38	1 000	V	61.2	-4.4	56.8	74.0	17.2
Above 2 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 499.38	1 000	V	42.1	-4.4	37.7	54.0	16.3
Above 2 GHz	Not Detected	-	-	-	-	-	-

802.11n HT20_MIMO (ANT 1+2) (5 240 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
1 035.00	1 000	H	57.3	-5.5	51.8	74.0	22.2
1 500.00	1 000	H	61.3	-4.4	56.9	74.0	17.1
5 611.25	1 000	H	49.0	8.8	57.8	74.0	16.2
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
1 035.00	1 000	H	44.0	-5.5	38.5	54.0	15.5
1 500.00	1 000	H	42.3	-4.4	37.9	54.0	16.1
5 611.25	1 000	H	36.0	8.8	44.8	54.0	9.2
Above 6 GHz	Not Detected	-	-	-	-	-	-

* This asterisk means restricted band.

*** Above 1 GHz data_5 250 Band**

802.11a_ANT 1 (5 260 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11a_ANT 1 (5 280 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11a_ANT 1 (5 320 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
*5 350.56	1 000	H	51.9	9.0	60.9	74.0	13.1
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
*5 350.56	1 000	H	34.7	9.0	43.7	54.0	10.3
Above 6 GHz	Not Detected	-	-	-	-	-	-

* This asterisk means restricted band.

802.11a_ANT 2 (5 260 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11a_ANT 2 (5 280 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11a_ANT 2 (5 320 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
*5 351.88	1 000	H	48.8	9.0	57.8	74.0	16.2
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
*5 351.88	1 000	H	36.1	9.0	45.1	54.0	8.9
Above 6 GHz	Not Detected	-	-	-	-	-	-

* This asterisk means restricted band.

802.11n HT20_ANT 1 (5 260 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11n HT20_ANT 1 (5 280 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11n HT20_ANT 1 (5 320 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
*5 351.88	1 000	H	51.1	9.0	60.1	74.0	13.9
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
*5 351.88	1 000	H	36.0	9.0	45.0	54.0	9.0
Above 6 GHz	Not Detected	-	-	-	-	-	-

* This asterisk means restricted band.

802.11n HT20_ANT 2 (5 260 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11n HT20_ANT 2 (5 280 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11n HT20_ANT 2 (5 320 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
*5 353.94	1 000	H	51.8	9.0	60.8	74.0	13.2
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
*5 353.94	1 000	H	37.2	9.0	46.2	54.0	7.8
Above 6 GHz	Not Detected	-	-	-	-	-	-

* This asterisk means restricted band.

802.11n HT20_MIMO (ANT 1+2) (5 260 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11n HT20_MIMO (ANT 1+2) (5 280 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11n HT20_MIMO (ANT 1+2) (5 320 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
*5 351.19	1 000	H	51.7	9.0	60.7	74.0	13.3
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
*5 351.19	1 000	H	39.4	9.0	48.4	54.0	5.6
Above 6 GHz	Not Detected	-	-	-	-	-	-

* This asterisk means restricted band.

*** Above 1 GHz data_5 470 Band**

802.11a_ANT 1 (5 500 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 468.06	1 000	H	50.8	9.3	60.1	68.2	8.1
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11a_ANT 1 (5 580 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11a_ANT 1 (5 700 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 725.42	1 000	H	52.8	10.2	63.0	68.2	5.2
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11a_ANT 2 (5 500 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 463.94	1 000	H	47.9	9.3	57.2	68.2	11.0
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11a_ANT 2 (5 580 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11a_ANT 2 (5 700 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 725.00	1 000	H	40.1	10.2	50.3	68.2	17.9
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11n HT20_ANT 1(5 500 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 469.69	1 000	H	53.7	9.3	63.0	68.2	5.2
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11n HT20_ANT 1 (5 580 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11n HT20_ANT 1 (5 700 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 725.00	1 000	H	39.9	10.2	50.1	68.2	18.1
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11n HT20_ANT 2(5 500 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 467.38	1 000	H	55.0	9.3	64.3	68.2	3.9
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11n HT20_ANT 2 (5 580 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11n HT20_ANT 2 (5 700 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 725.05	1 000	H	54.9	10.2	65.1	68.2	3.1
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11n HT20_MIMO (ANT 1+2) (5 500 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 469.44	1 000	H	48.2	9.3	57.5	68.2	10.7
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11n HT20_MIMO (ANT 1+2) (5 580 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11n HT20_MIMO (ANT 1+2) (5 700 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 725.01	1 000	H	54.8	10.2	65.0	68.2	3.2
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

