

8.6.3 Test data for Multiple transmit

- Test Date : December 16, 2013

- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)	CALCULATE D OUTPUT POWER (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	38.32	7.99	17.00	9.01
	High	5 230	38.32	8.76	17.00	8.24
5 150 ~ 5 250	Low	5 270	38.09	9.44	24.00	14.56
	High	5 310	38.09	9.42	24.00	14.58
5 470 ~ 5 725	Low	5 510	38.21	8.38	24.00	15.62
	Middle	5 590	38.21	5.18	24.00	18.82
	High	5 670	38.21	9.10	24.00	14.90

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	CALCULATE D OUTPUT POWER (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	35.89	8.14	17.00	8.86
	High	5 230	35.89	8.79	17.00	8.21
5 150 ~ 5 250	Low	5 270	35.77	9.37	24.00	14.63
	High	5 310	35.77	9.31	24.00	14.69
5 470 ~ 5 725	Low	5 510	35.89	8.11	24.00	15.89
	Middle	5 590	35.89	8.04	24.00	15.96
	High	5 670	35.89	9.14	24.00	14.86

Remark 1 : Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Remark 2 : Calculated Output Power= $10\log(10^{(\text{Antenna1 Output Power}/10)}+10^{(\text{Antenna2 Output Power}/10)})$



Tested by: Hong-Kyu, Lee/ Engineer

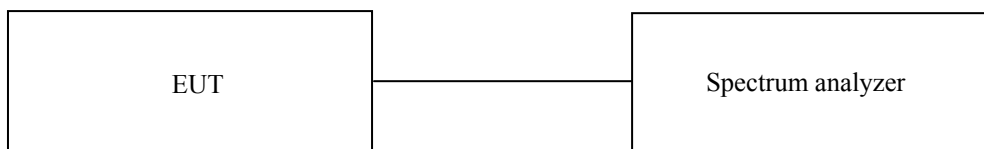
9. PEAK POWER SPECTRUL DENSITY

9.1 Operating environment

Temperature : 24 °C
 Relative humidity : 43 % R.H.

9.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz, the video bandwidth is set to 3 times the resolution bandwidth. The maximum level form the EUT in 1 MHz bandwidth was measured with above condition.



9.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV30	R/S	Spectrum Analyzer	101372	May 20, 2013

All test equipment used is calibrated on a regular basis.

9.4 Test data for 802.11a RLAN Mode

9.4.1 Test data for Antenna 0

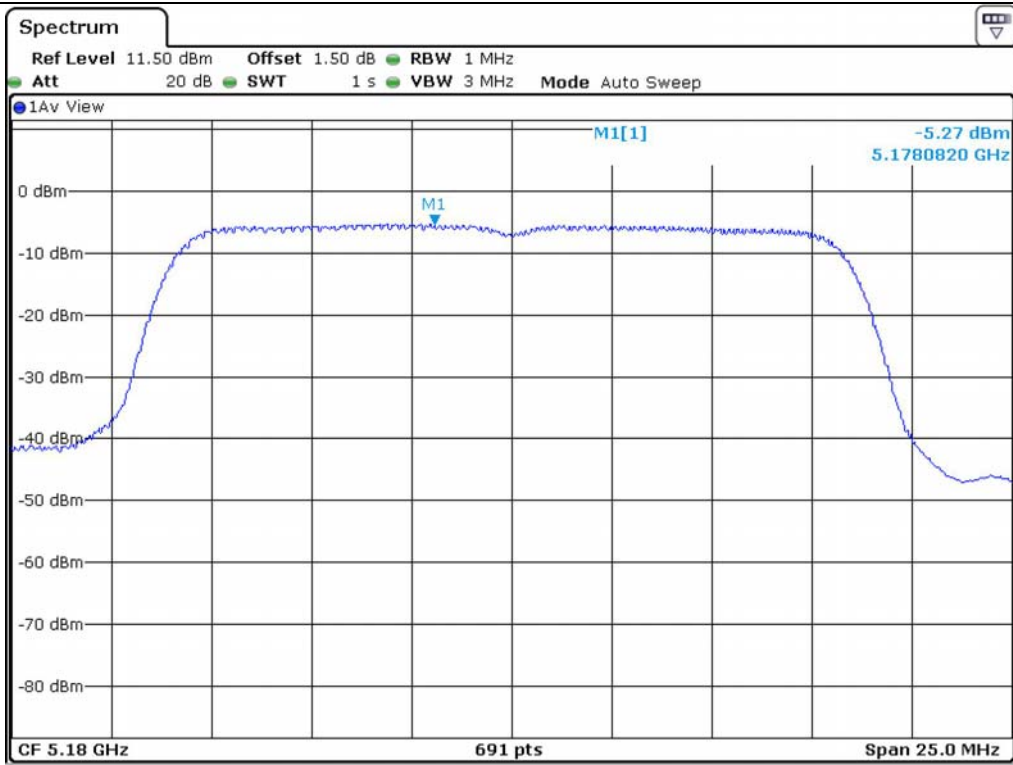
- Test Date : December 16, 2013
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	-5.27	4.00	9.27
	Middle	5 200	-5.39	4.00	9.39
	High	5 240	-3.56	4.00	7.56
5 250 ~ 5 350	Low	5 260	-3.89	11.00	14.89
	Middle	5 300	-4.31	11.00	15.31
	High	5 320	-5.16	11.00	16.16
5 470 ~ 5 725	Low	5 500	-5.70	11.00	16.70
	Middle	5 600	-5.97	11.00	16.97
	High	5 700	-4.54	11.00	15.54

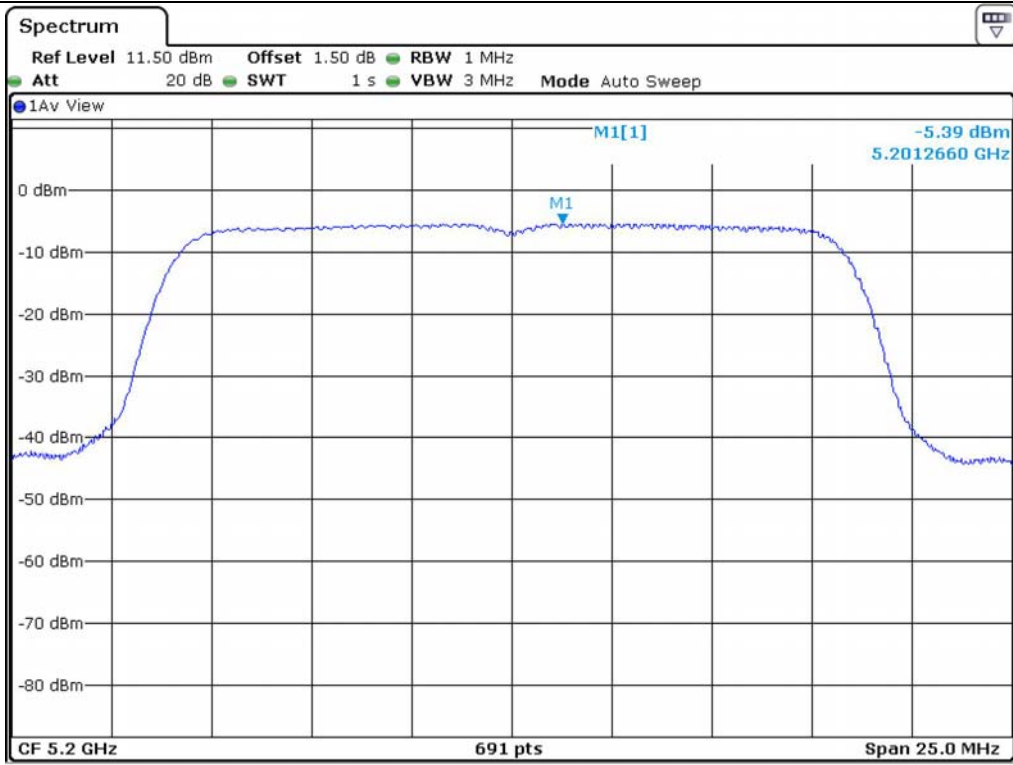
Remark: See next page for measurement data.



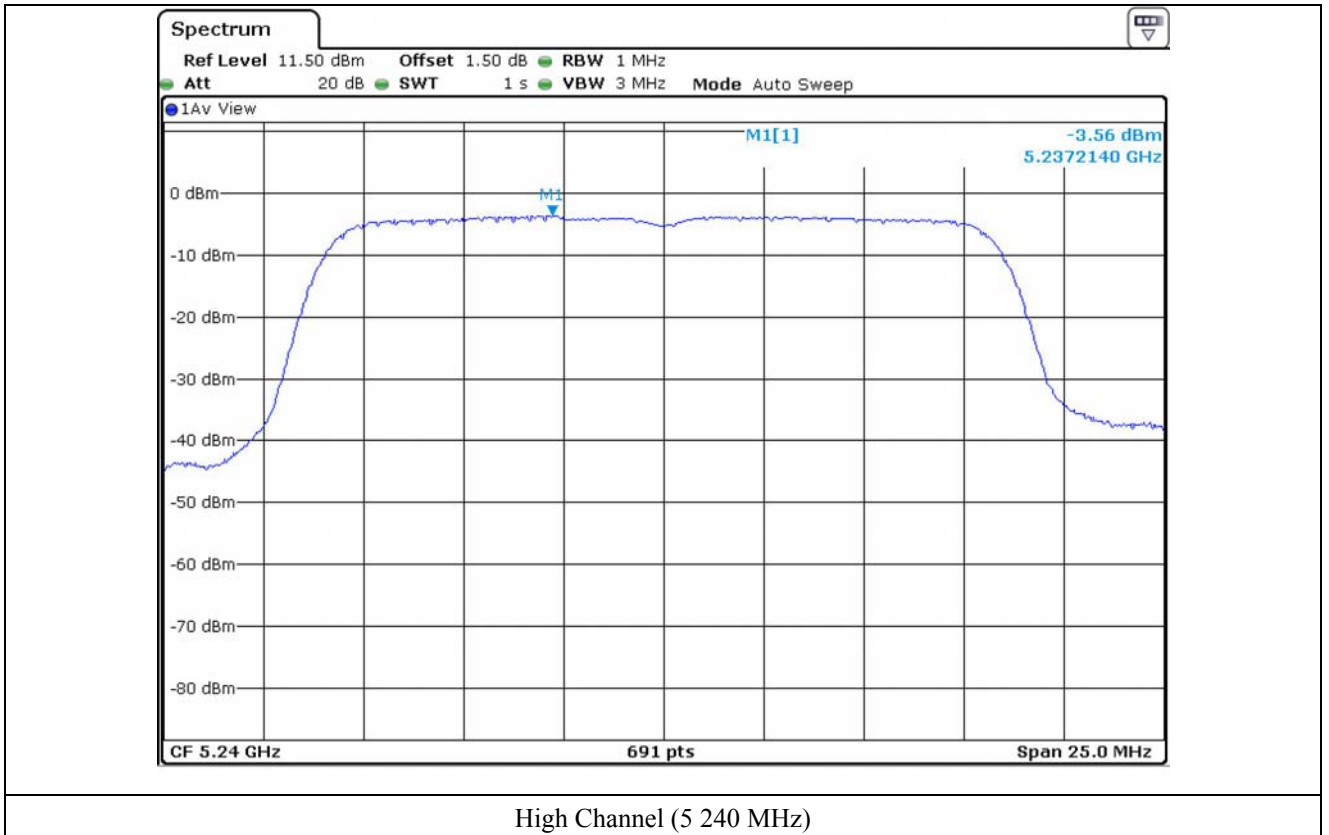
Tested by: Hong-Kyu, Lee/ Engineer

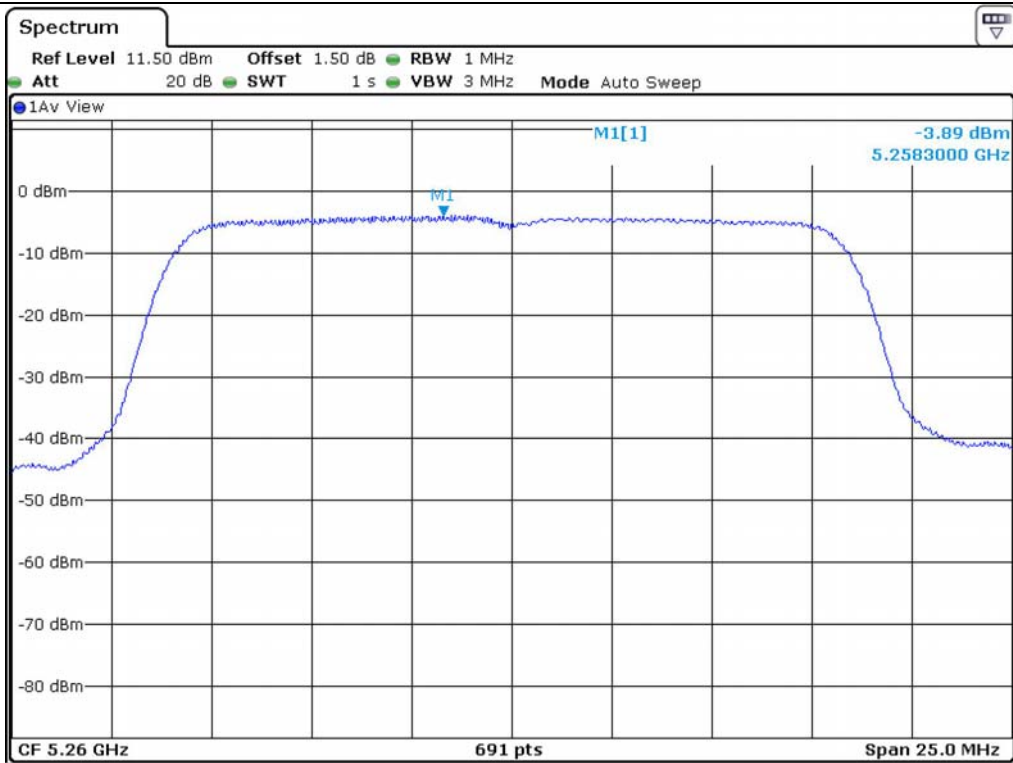


Low Channel (5 180 MHz)

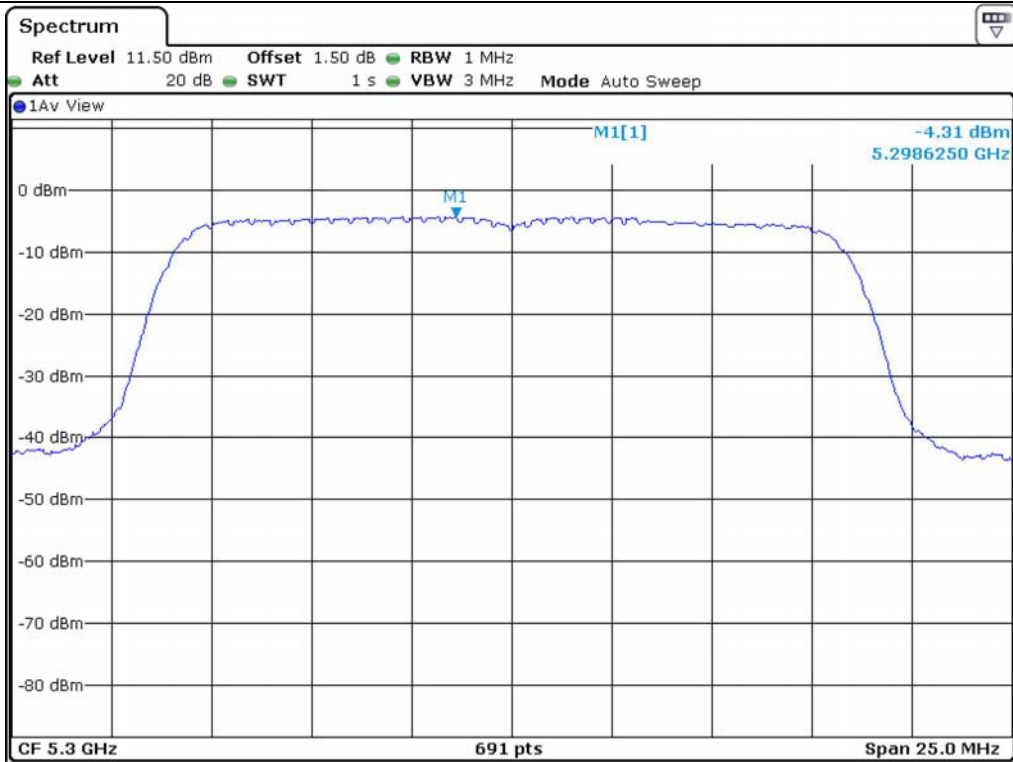


Middle Channel (5 200 MHz)

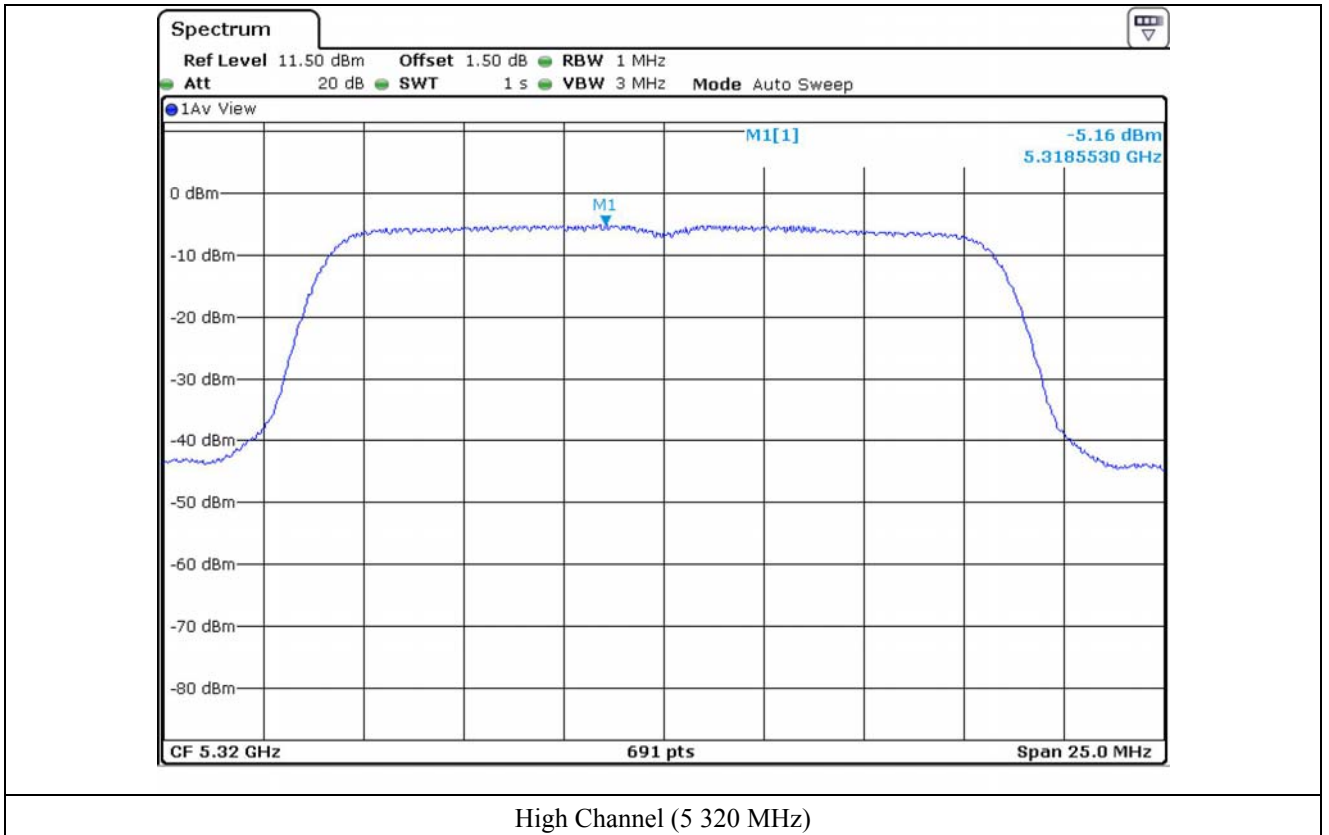


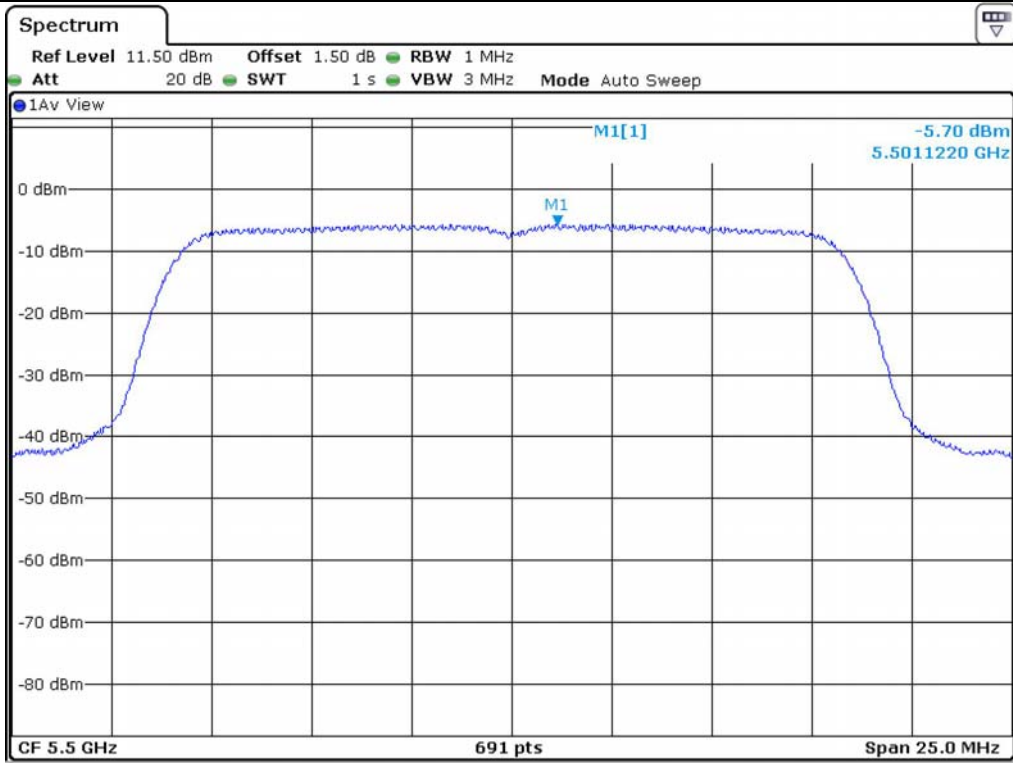


Low Channel (5 260 MHz)