*** Above 1 GHz data_5 725 Band**

802.11a_ANT 1 (5 745 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 725.00	1 000	H	40.7	10.2	50.9	78.2	27.3
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11a_ANT 1 (5 785 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11a_ANT 1 (5 825 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 850.31	1 000	H	52.6	10.6	63.2	78.2	15.0
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11a_ANT 2 (5 745 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 725.00	1 000	H	39.4	10.2	49.6	78.2	28.6
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11a_ANT 2 (5 785 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11a_ANT 2 (5 825 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 851.00	1 000	H	48.6	10.6	59.2	78.2	19.0
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11n HT20_ANT 1 (5 745 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 725.00	1 000	H	40.7	10.2	50.9	78.2	27.3
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11n HT20_ANT 1 (5 785 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11n HT20_ANT 1 (5 825 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 850.31	1 000	H	51.0	10.6	61.6	78.2	16.6
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11n HT20_ANT 2 (5 745 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 725.00	1 000	H	39.4	10.2	49.6	78.2	28.6
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11n HT20_ANT 2 (5 785 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-					

802.11n HT20_ANT 2 (5 825 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 850.31	1 000	H	46.8	10.6	57.4	78.2	20.8
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11n HT20_MIMO (ANT 1+2) (5 745 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 725.00	1 000	H	63.6	10.2	73.8	78.2	4.4
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

802.11n HT20_MIMO (ANT 1+2) (5 785 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

802.11n HT20_MIMO (ANT 1+2) (5 825 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Peak DATA. Emissions above 1 GHz							
#5 850.31	1 000	H	52.6	10.6	63.2	78.2	15.0
Above 6 GHz	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1 GHz							
-	Not Detected	-	-	-	-	-	-

This hash means out of band.

5.7 Frequency Stability

5.7.1 Regulation

According to §15.407 (g) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

5.7.2 Measurement Procedure

The frequency stability of the carrier frequency of the intentional radiator shall be maintained all conditions of normal operation as specified in the users manual. The frequency stability shall be maintained over a temperature variation of specified in the users manual at normal supply voltage, and over a variation in the primary supply voltage of specified in the users manual of the rated supply voltage at a temperature of 20 °C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.

1. The EUT was placed inside the environmental test chamber.
2. The temperature was incremented by 10 °C intervals from lowest temperature.
3. Each increase step of temperature measured the frequency.
4. The test temperature was set 20°C and the supply voltage was then adjusted on the EUT from 85 % to 115% and the frequency record.

5.7.3 Test Result

-complied

* 802.11an HT20_5 150 Band

5 180 MHz

Voltage (%)	Power (V)	Temp. (°C)	Reading Frequency (Hz)	Frequency Error (Hz)	Frequency Error (%)
100	12.0	0	5 180 039 359	-39 359	-0.000 8
100		10	5 180 033 813	-33 813	-0.000 7
100		20	5 180 024 144	-24 144	-0.000 5
100		30	5 180 014 684	-14 684	-0.000 3
100		40	5 180 007 824	-7 824	-0.000 2
100		50	5 180 006 187	-6 187	-0.000 1
100		60	5 180 014 862	-14 862	-0.000 3
85		20	5 180 024 371	-24 371	-0.000 5
115	13.8	20	5 180 024 197	-24 197	-0.000 5

* 802.11an HT20_5 250 Band

5 240 MHz

Voltage (%)	Power (V)	Temp. (°C)	Reading Frequency (Hz)	Frequency Error (Hz)	Frequency Error (%)
100	12.0	0	5260039766	-39766	-0.0008
100		10	5260034101	-34101	-0.0006
100		20	5260024288	-24288	-0.0005
100		30	5260015893	-15893	-0.0003
100		40	5260007880	-7880	-0.0001
100		50	5260006315	-6315	-0.0001
100		60	5260014852	-14852	-0.0003
85		20	5260024572	-24572	-0.0005
115	13.8	20	5260024529	-24529	-0.0005