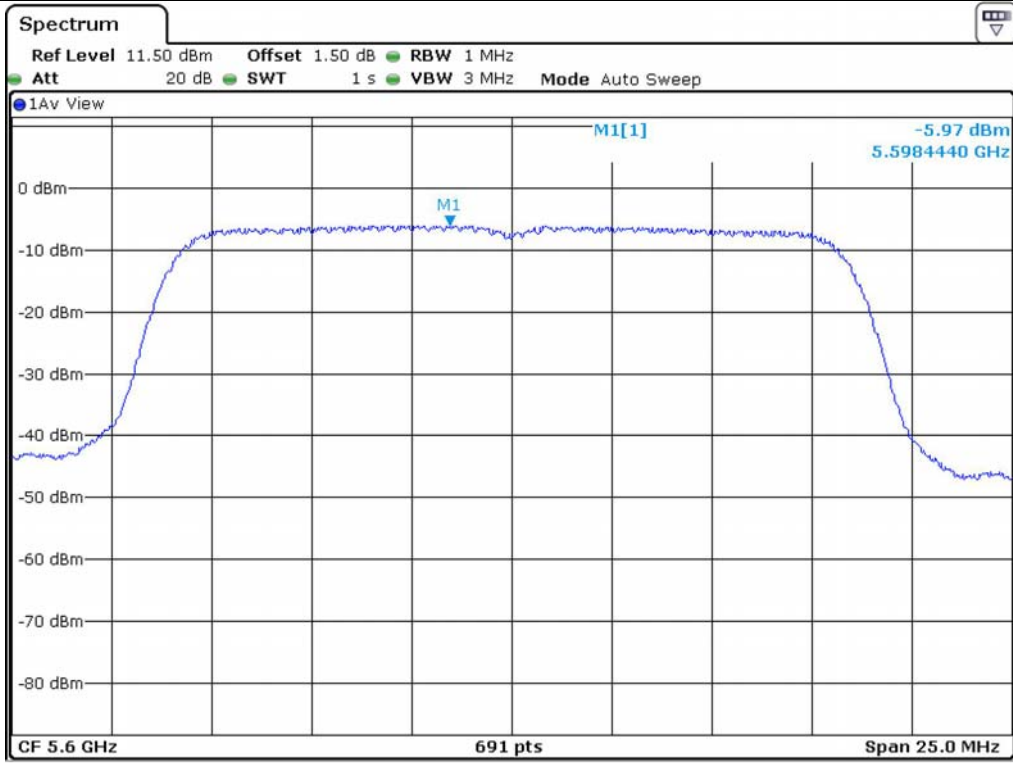


Middle Channel (5 300 MHz)

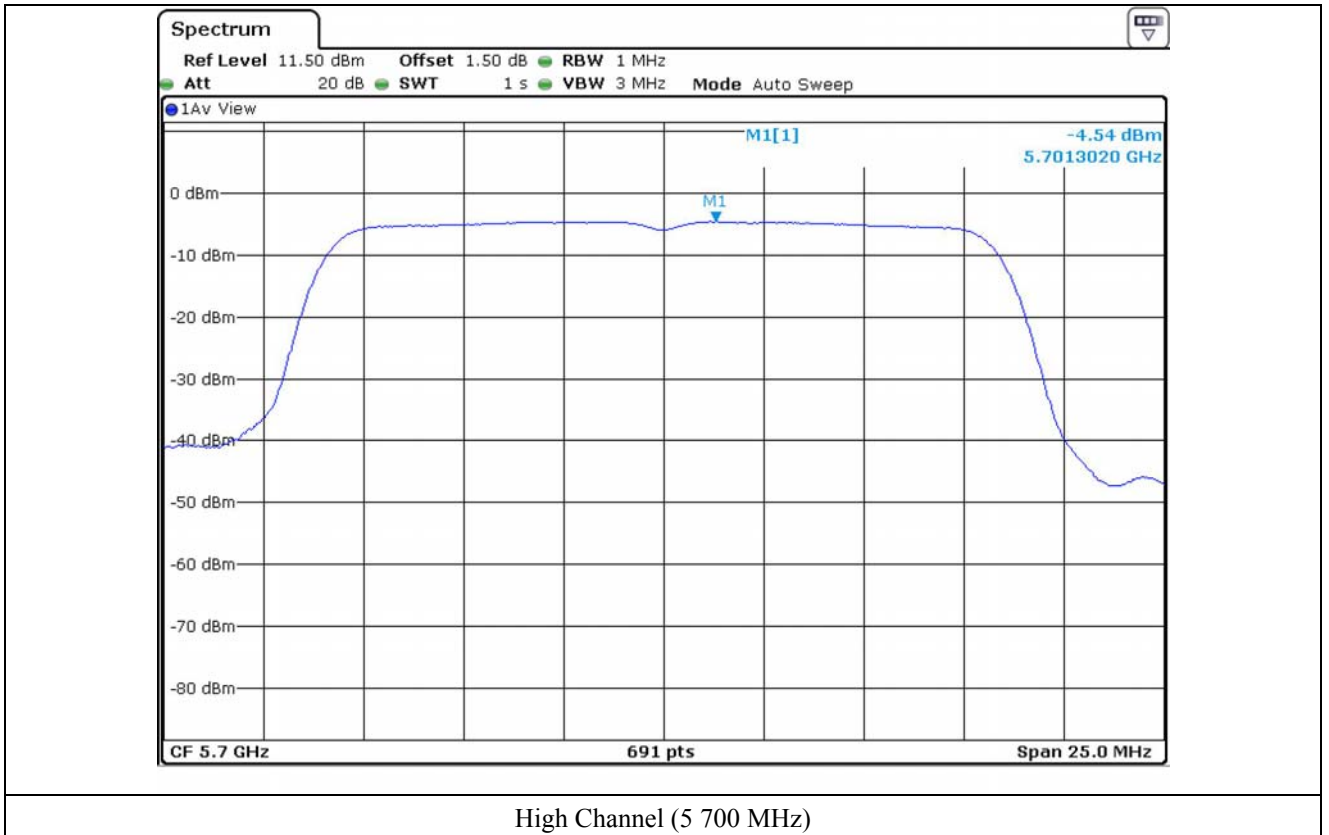




Low Channel (5 500 MHz)



Middle Channel (5 600 MHz)



High Channel (5 700 MHz)

9.4.2 Test data for Antenna 1

- Test Date : December 16, 2013
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	-4.17	4.00	8.17
	Middle	5 200	-4.60	4.00	8.60
	High	5 240	-4.64	4.00	8.64
5 250 ~ 5 350	Low	5 260	-4.06	11.00	15.06
	Middle	5 300	-3.29	11.00	14.29
	High	5 320	-3.91	11.00	14.91
5 470 ~ 5 725	Low	5 500	-4.07	11.00	15.07
	Middle	5 600	-4.18	11.00	15.18
	High	5 700	-3.57	11.00	14.57

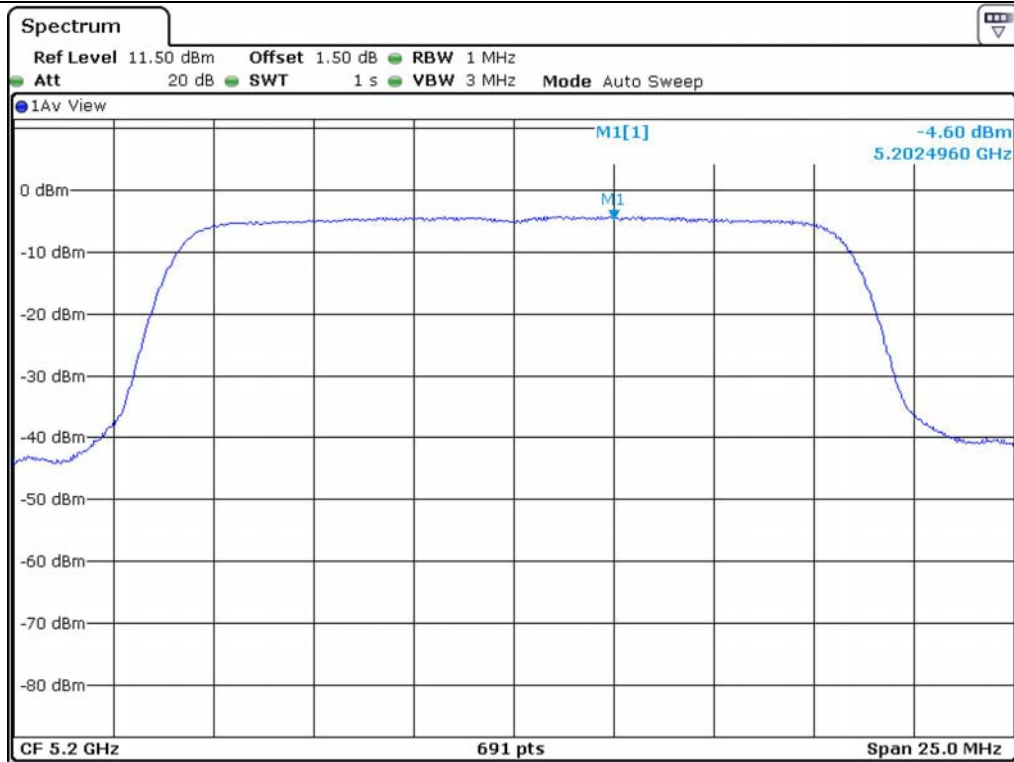
Remark: See next page for measurement data.



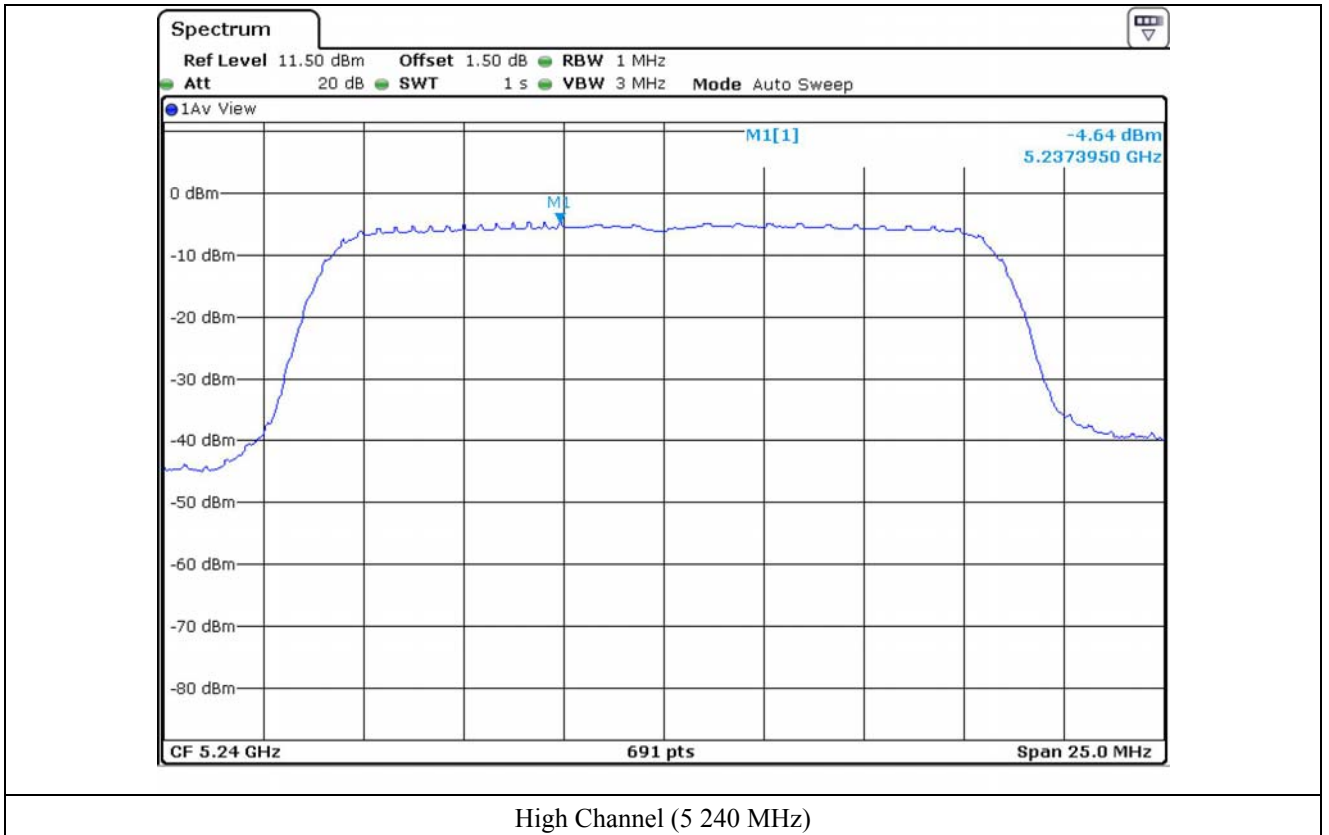
Tested by: Hong-Kyu, Lee/ Engineer



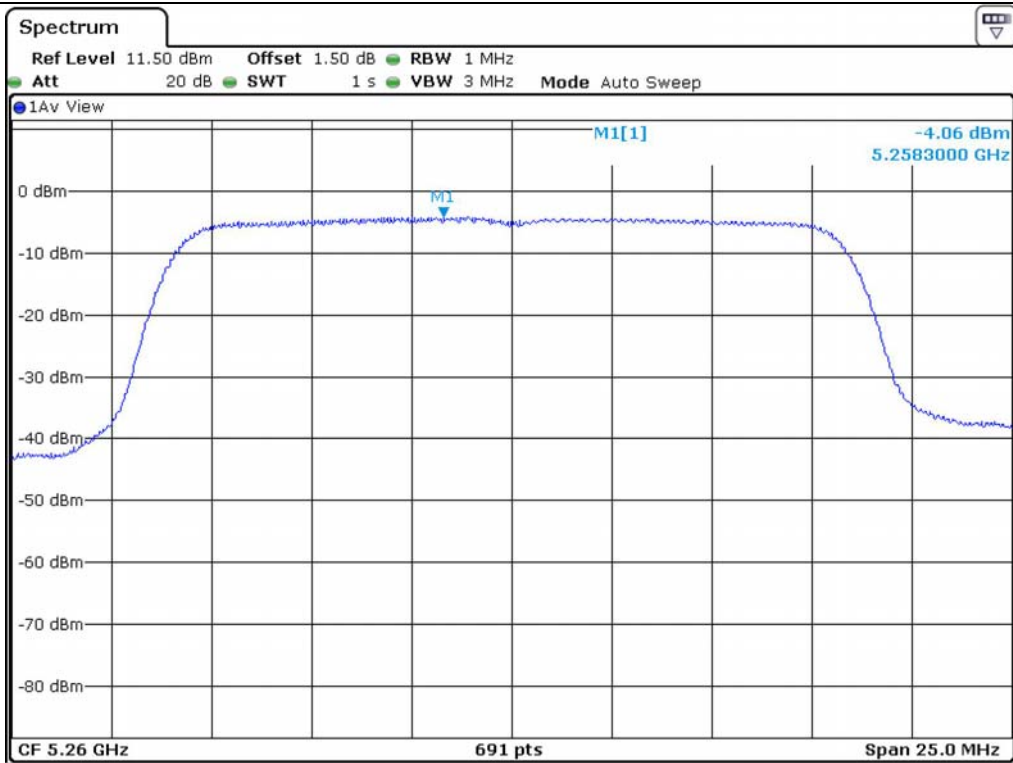
Low Channel (5 180 MHz)



Middle Channel (5 200 MHz)



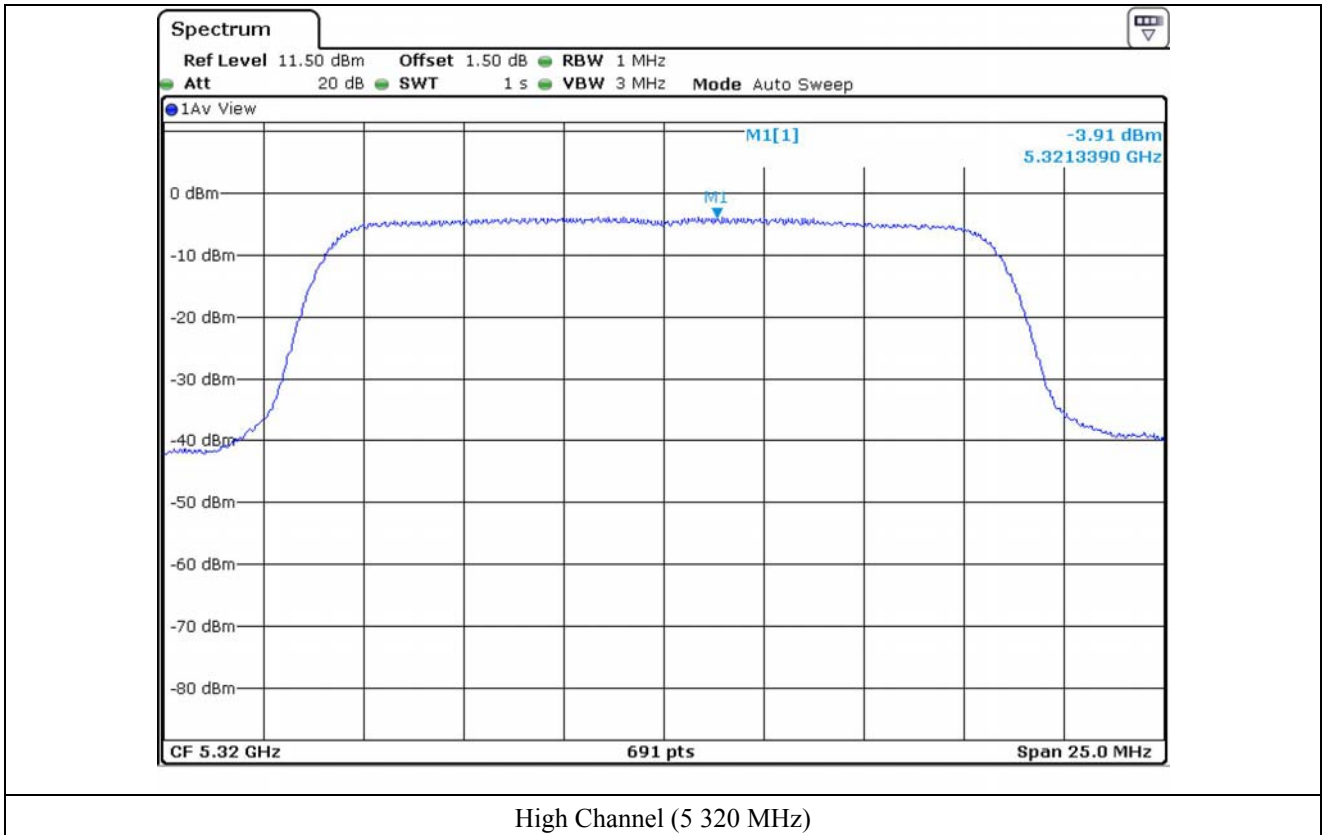
High Channel (5 240 MHz)



Low Channel (5 260 MHz)