* 802.11an HT20_5 470 Band

5 500 MHz

Voltage (%)	Power (V)	Temp. (°C)	Reading Frequency (Hz)	Frequency Error (Hz)	Frequency Error (%)
100	12.0	0	5 500 041 639	-41 639	-0.000 8
100		10	5 500 035 731	-35 731	-0.000 6
100		20	5 500 025 720	-25 720	-0.000 5
100		30	5 500 016 273	-16 273	-0.000 3
100		40	5 500 008 281	-8 281	-0.000 2
100		50	5 500 006 639	-6 639	-0.000 1
100		60	5 500 015 698	-15 698	-0.000 3
85		20	5 500 026 104	-26 104	-0.000 5
115	13.8	20	5 500 026 277	-26 277	-0.000 5

* 802.11an HT20_5 470 Band

5 745 MHz

Voltage (%)	Power (V)	Temp. (°C)	Reading Frequency (Hz)	Frequency Error (Hz)	Frequency Error (%)
100	12.0	0	5 745 043 523	-43 523	-0.000 8
100		10	5 745 037 574	-37 574	-0.000 7
100		20	5 745 026 631	-26 631	-0.000 5
100		30	5 745 017 301	-17 301	-0.000 3
100		40	5 745 008 796	-8 796	-0.000 2
100		50	5 745 006 853	-6 853	-0.000 1
100		60	5 745 016 365	-16 365	-0.000 3
85		20	5 745 027 437	-27 437	-0.000 5
115	13.8	20	5 745 027 093	-27 093	-0.000 5

5.8 DFS(Dynamic Frequency Selection)

5.8.1 Regulation

Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS).

(1) Transmit power control (TPC). U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

(2) Radar Detection Function of Dynamic Frequency Selection (DFS). U-NII devices operating with any part of its 26 dB emission bandwidth in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems. Operators shall only use equipment with a DFS mechanism that is turned on when operating in these bands. The device must sense for radar signals at 100 percent of its emission bandwidth. The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is -64 dBm. For devices that operate with less than 200 mW e.i.r.p. and a power spectral density of less than 10 dBm in a 1 MHz band, the minimum detection threshold is -62 dBm. The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna. For the initial channel setting, the manufacturers shall be permitted to provide for either random channel selection or manual channel selection.

(i) Operational Modes. The DFS requirement applies to the following operational modes:

(A) The requirement for channel availability check time applies in the master operational mode.

(B) The requirement for channel move time applies in both the master and slave operational modes.

(ii) Channel Availability Check Time. A U-NII device shall check if there is a radar system already operating on the channel before it can initiate a transmission on a channel and when it has to move to a new channel. The U-NII device may start using the channel if no radar signal with a power level greater than the interference threshold values listed in paragraph (h)(2) of this section, is detected within 60 seconds.

(iii) Channel Move Time. After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

(iv) Non-occupancy Period. A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.

(i) Device Security. All U-NII devices must contain security features to protect against modification of software by unauthorized parties.

5.8.2 Measurement Procedure

The following table from FCC 06-96 lists the applicable requirements for the DFS testing.
The device evaluated in this report is considered a client device without radar detection capability.

5.8.3 Support Equipment

Product	Manufacture	Model No.	Serial No.	FCCID.
Cisco Aironet IOS Access Point	Cisco	AIR-AP1252AG-K-K9	FGL1439ZOHS	LDK102056

Note. This device was functioned as a Master device during the DFS test.

5.8.4 Test Result

The UUT is a U-NII Device operating in Client mode without radar detection. The radar test signals are injected into the Master Device.

The highest power level within these bands in 21.77 dBm (150.31 mW) EIRP in the 5 250 ~ 5 350 MHz band and 21.64 dBm (145.88 mW) EIRP in the 5 470 ~ 5 725 MHz band.

The gain antenna assembly utilized with the master has a gain of 2.8 dBi.