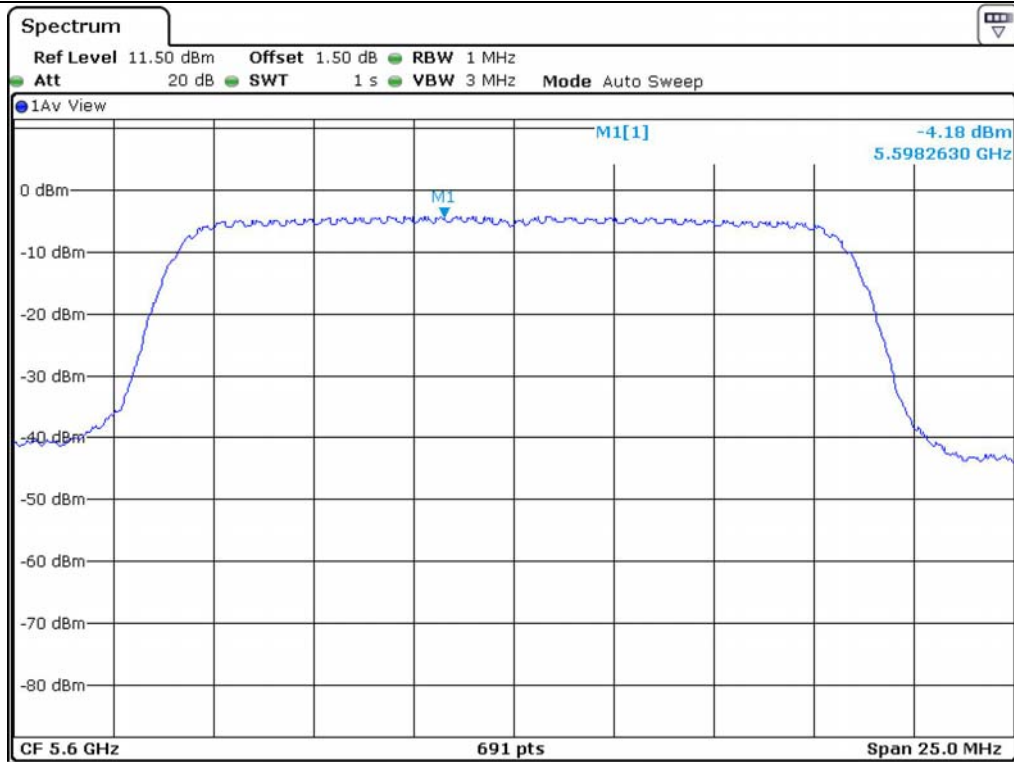


Middle Channel (5 300 MHz)

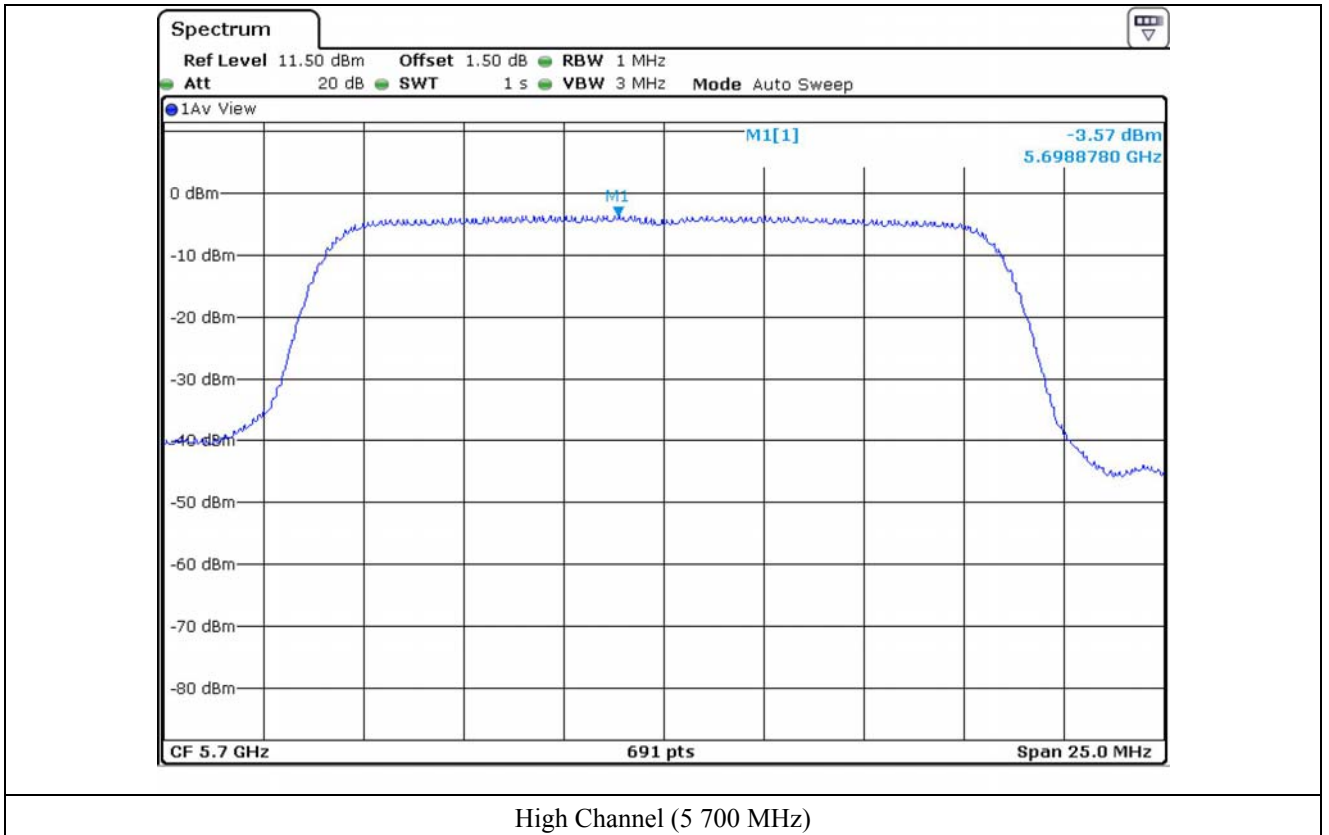




Low Channel (5 500 MHz)



Middle Channel (5 600 MHz)



High Channel (5 700 MHz)

9.5 Test data for 802.11n_HT20 RLAN Mode

9.5.1 Test data for Antenna 0

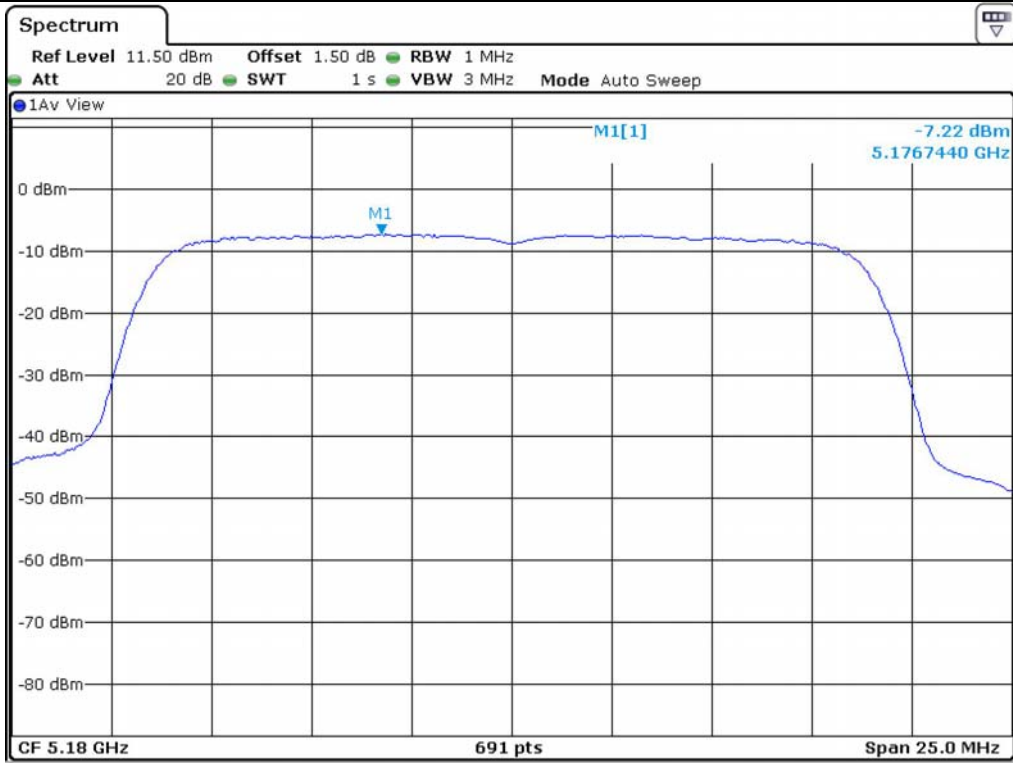
- Test Date : December 16, 2013
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	-7.22	4.00	11.22
	Middle	5 200	-7.25	4.00	11.25
	High	5 240	-5.42	4.00	9.42
5 250 ~ 5 350	Low	5 260	-6.02	11.00	17.02
	Middle	5 300	-6.27	11.00	17.27
	High	5 320	-7.10	11.00	18.10
5 470 ~ 5 725	Low	5 500	-7.40	11.00	18.40
	Middle	5 600	-7.83	11.00	18.83
	High	5 700	-6.01	11.00	17.01

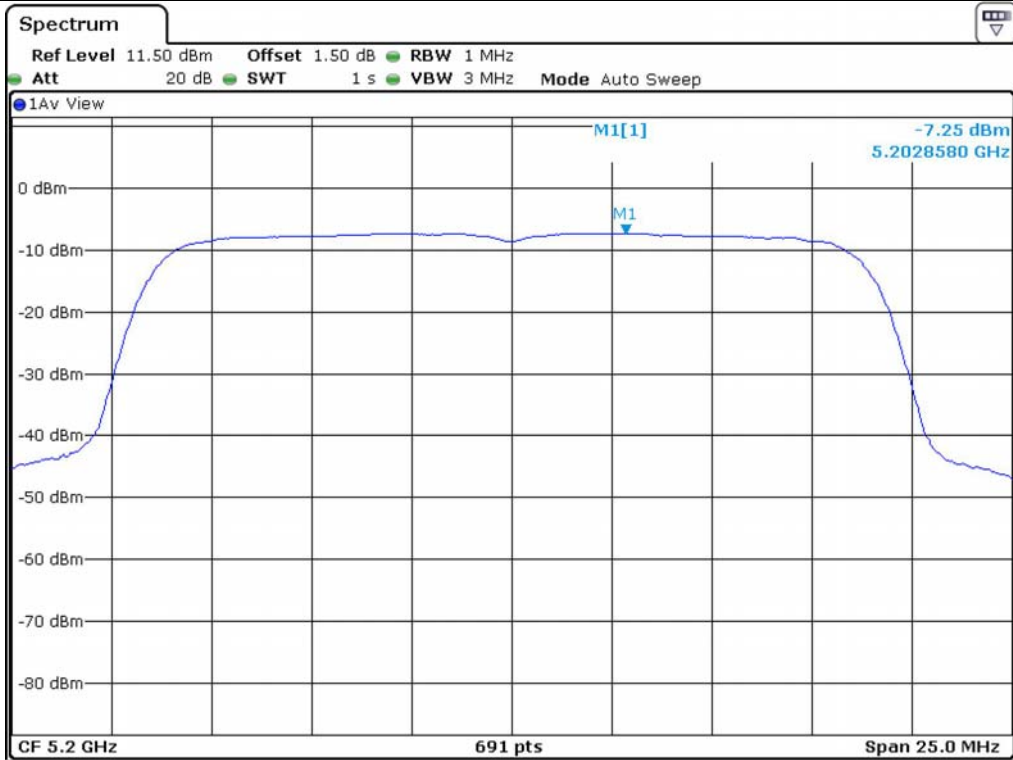
Remark: See next page for measurement data.



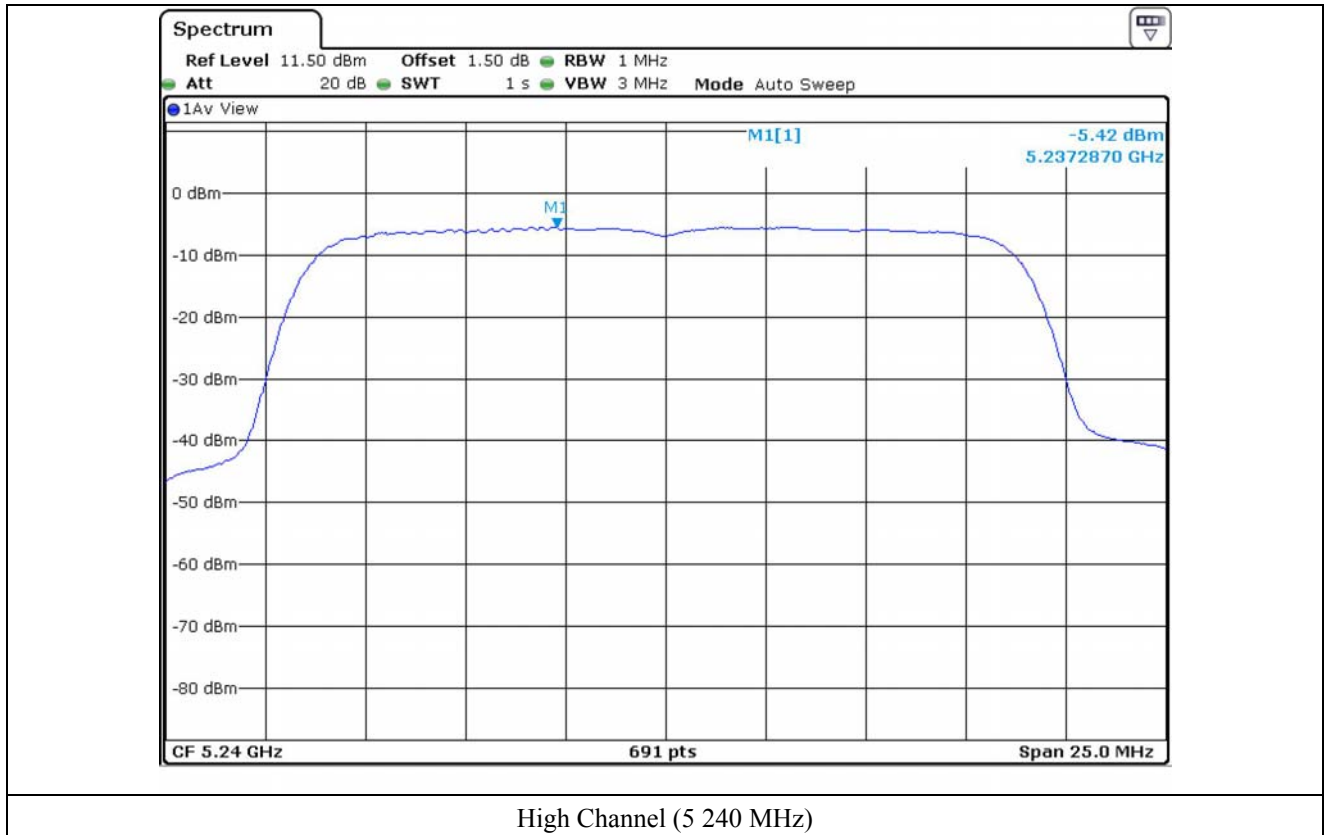
Tested by: Hong-Kyu, Lee/ Engineer

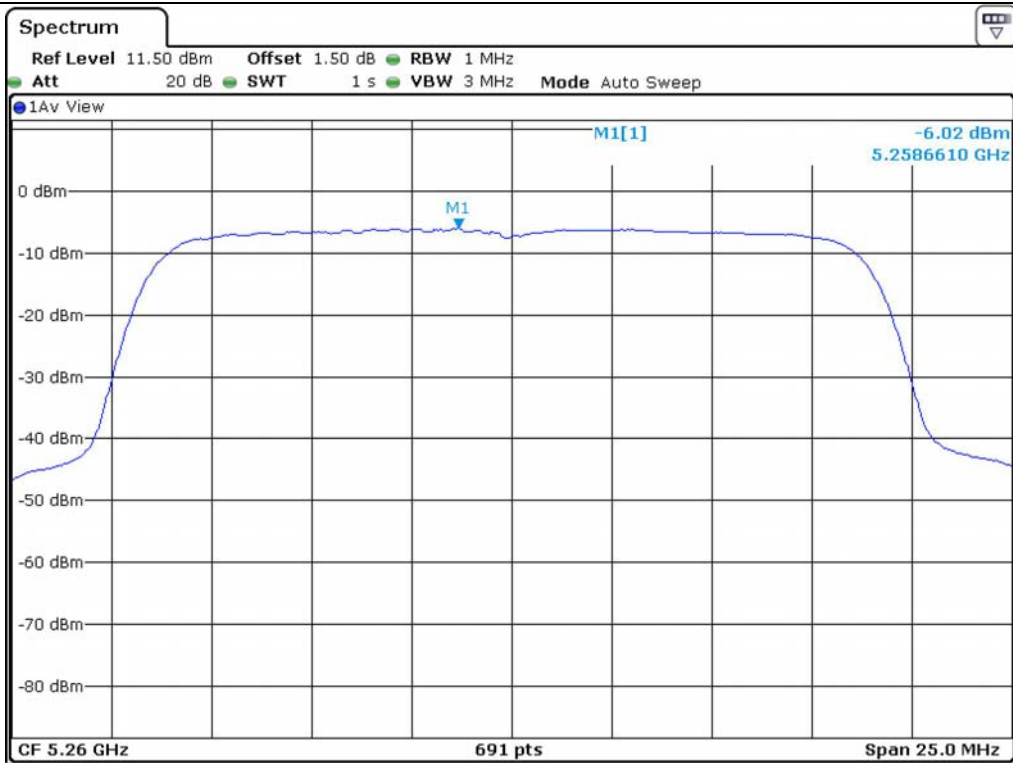


Low Channel (5 180 MHz)

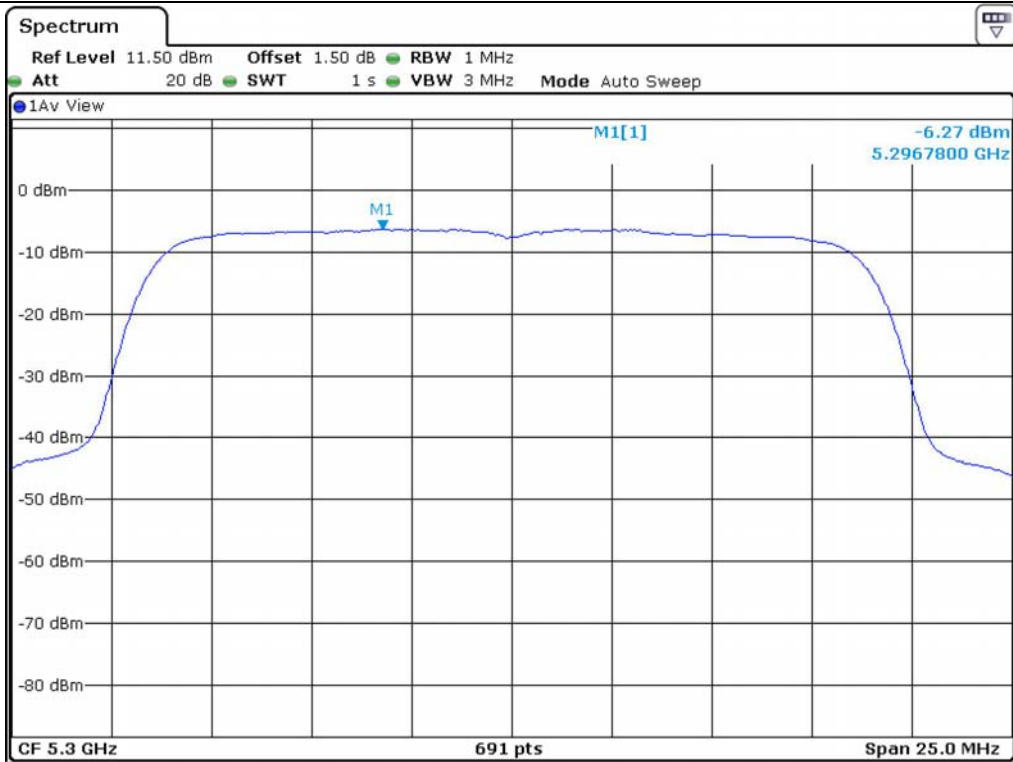


Middle Channel (5 200 MHz)

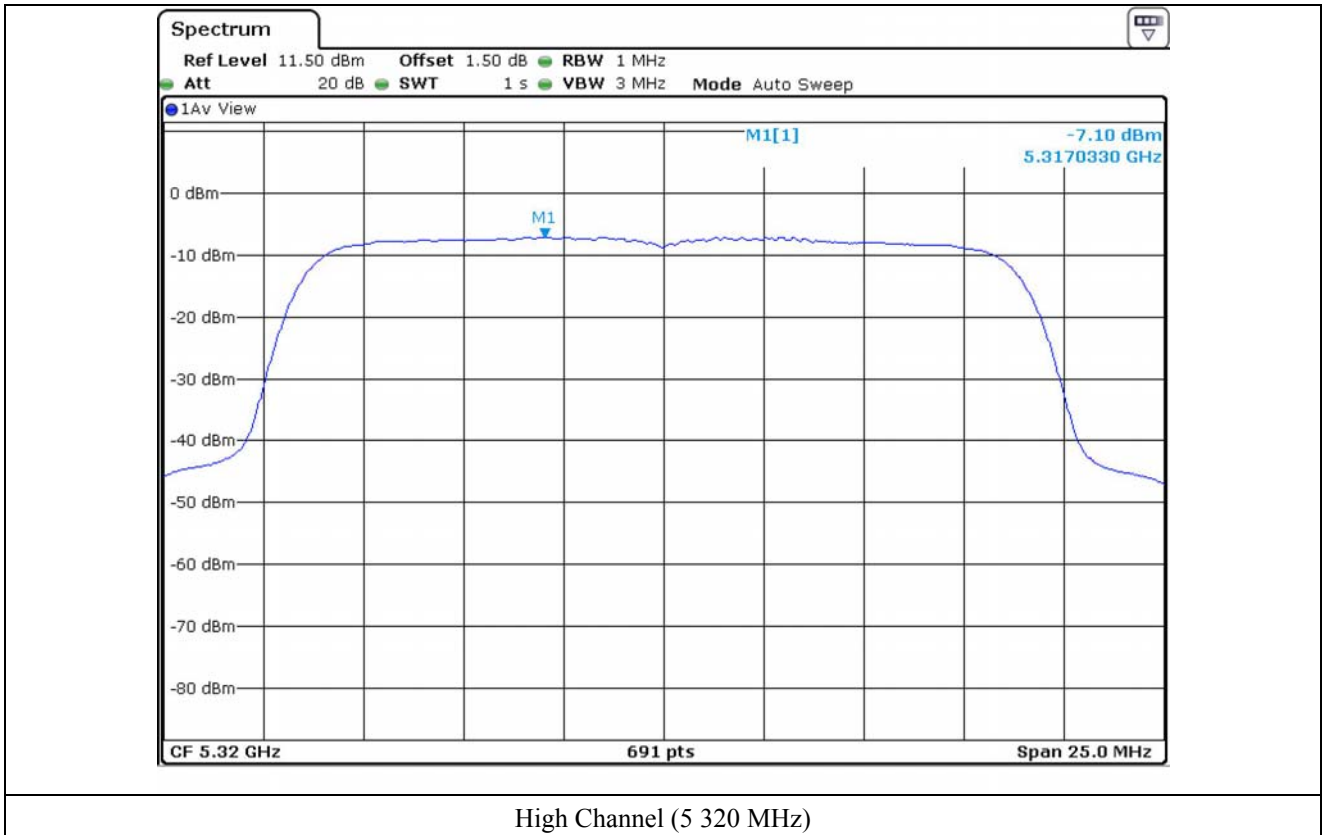




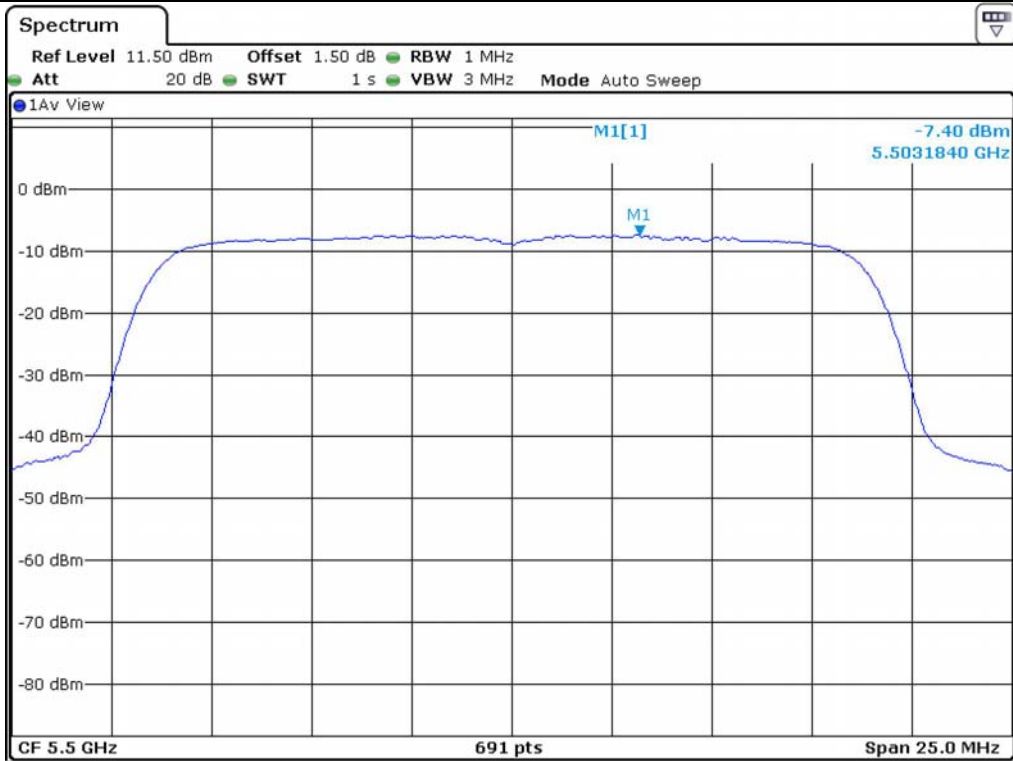
Low Channel (5 260 MHz)



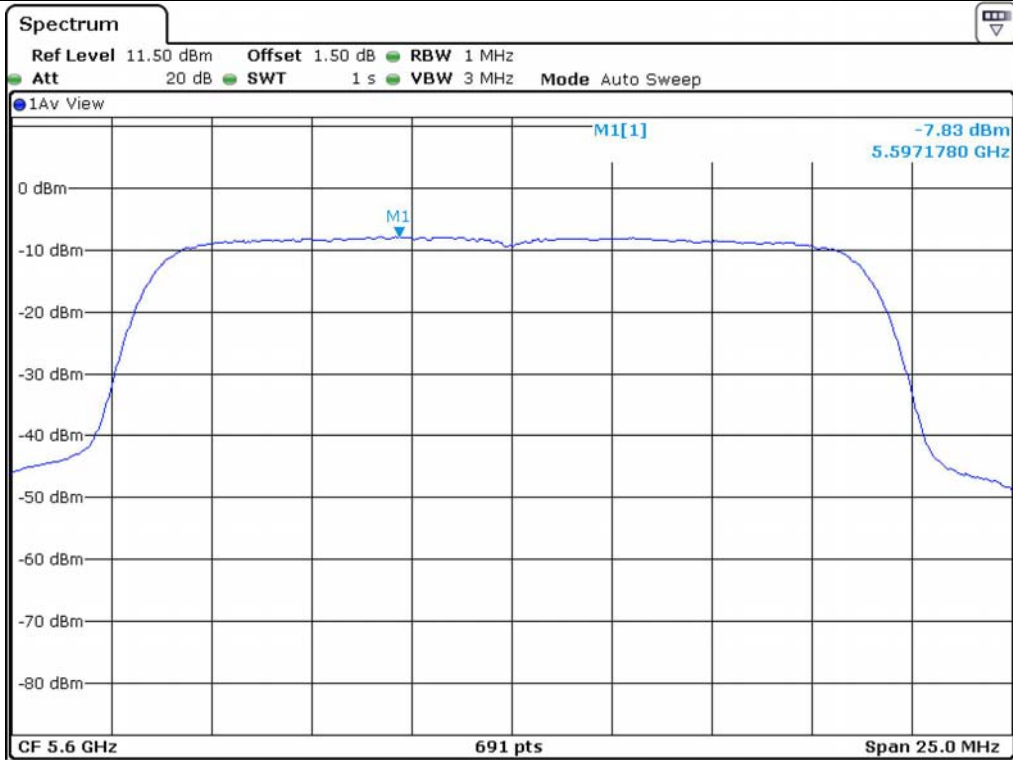
Middle Channel (5 300 MHz)



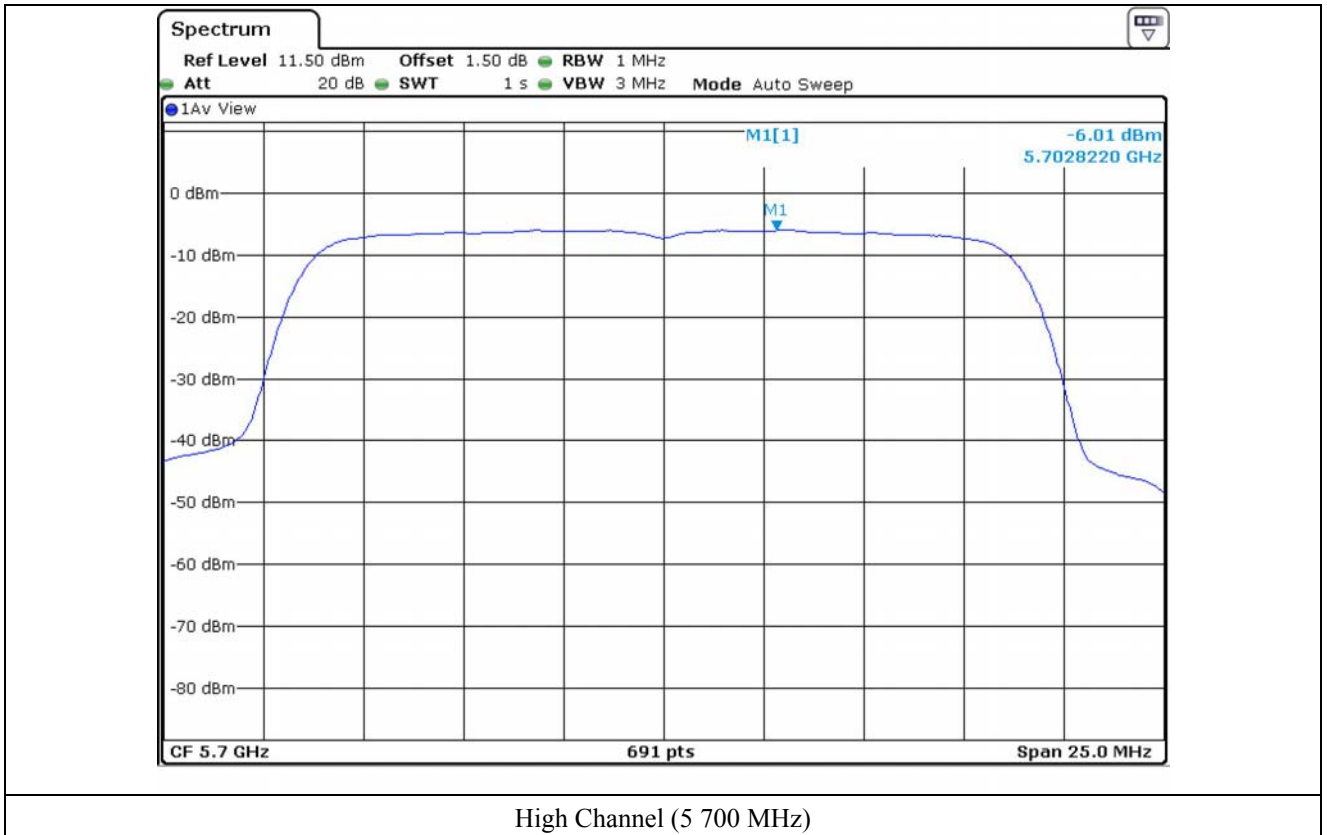
High Channel (5 320 MHz)



Low Channel (5 500 MHz)



Middle Channel (5 600 MHz)



High Channel (5 700 MHz)

9.5.2 Test data for Antenna 1

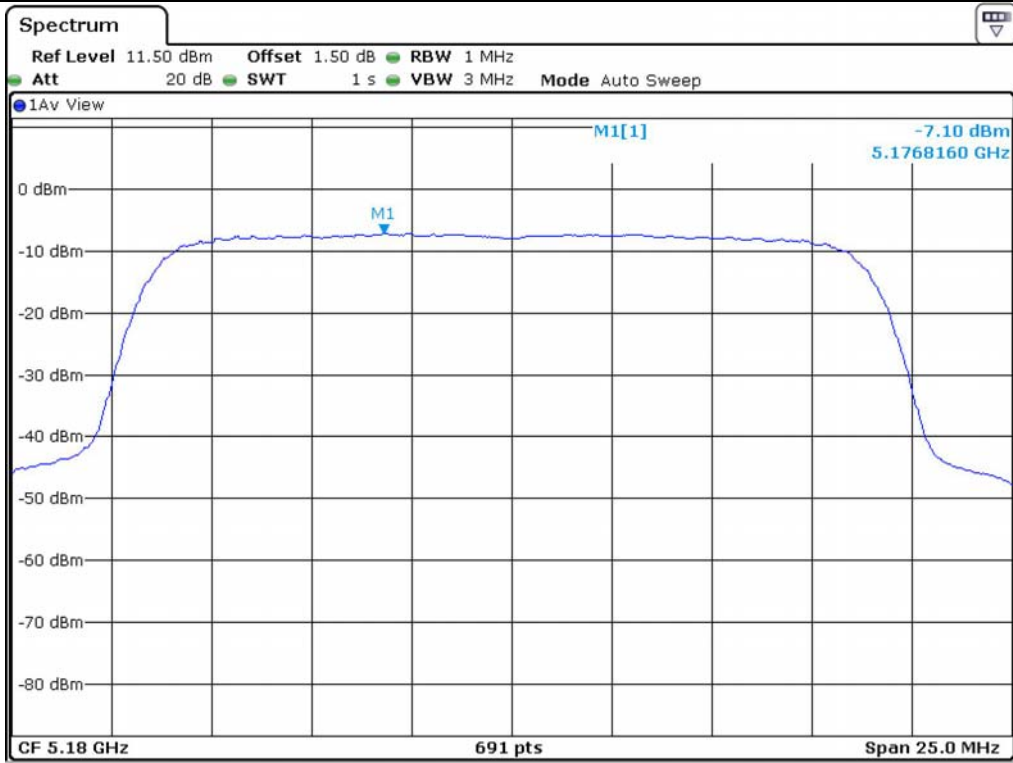
- Test Date : December 16, 2013
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	-7.10	4.00	11.10
	Middle	5 200	-7.72	4.00	11.72
	High	5 240	-6.92	4.00	10.92
5 250 ~ 5 350	Low	5 260	-5.97	11.00	16.97
	Middle	5 300	-5.22	11.00	16.22
	High	5 320	-5.84	11.00	16.84
5 470 ~ 5 725	Low	5 500	-5.69	11.00	16.69
	Middle	5 600	-6.02	11.00	17.02
	High	5 700	-5.46	11.00	16.46

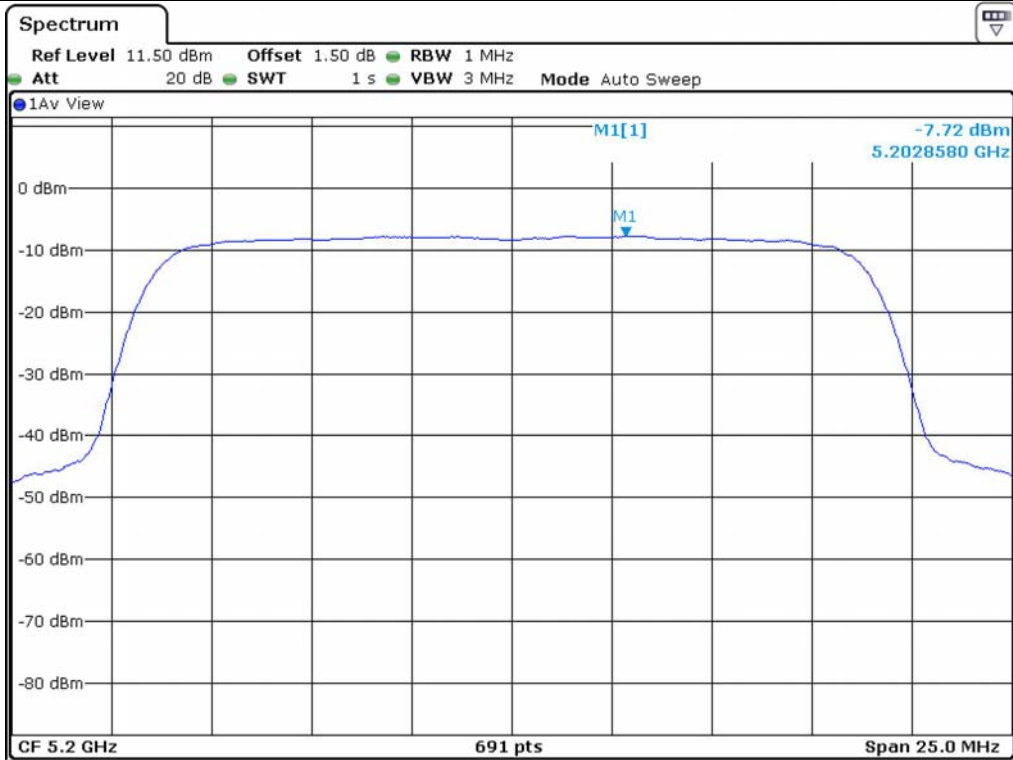
Remark: See next page for measurement data.



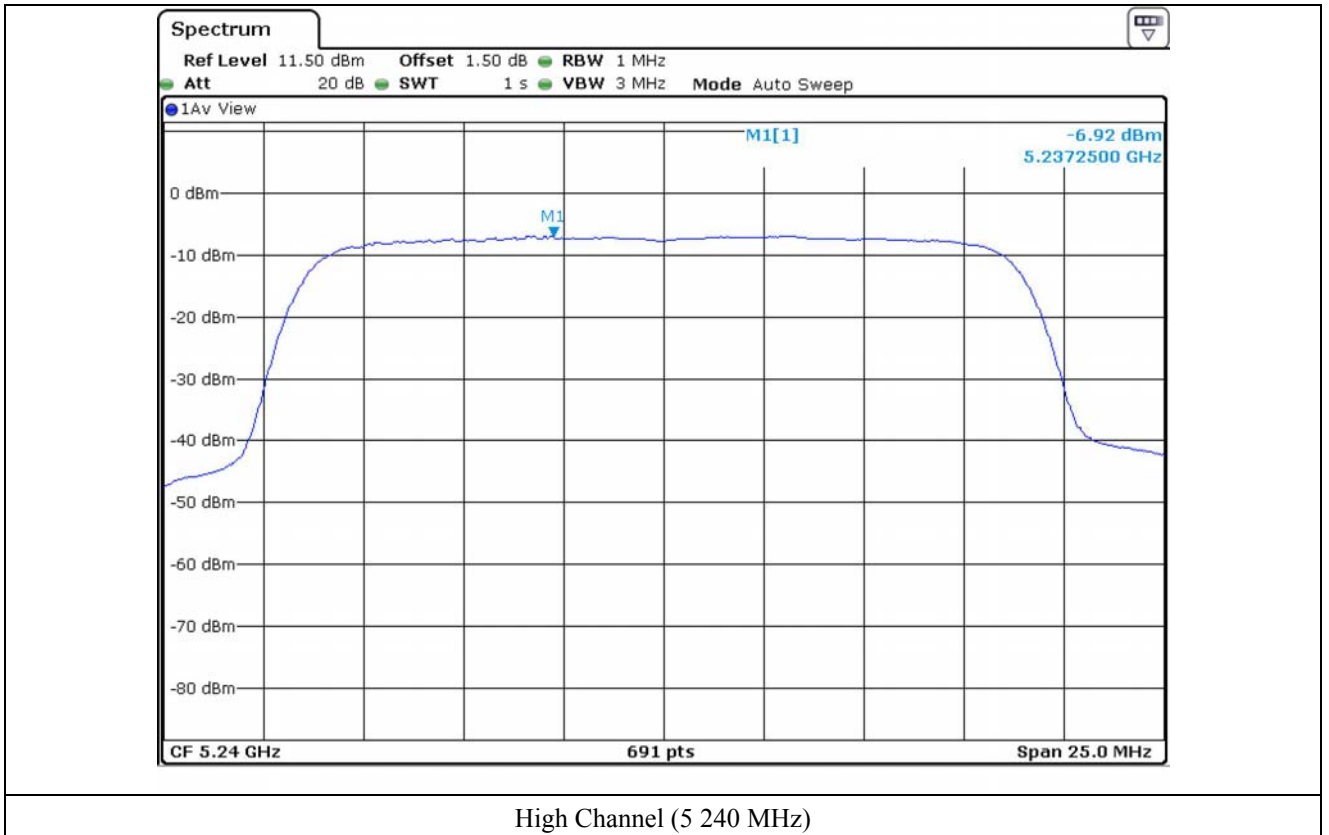
Tested by: Hong-Kyu, Lee/ Engineer

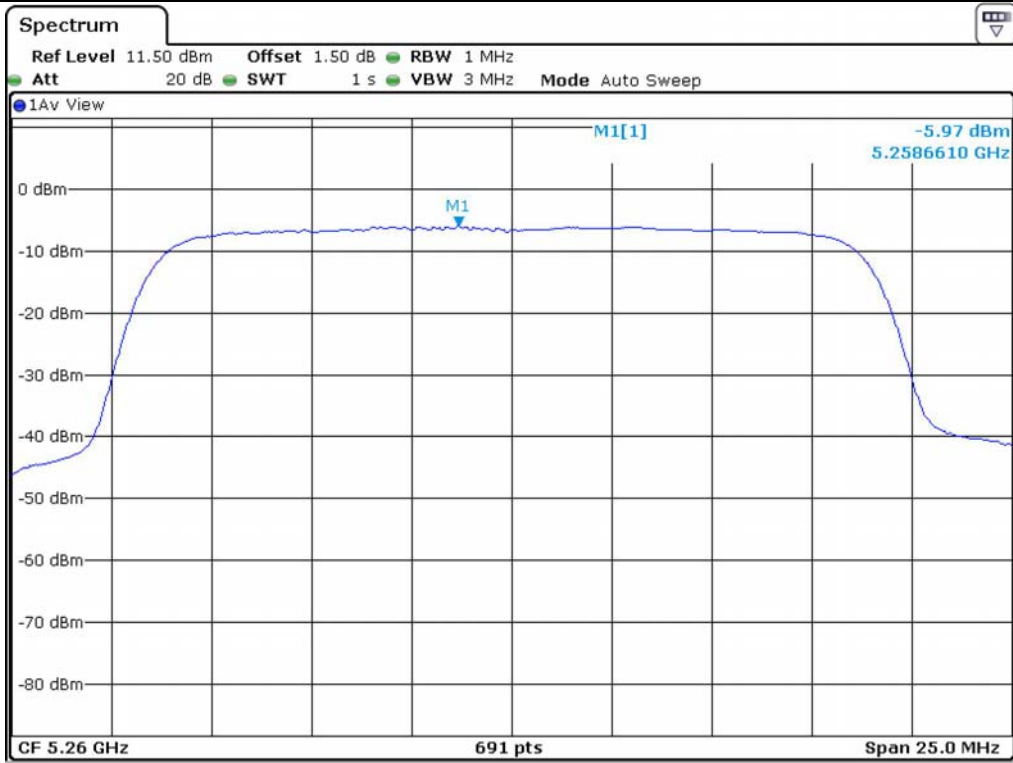


Low Channel (5 180 MHz)