The calibrated conducted DFS detection threshold level is set to -58.2 dBm. (-62 + 1 + 2.8 = -58.2)

802.11a

5 250 Band

Channel Move Time

Frequency (MHz)	Channel Move Time	Limit
5 320	< 10 s	10 s

Channel Closing Time

Frequency (MHz)	Channel Closing Time	Limit
5 320	< 60 ms	60 ms

Non occupancy period

Frequency (MHz)	Channel Move Time	Limit
5 320	> 1800 s	1800 s

802.11a

5 470 Band

Channel Move Time

Frequency (MHz)	Channel Move Time	Limit
5 580	< 10 s	10 s

Channel Closing Time

Frequency (MHz)	Channel Closing Time	Limit
5 580	< 60 ms	60 ms

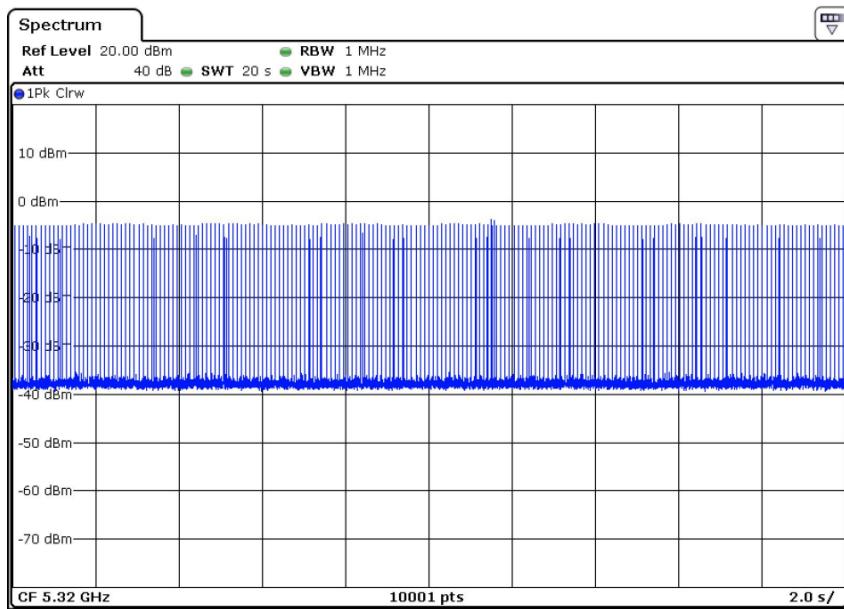
Non occupancy period

Frequency (MHz)	Non occupancy period	Limit
5 580	> 1800 s	1800 s

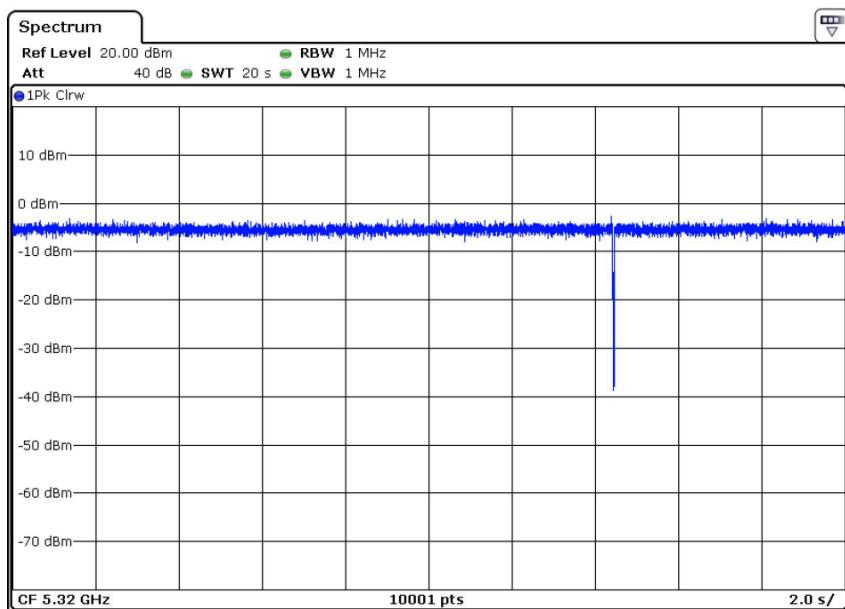
5.8.4 Test Plot

Figure 4. Plot of the DFS

No traffic signal(master signal)