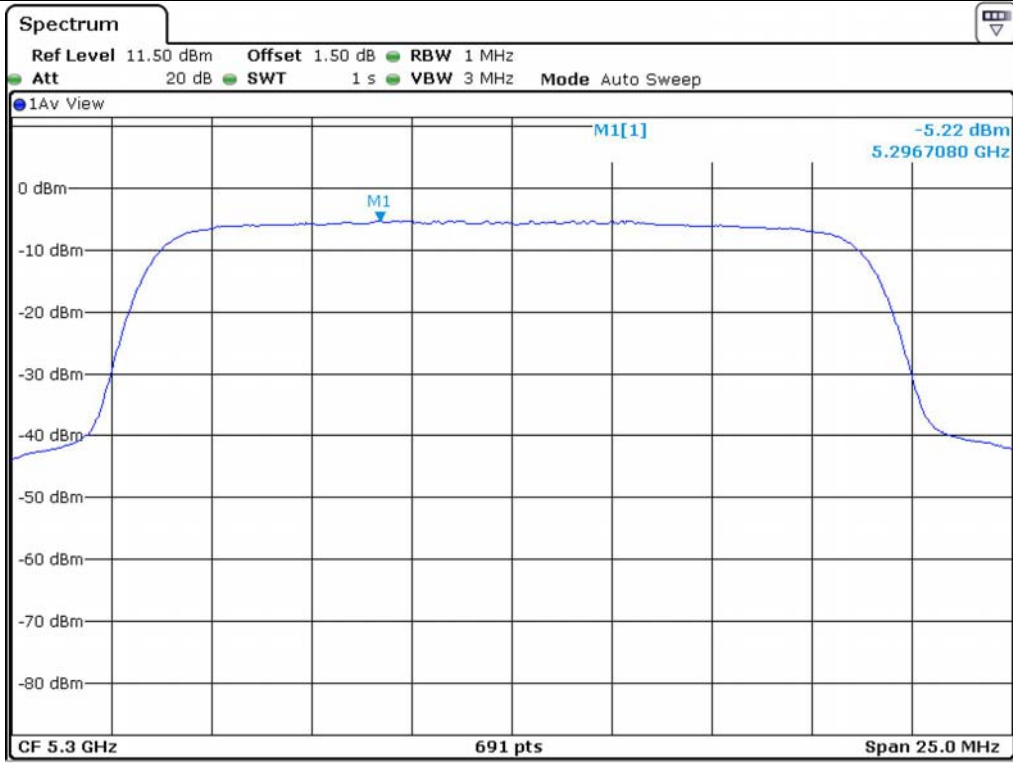


Middle Channel (5 200 MHz)

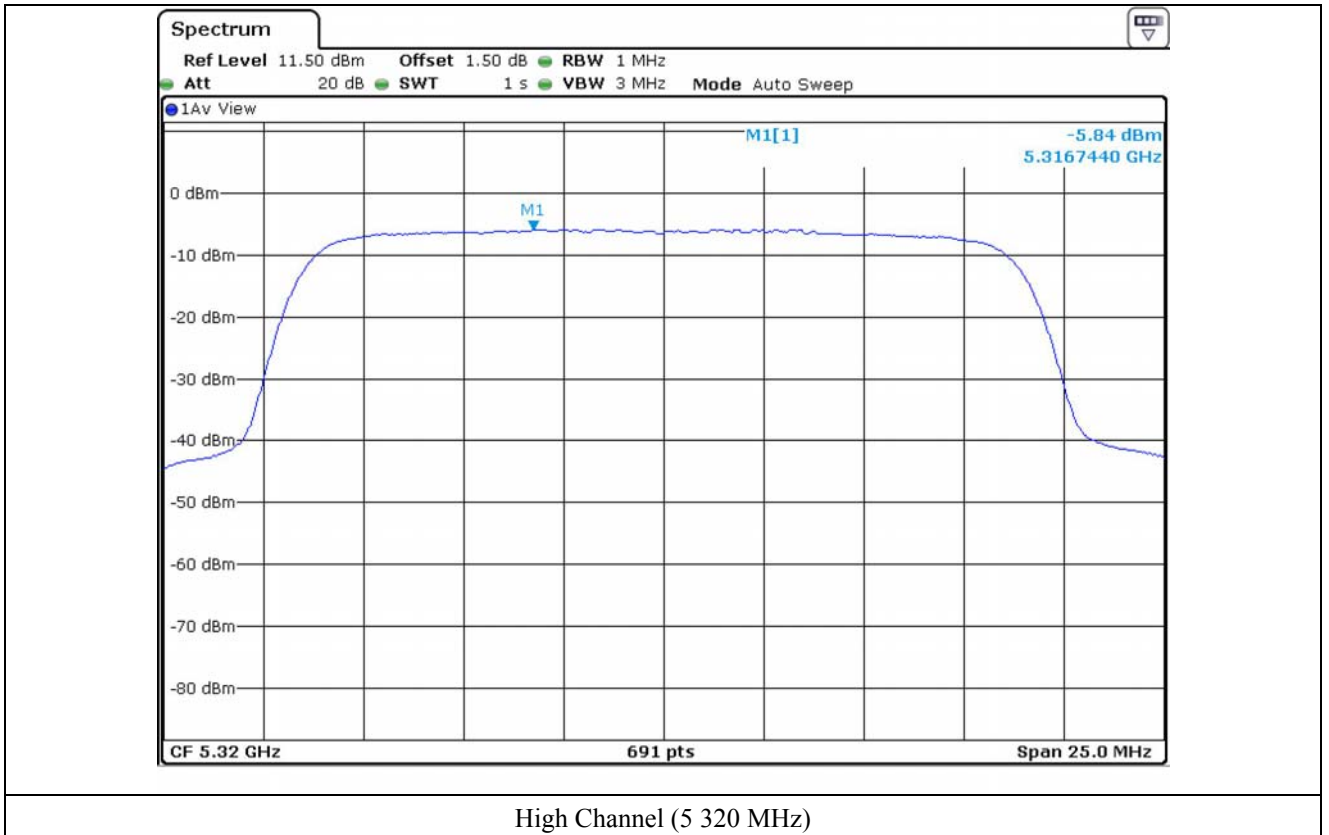




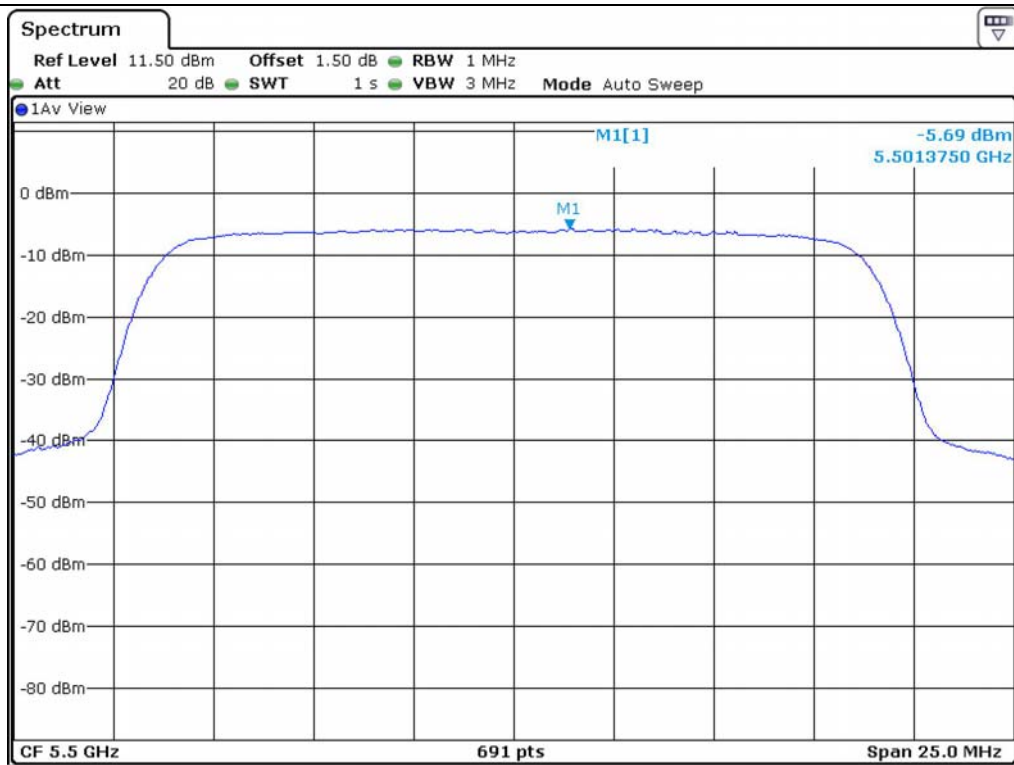
Low Channel (5 260 MHz)



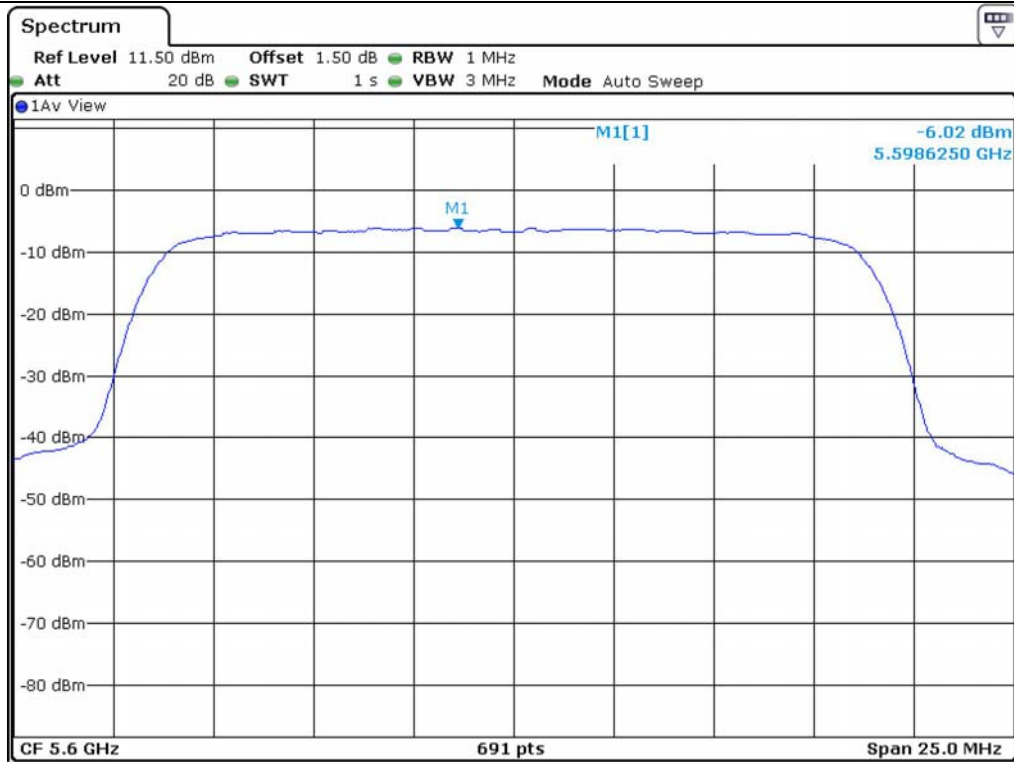
Middle Channel (5 300 MHz)



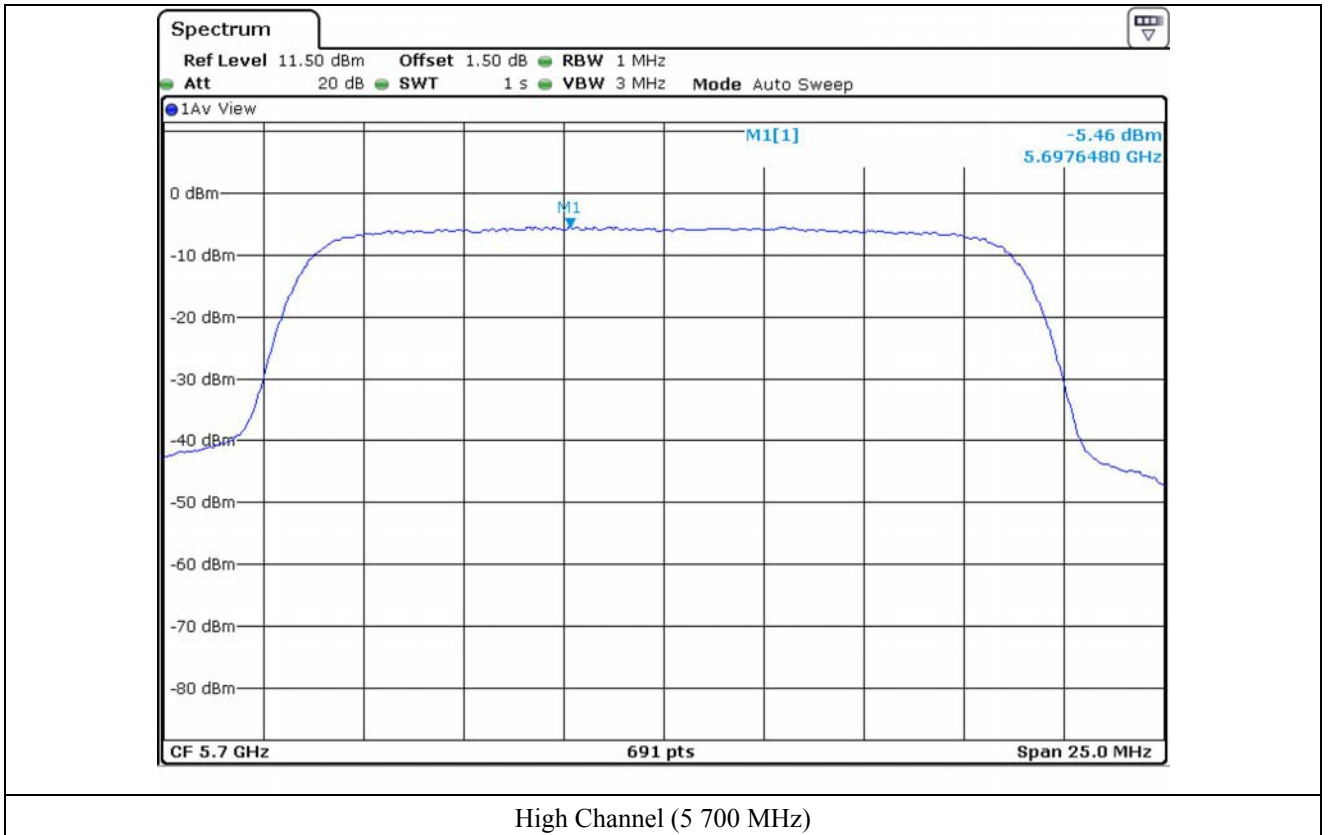
High Channel (5 320 MHz)



Low Channel (5 500 MHz)



Middle Channel (5 600 MHz)



High Channel (5 700 MHz)

9.5.3 Test data for Multiple transmit

- Test Date : December 16, 2013
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	CALCULATED POWER (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	-4.15	4.00	8.15
	Middle	5 200	-4.47	4.00	8.47
	High	5 240	-3.10	4.00	7.10
5 250 ~ 5 350	Low	5 260	-2.98	11.00	13.98
	Middle	5 300	-2.70	11.00	13.70
	High	5 320	-3.41	11.00	14.41
5 470 ~ 5 725	Low	5 500	-3.45	11.00	14.45
	Middle	5 600	-3.82	11.00	14.82
	High	5 700	-2.72	11.00	13.72

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10 \log (10^{(\text{Antenna1 Power Density}/10)} + 10^{(\text{Antenna2 Power Density}/10)})$



Tested by: Hong-Kyu, Lee/ Engineer

9.6 Test data for 802.11n_HT40 RLAN Mode

9.6.1 Test data for Antenna 0

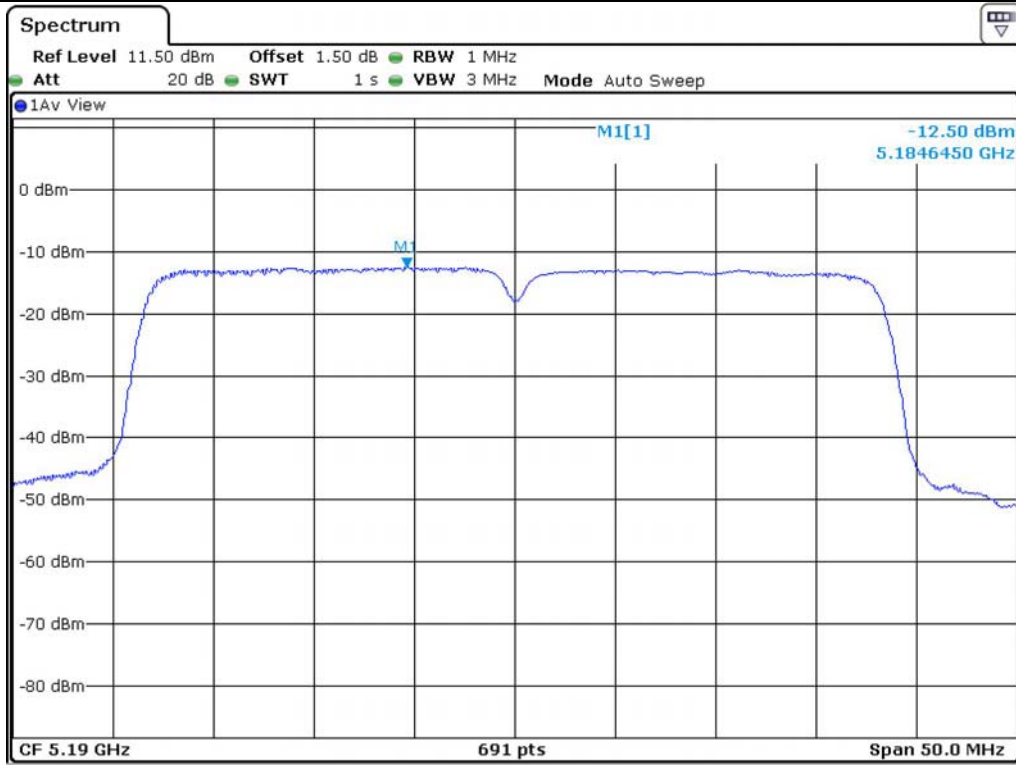
- Test Date : December 16, 2013
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	-12.50	4.00	16.50
	High	5 230	-11.17	4.00	15.17
5 150 ~ 5 250	Low	5 270	-10.73	11.00	21.73
	High	5 310	-11.10	11.00	22.10
5 470 ~ 5 725	Low	5 510	-12.08	11.00	23.08
	Middle	5 590	-12.09	11.00	23.09
	High	5 670	-11.89	11.00	22.89

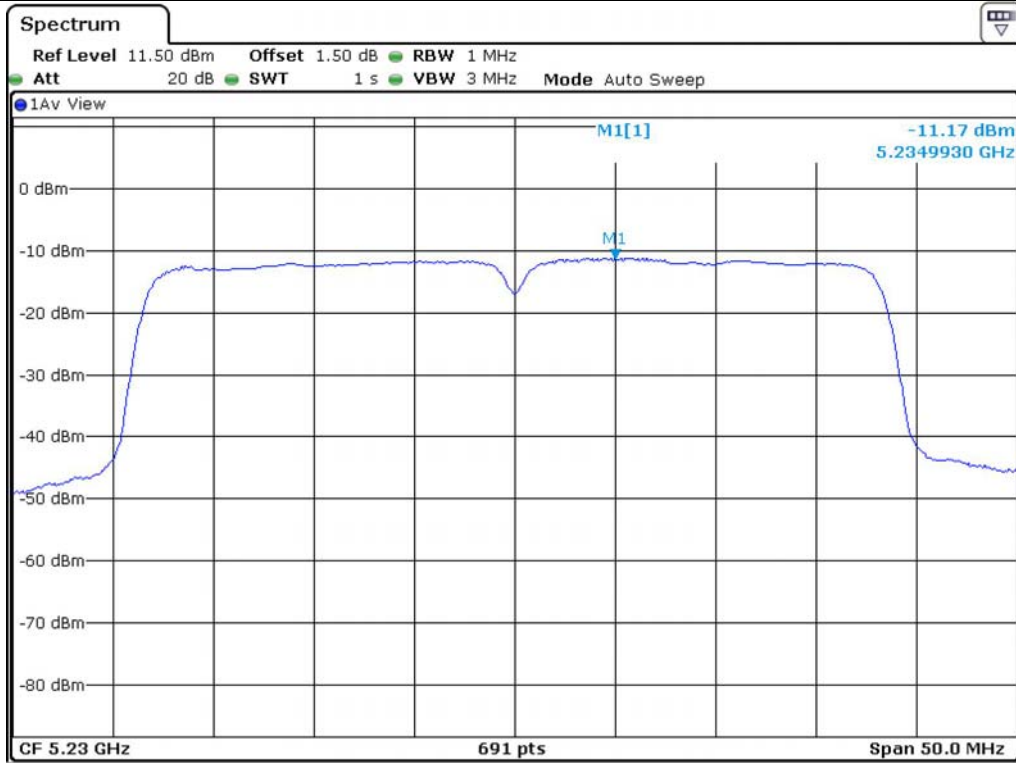
Remark: See next page for measurement data.



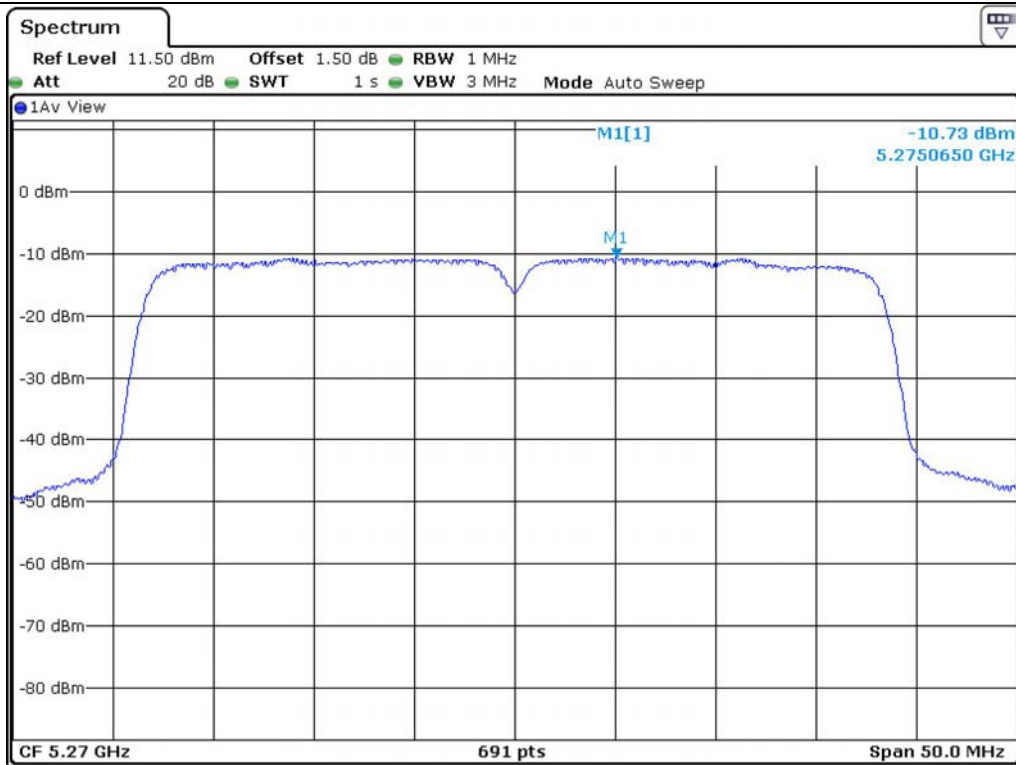
Tested by: Hong-Kyu, Lee/ Engineer



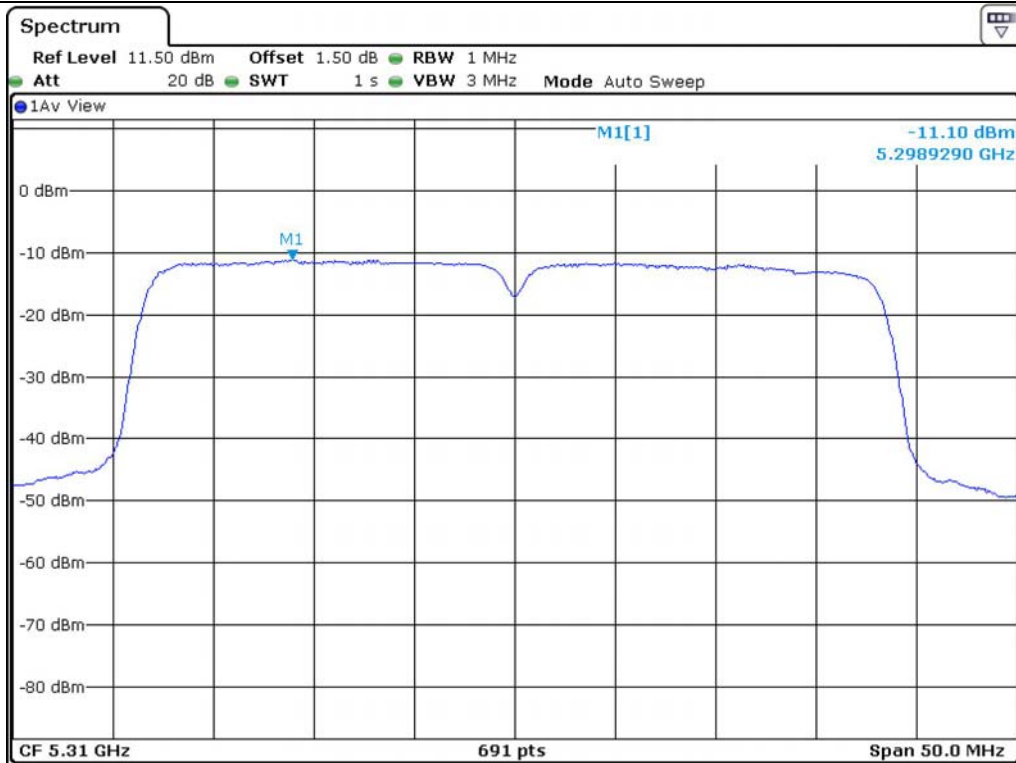
Low Channel (5 190 MHz)



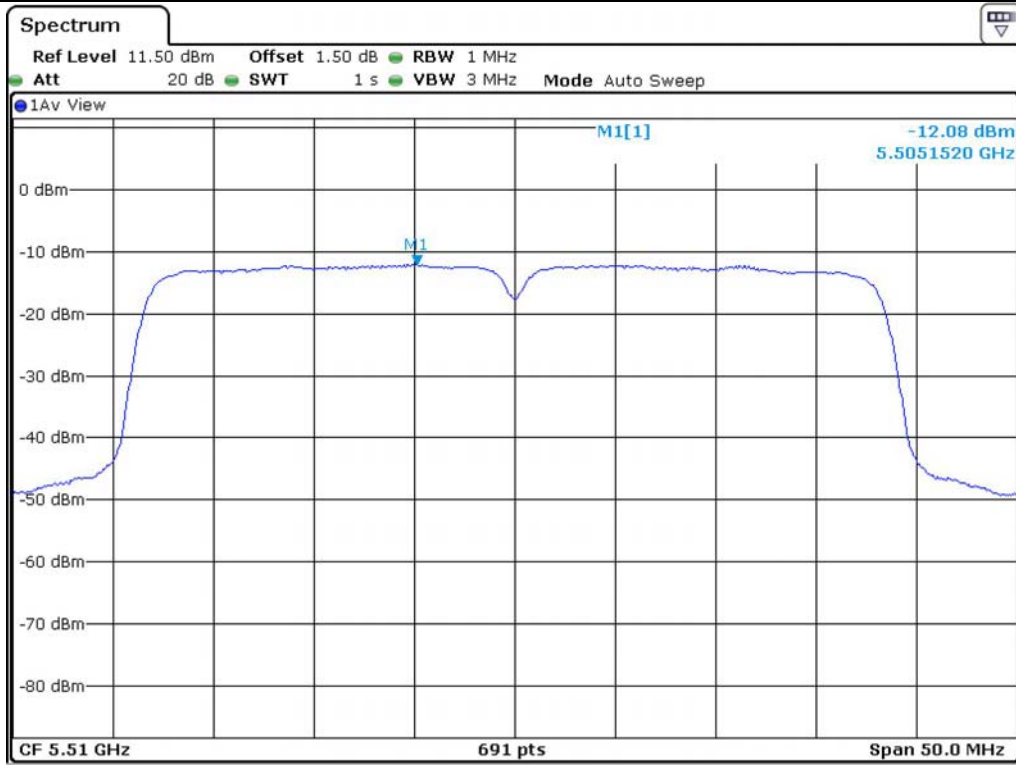
High Channel (5 230 MHz)



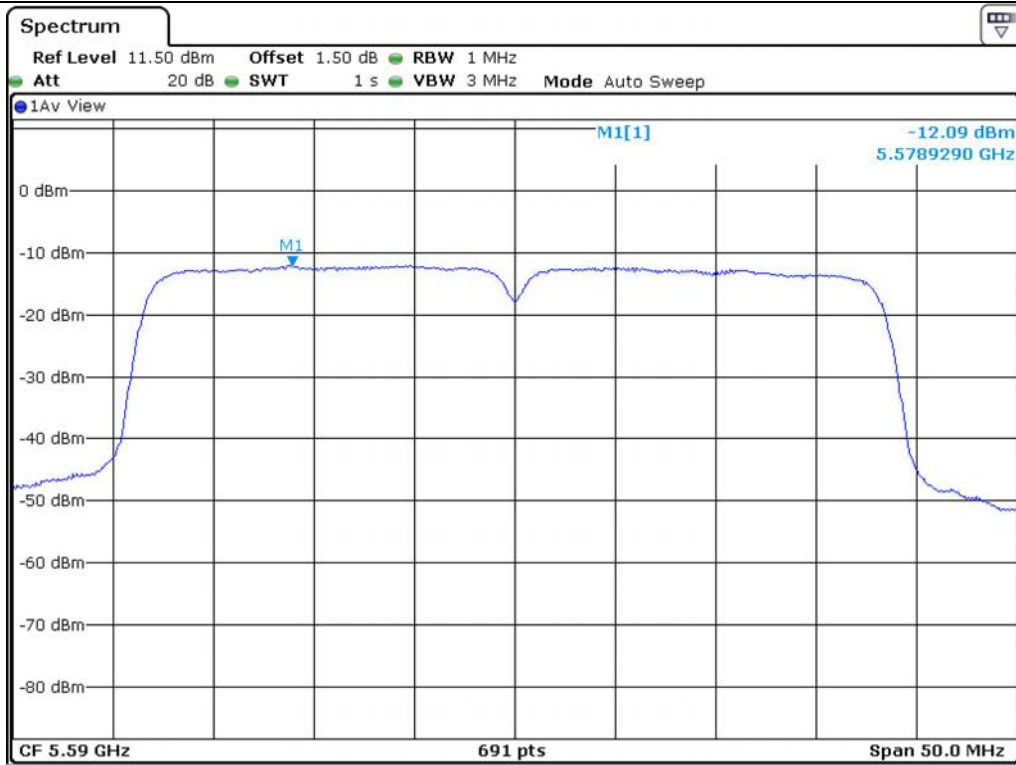
Low Channel (5 270 MHz)



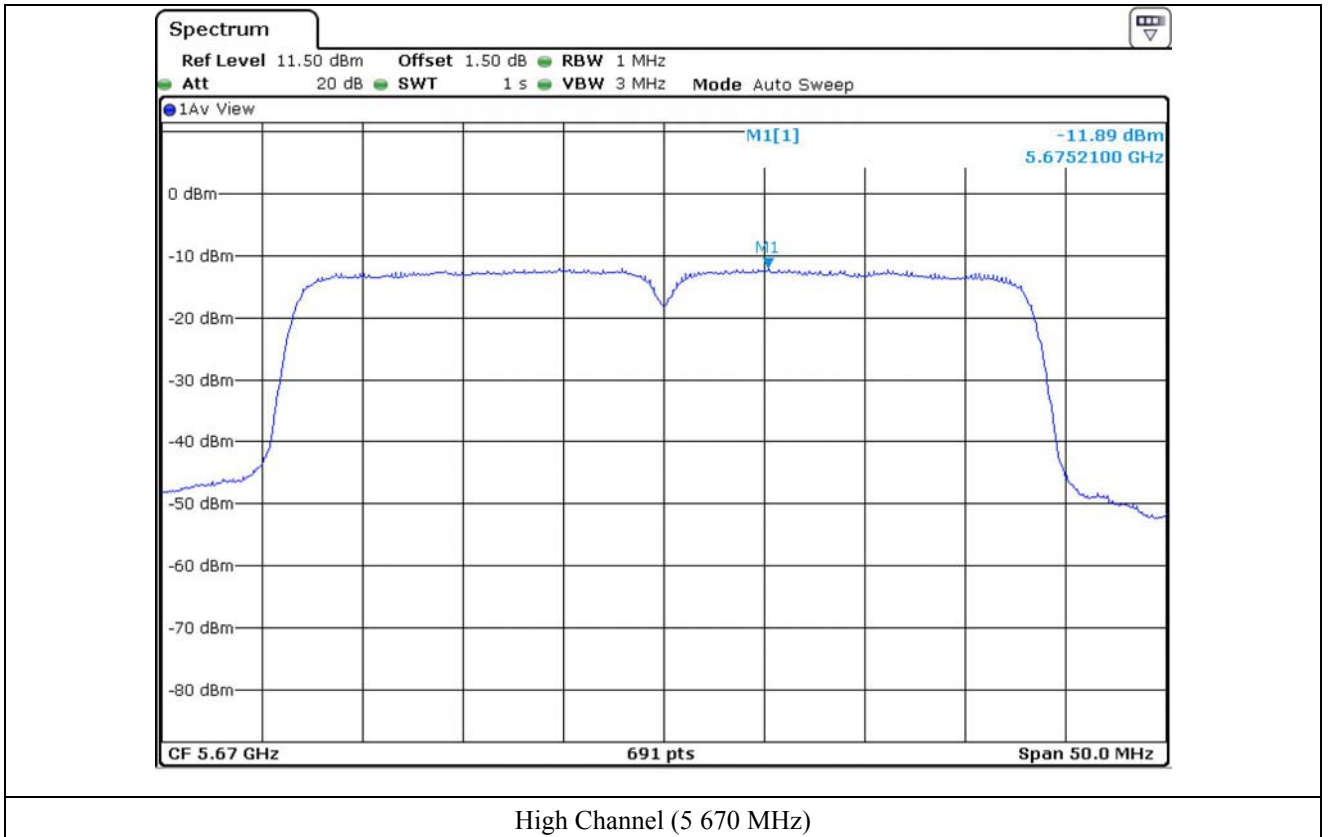
High Channel (5 310 MHz)



Low Channel (5 510 MHz)



Middle Channel (5 590 MHz)



9.6.2 Test data for Antenna 1

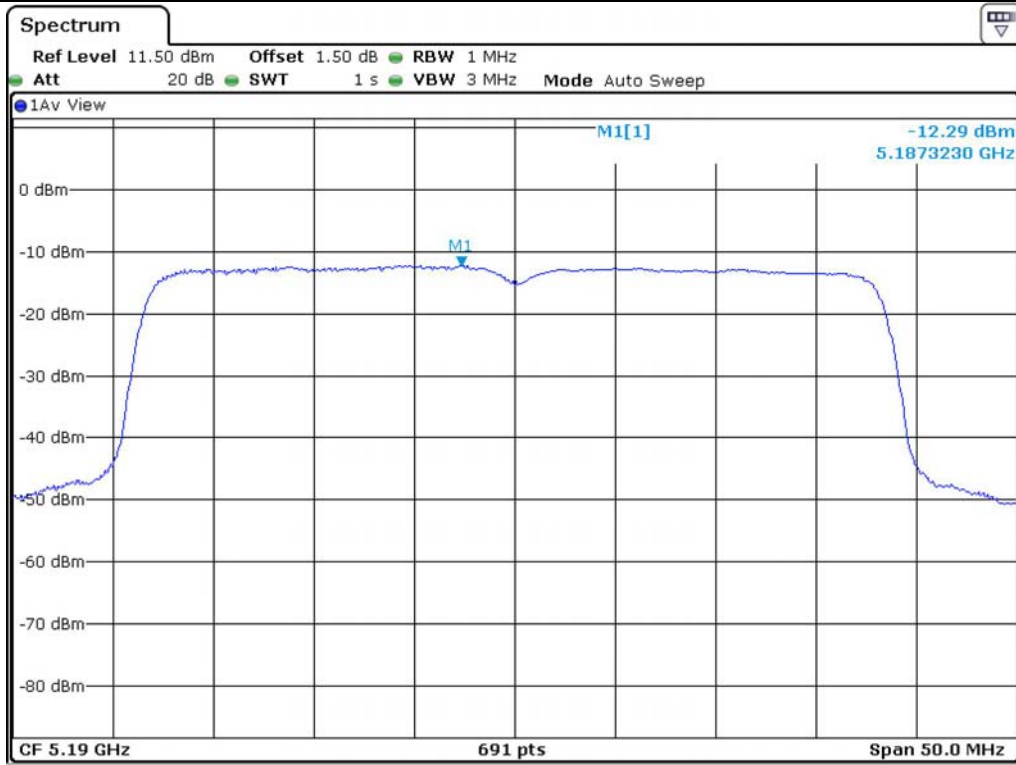
- Test Date : December 16, 2013
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	-12.29	4.00	16.29
	High	5 230	-11.74	4.00	15.74
5 150 ~ 5 250	Low	5 270	-10.71	11.00	21.71
	High	5 310	-10.17	11.00	21.17
5 470 ~ 5 725	Low	5 510	-10.69	11.00	21.69
	Middle	5 590	-10.65	11.00	21.65
	High	5 670	-10.14	11.00	21.14

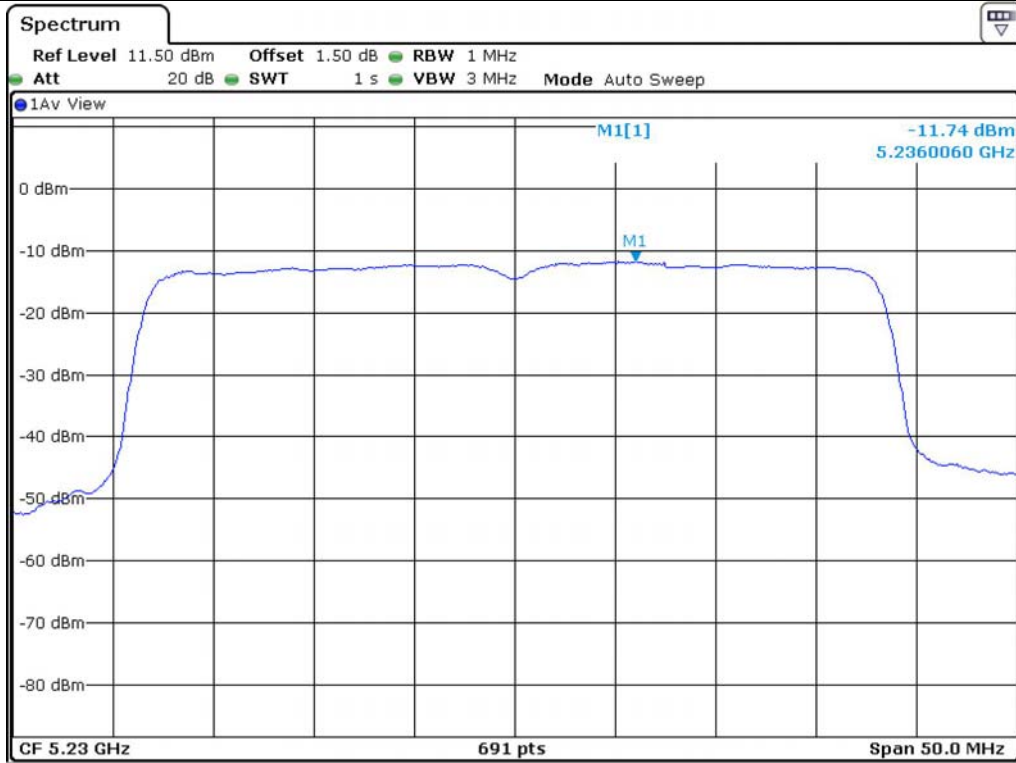
Remark: See next page for measurement data.