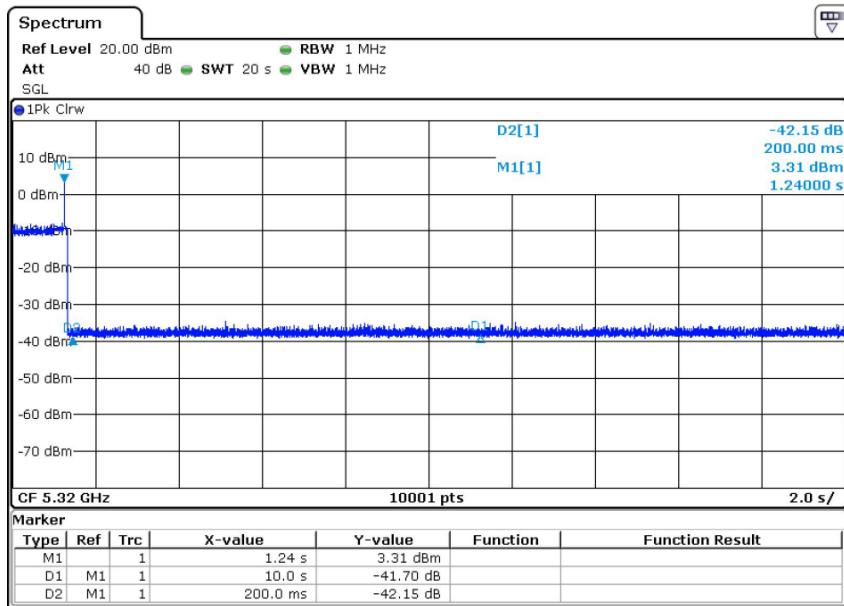
Client(EUT) Data Traffic Signal



Channel closing time and move time

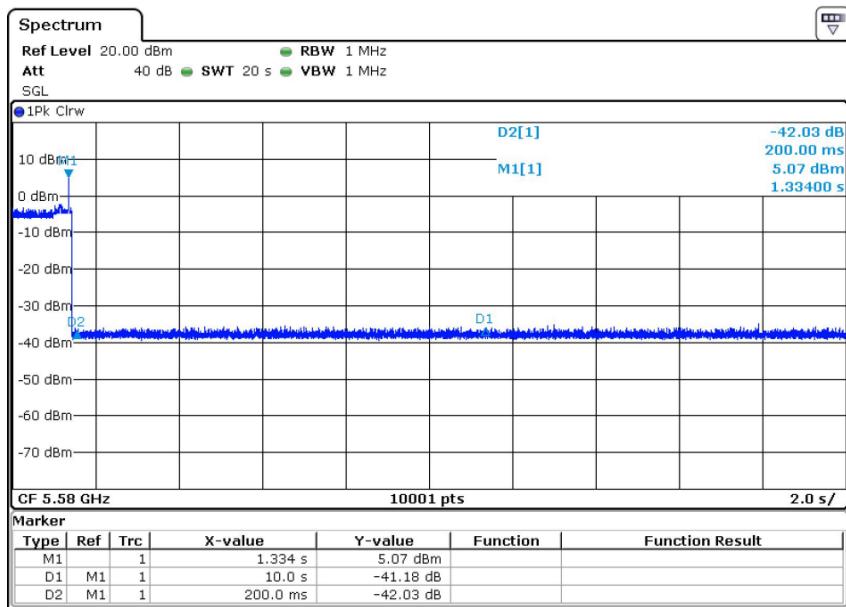
* 802.11an HT20_5 250 Band

- 5 320 MHz



* 802.11an HT20_5 470 Band

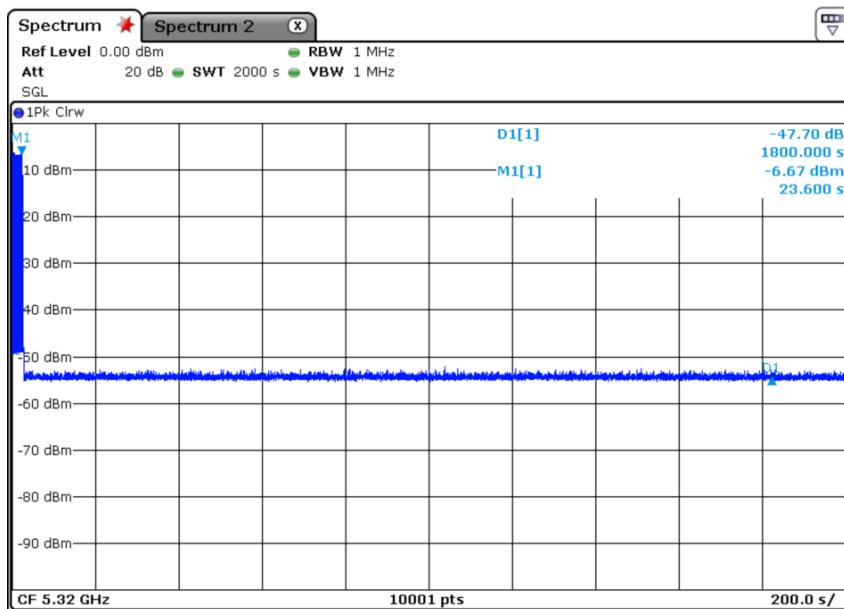
- 5 580 MHz



Non occupancy period

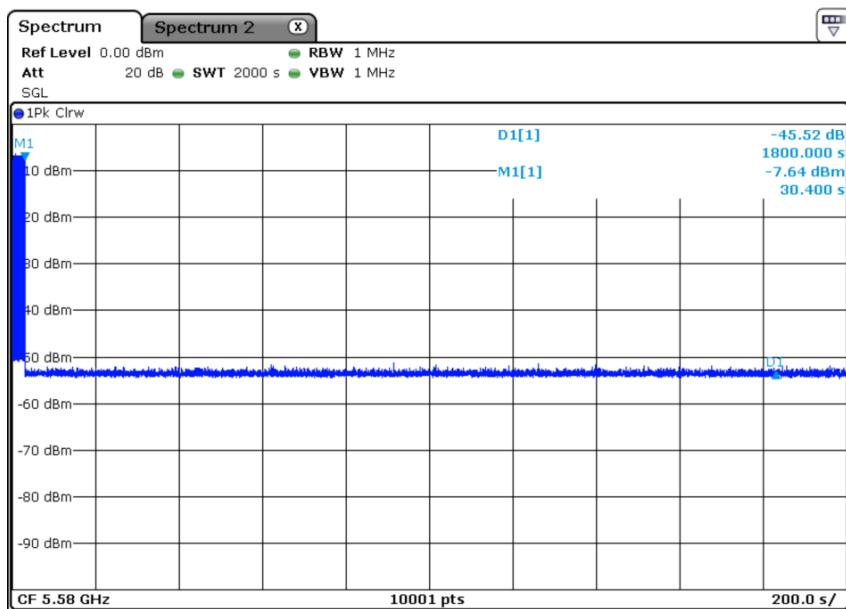
* 802.11an HT20_5 250 Band

- 5 320 MHz



* 802.11an HT20_5 470 Band

- 5 580 MHz



5.9 Conducted Emission

5.9.1 Regulation

According to §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency.

According to §15.107(a), for unintentional device, except for Class A digital devices, line conducted emission limits are the same as the above table.