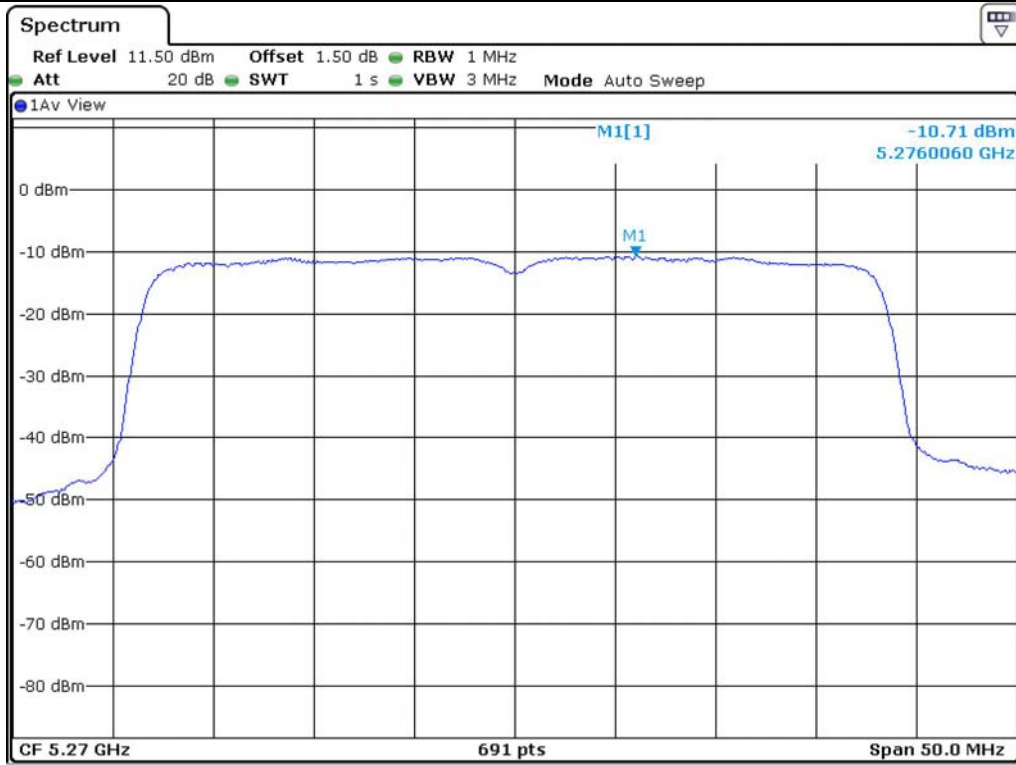
Tested by: Hong-Kyu, Lee/ Engineer



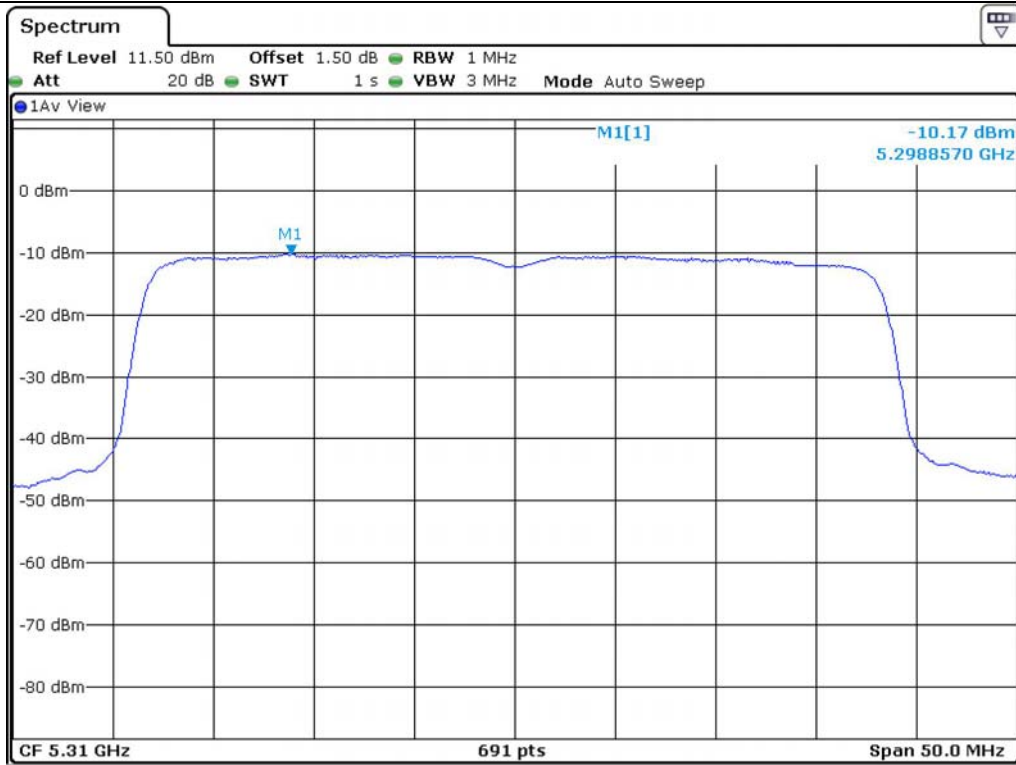
Low Channel (5 190 MHz)



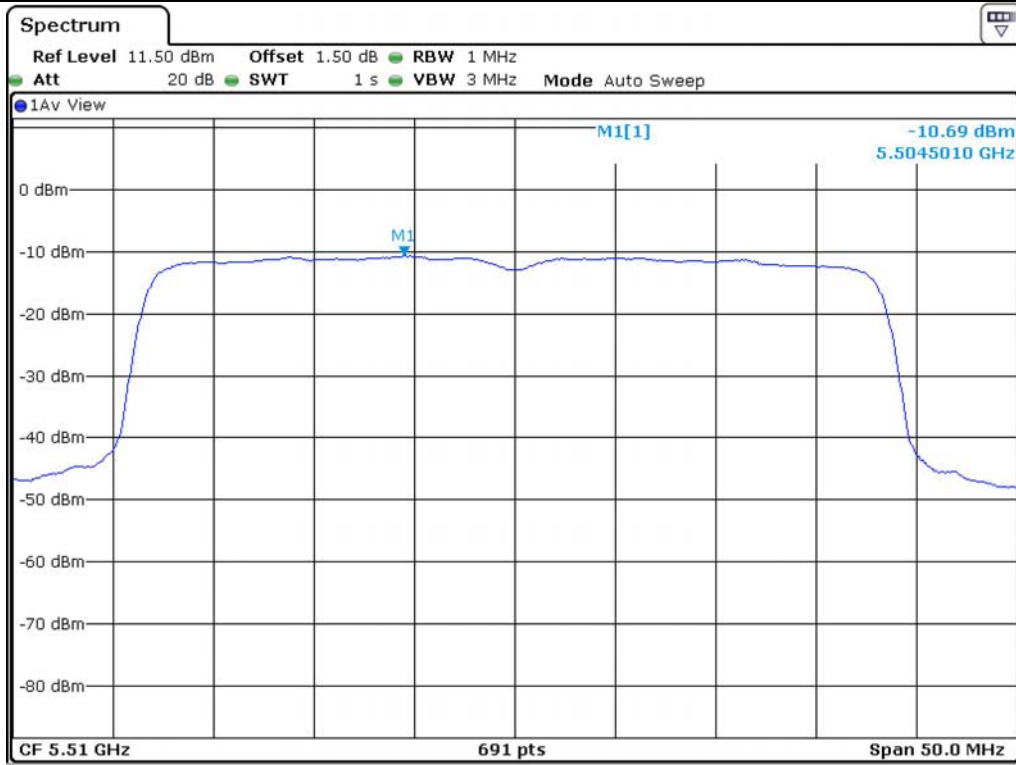
High Channel (5 230 MHz)



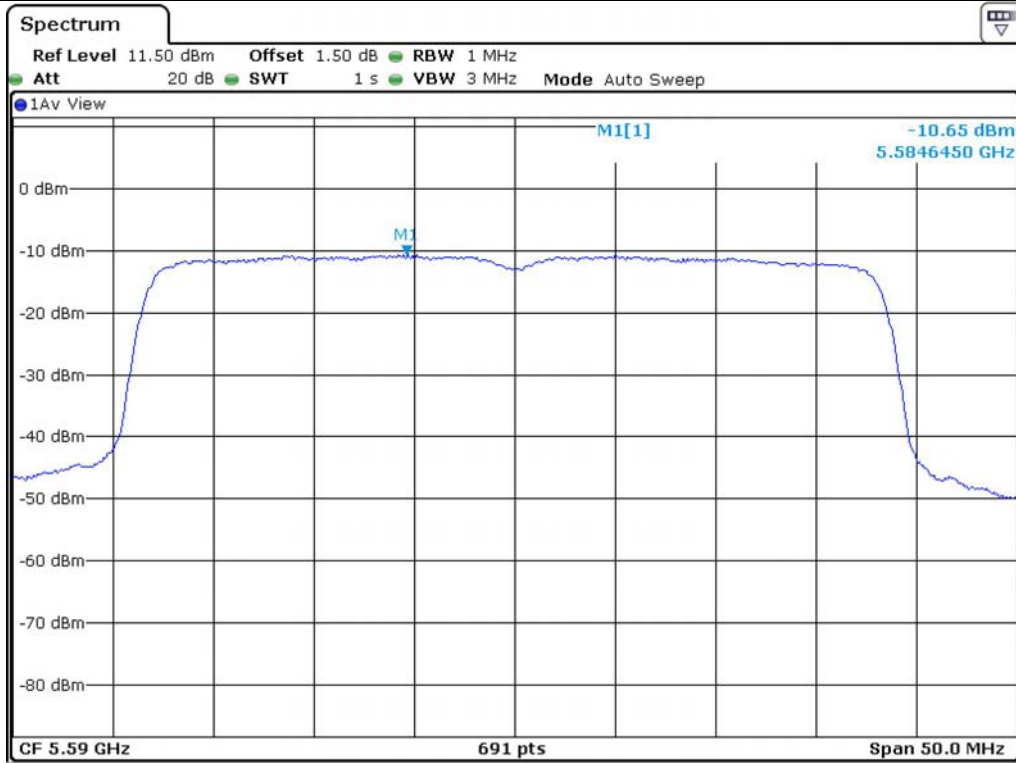
Low Channel (5 270 MHz)



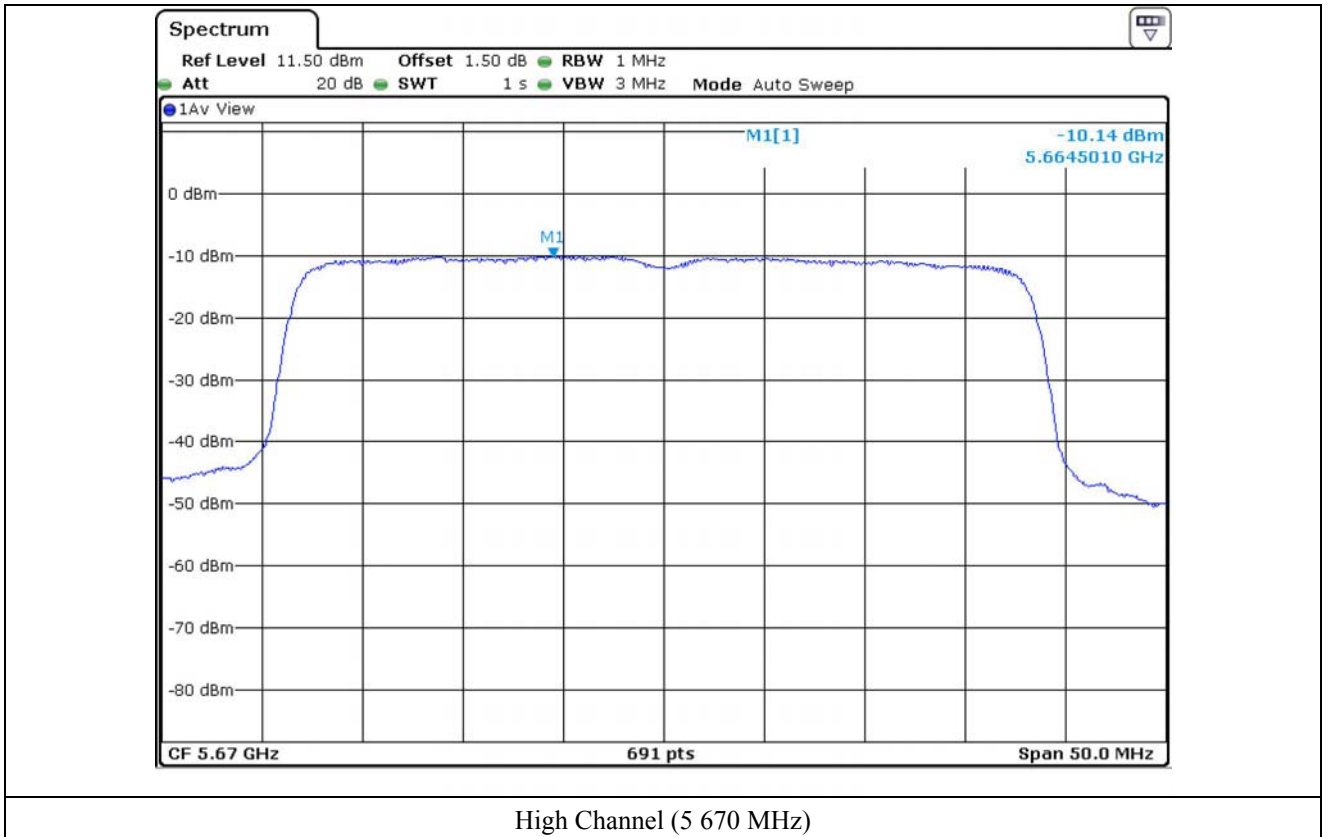
High Channel (5 310 MHz)



Low Channel (5 510 MHz)



Middle Channel (5 590 MHz)



9.6.3 Test data for Multiple transmit

- Test Date : December 16, 2013
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	CALCULATED POWER (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	-9.38	4.00	13.38
	High	5 230	-8.44	4.00	12.44
5 150 ~ 5 250	Low	5 270	-7.71	11.00	18.71
	High	5 310	-7.60	11.00	18.60
5 470 ~ 5 725	Low	5 510	-8.32	11.00	19.32
	Middle	5 590	-8.30	11.00	19.30
	High	5 670	-7.92	11.00	18.92

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10\log (10^{(\text{Antenna1 Power Density}/10)}+10^{(\text{Antenna2 Power Density}/10)})$



Tested by: Hong-Kyu, Lee/ Engineer

10. PEAK EXCURSION RATIO

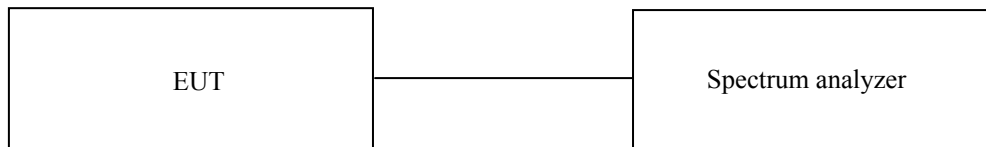
10.1 Operating environment

Temperature : 24 °C

Relative humidity : 43 % R.H.

10.2 Test set-up for conducted measurement

The spectrum analyzer was connected to the antenna terminal while the EUT was operating in the continuous transmission mode at the appropriate center frequencies. The largest permissible difference between the modulation envelope (measured using a peak hold function) and the maximum conducted output power 13 dB/MHz.



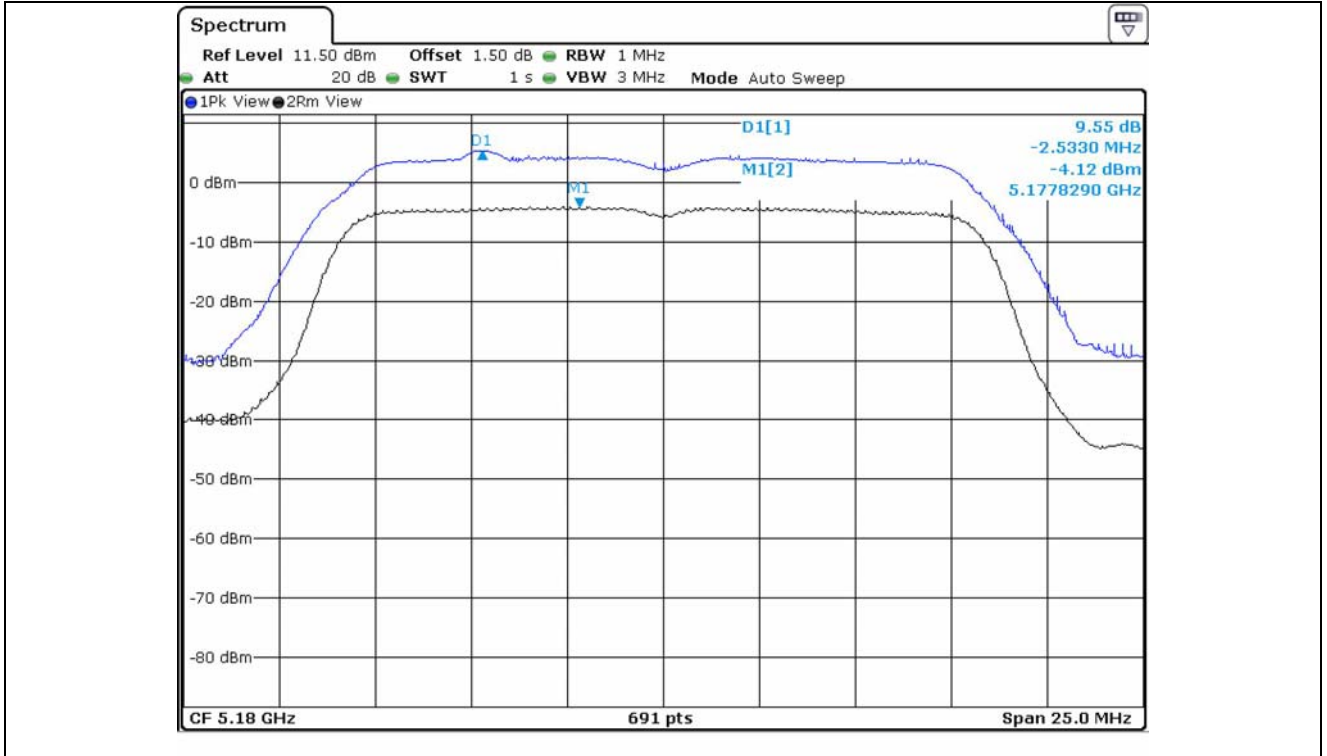
10.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV30	R/S	Spectrum Analyzer	101372	May 20, 2013

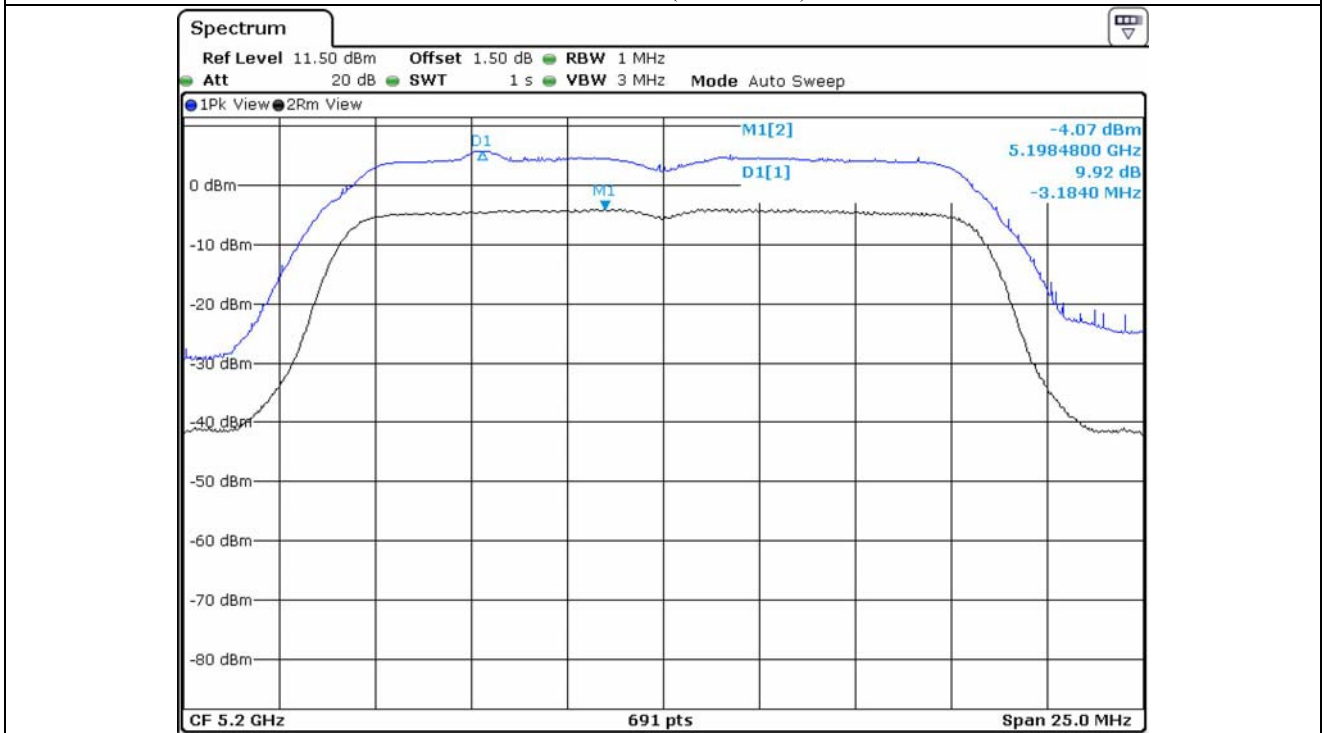
All test equipment used is calibrated on a regular basis.