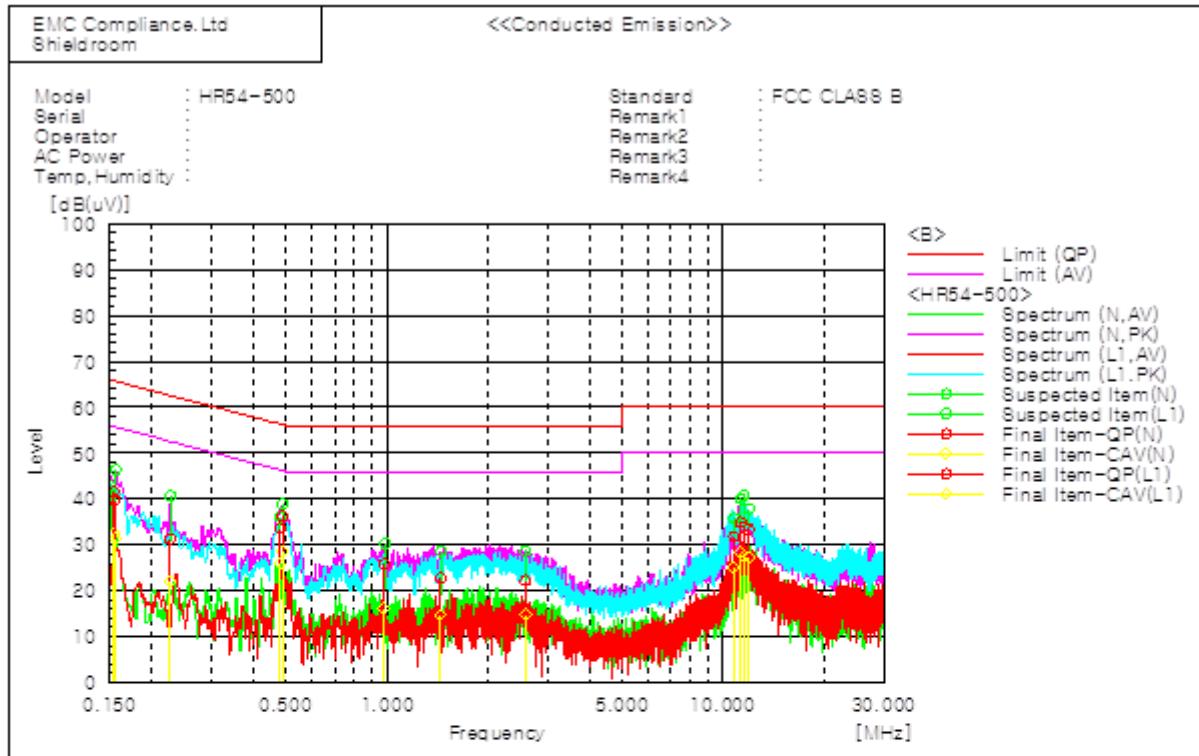
5.9.2 Measurement Procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a $50\Omega/50\mu$ H LISN, which is an input transducer to a Spectrum Analyzer or an EMI/Field Intensity Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
5. The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 kHz or to QUASI-PEAK and AVERAGE within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

5.9.3 Test Result

Figure 5. Plot of the Conducted Emission

*Conducted worst-case data : Middle Channel (5 250 Band_5 280 MHz)



6. Test equipment used for test

	Description	Manufacturer	Model No.	Serial No.	Next Cal Date.
■	Temp & humidity chamber	ESPEC CORP.	SH-641	92005476	15.12.26
■	Spectrum Analyzer	R&S	FSV30	100914	15.08.05
■	Wideband Power Sensor	R&S	NRP-Z81	102398	15.11.27
■	DC Power Supply	AGILENT	E3632A	MY40004399	16.01.06
■	Loop Antenna	R&S	HFH2-Z2	100355	15.06.19
■	Bi-Log Antenna	SCHWARZBECK	VULB9163	552	16.06.14
■	Horn Antenna	SCHWARZBECK	3117	155787	16.02.05
■	Horn Antenna	ETS.lindgren	3116	86632	15.10.20
■	Amplifier	SONOMA INSTRUMENT	310	293004	15.09.25
■	Emi Test Receiver	R&S	ESCI	100001	15.07.14
■	Two-Line V-Network	R&S	ENV216	101352	15.10.13
■	Line Impedance Stabilisation Network	Schwarzbeck	NNLK8121	8121-472	15.06.24
■	Vector Signal Generator	R&S	SMBV100A	257566	16.01.06
■	Broadband Preamplifier	SCHWARZBECK	BBV9721	2	15.05.09
■	Broadband Preamplifier	SCHWARZBECK	BBV9718	9718-233	16.04.13
■	Power Divider	Aeroflex/ Weinschel,Inc	1580-1	NX375	15.10.14
■	Power Divider	Aeroflex/ Weinschel,Inc	1580-1	RM986	16.04.08
■	Attenuator	HP	8494A	2631A09825	15.10.14
■	Attenuator	HP	8496A	3308A16640	15.10.14
■	Attenuator	HP	8491A	MY52460424	15.07.23
■	Antenna Mast	Innco Systems	MA4000-EP	-	-
■	Turn Table	Innco Systems	DT2000	-	-