10.4 Test data for 802.11a RLAN Mode

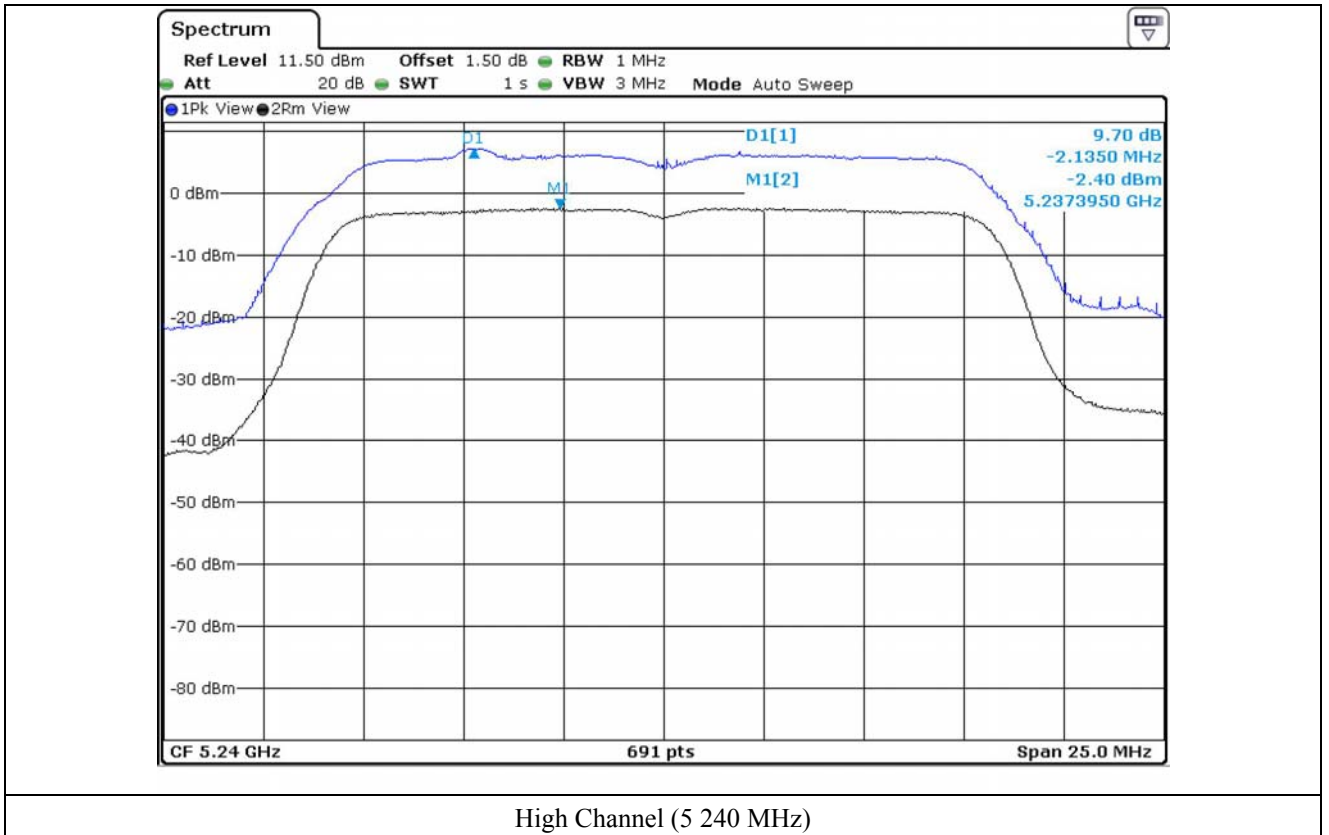
10.4.1 Test data for Antenna 0



Low Channel (5 180 MHz)

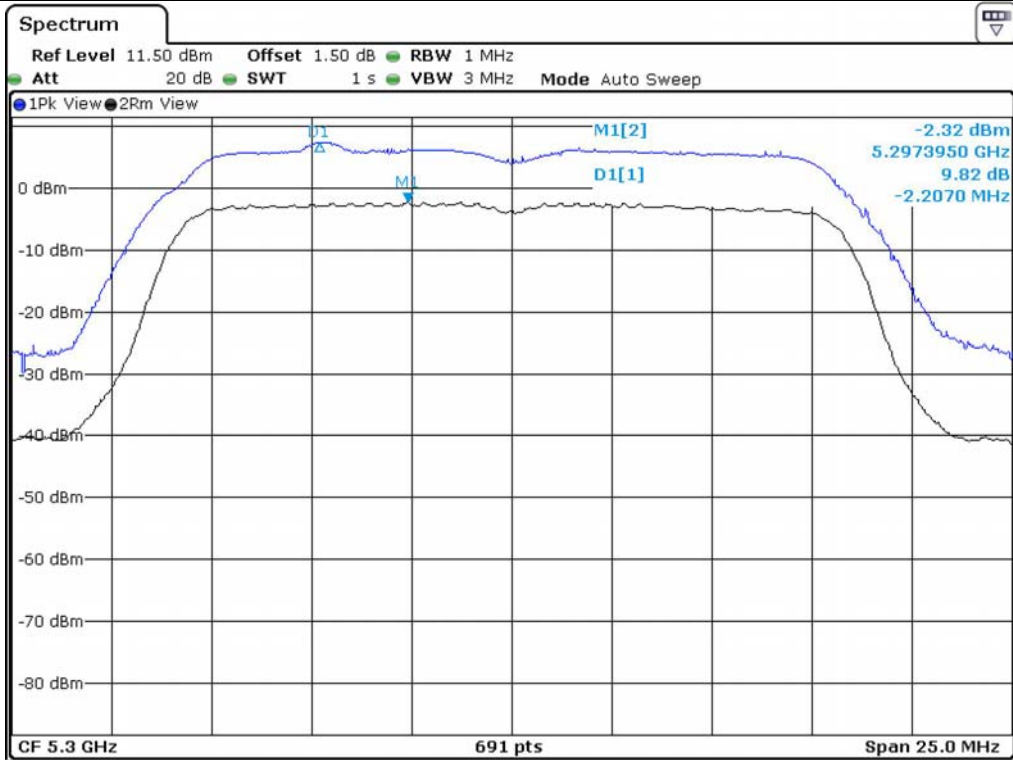


Middle Channel (5 200 MHz)

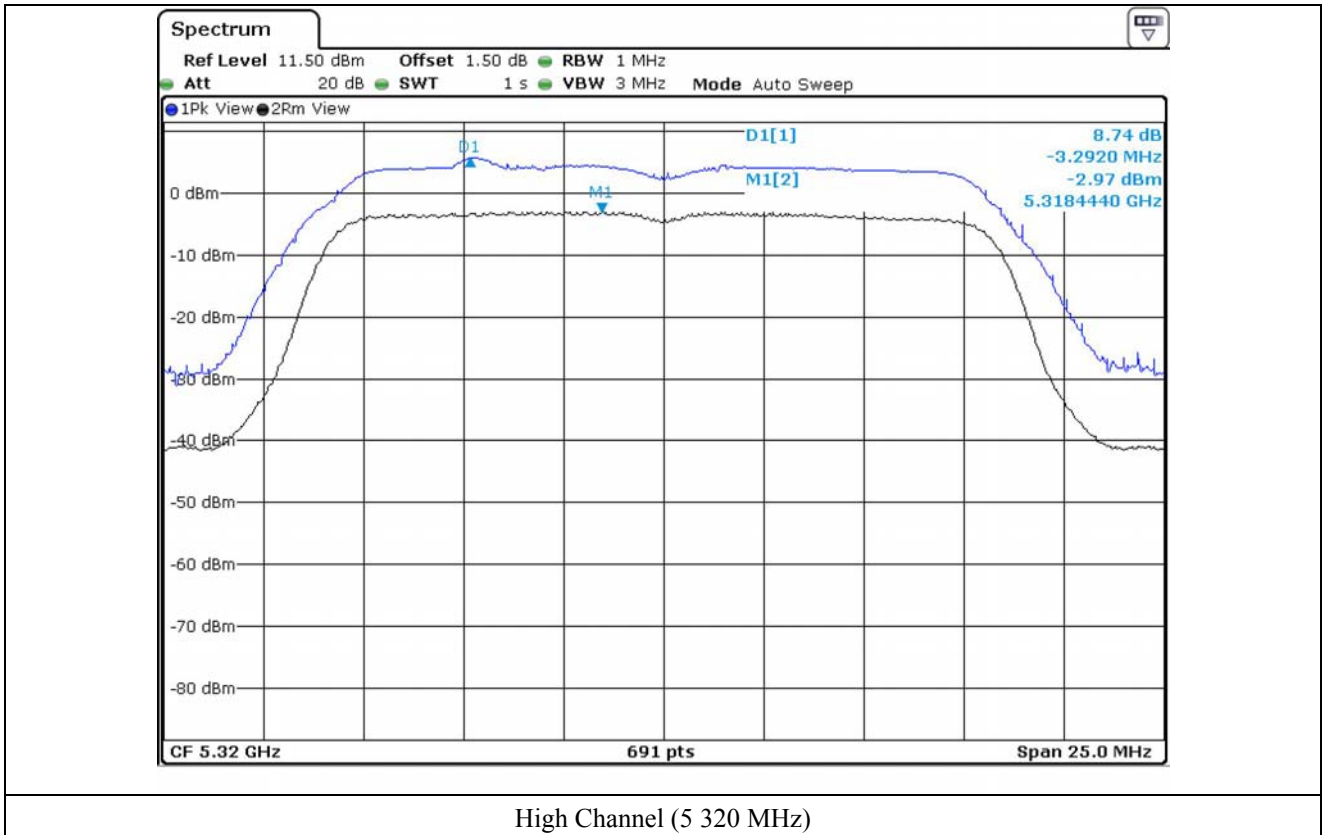


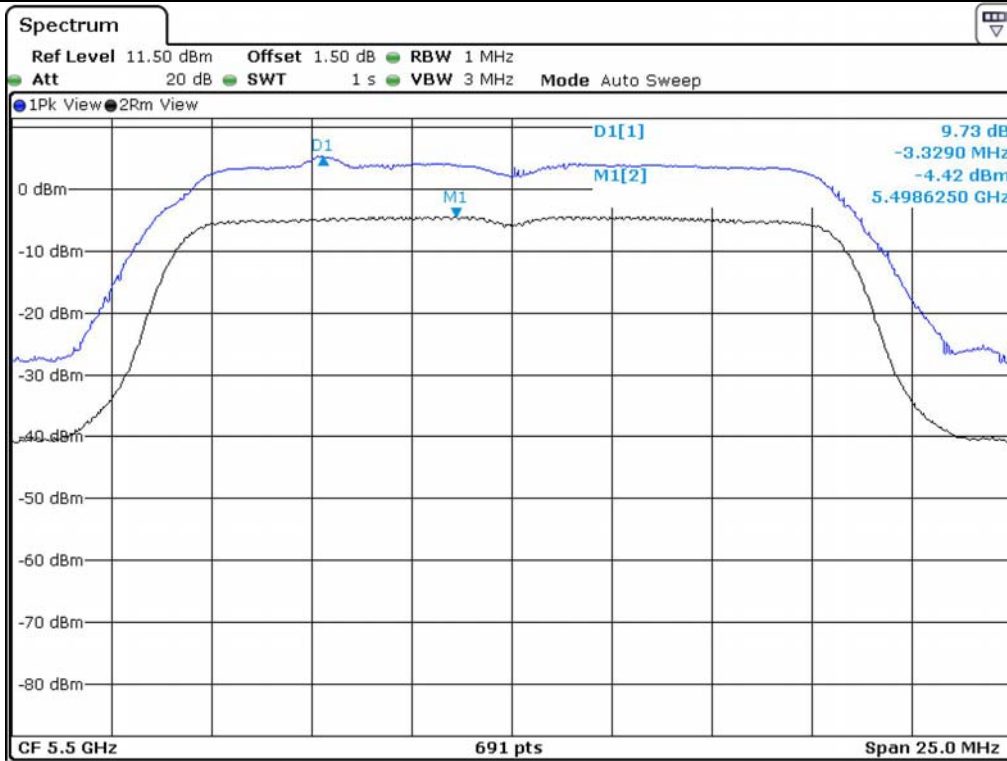


Low Channel (5 260 MHz)

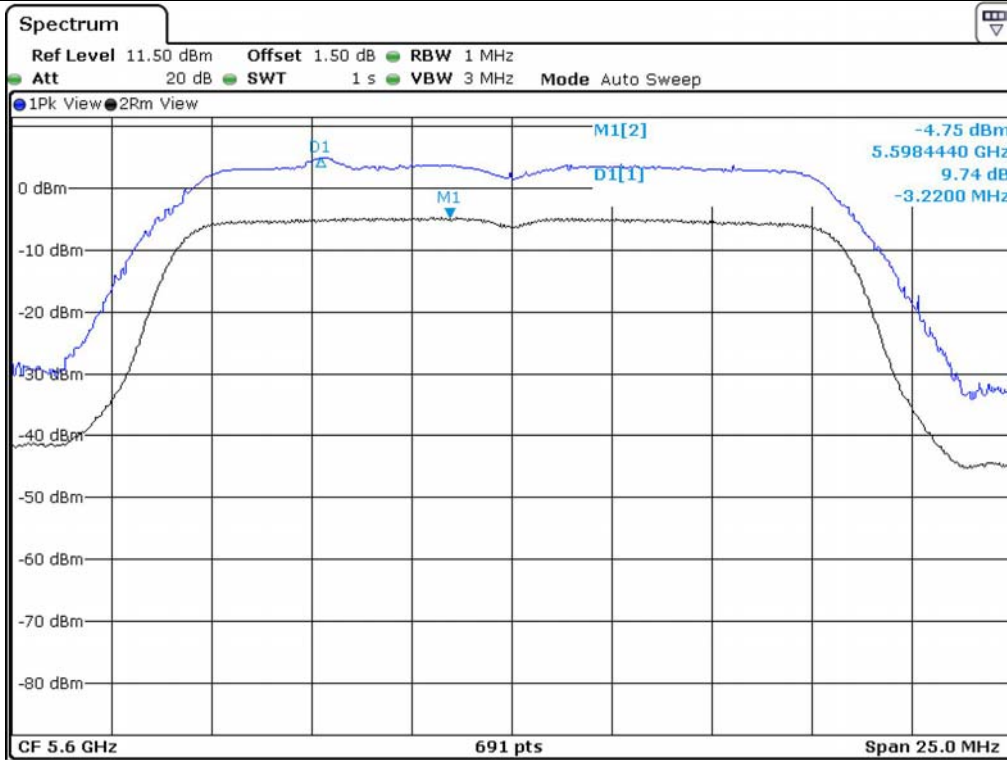


Middle Channel (5 300 MHz)

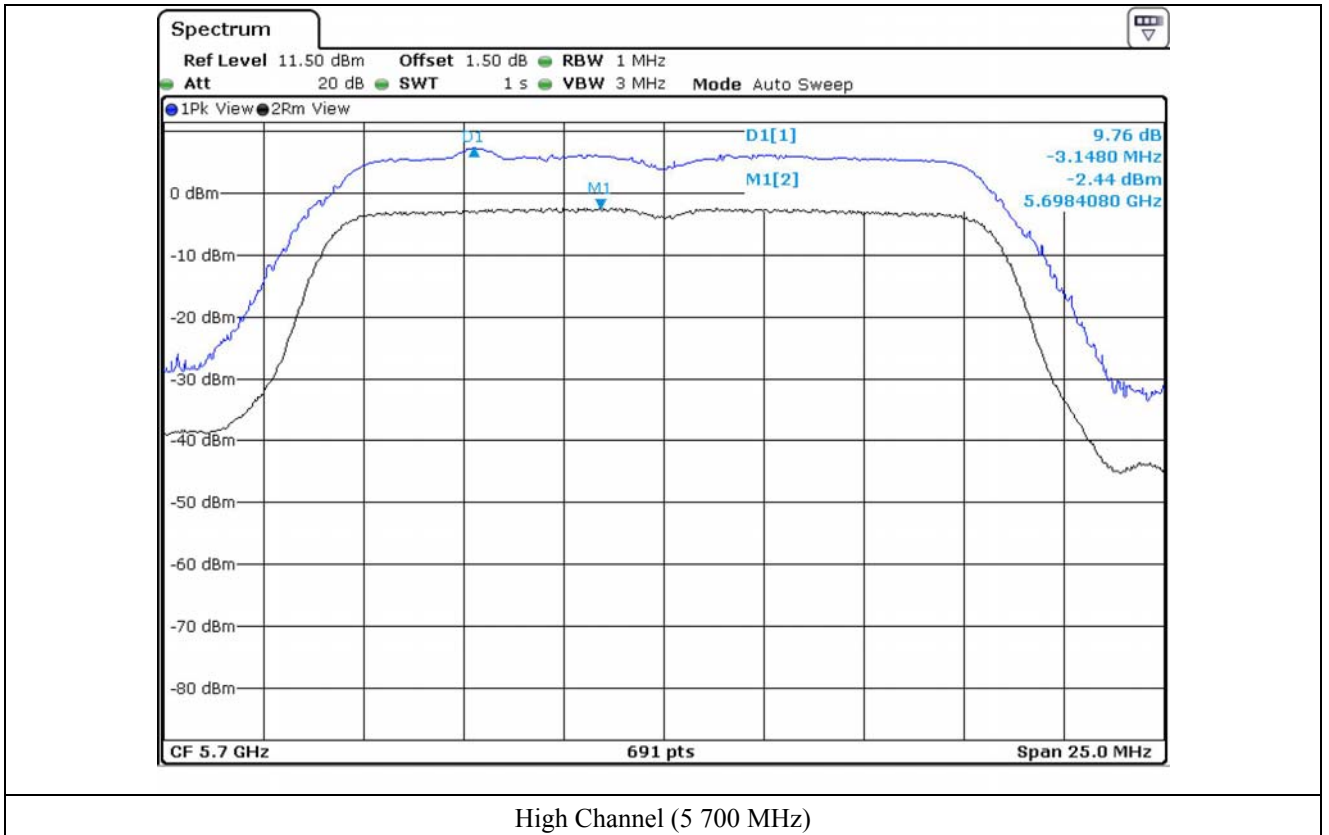




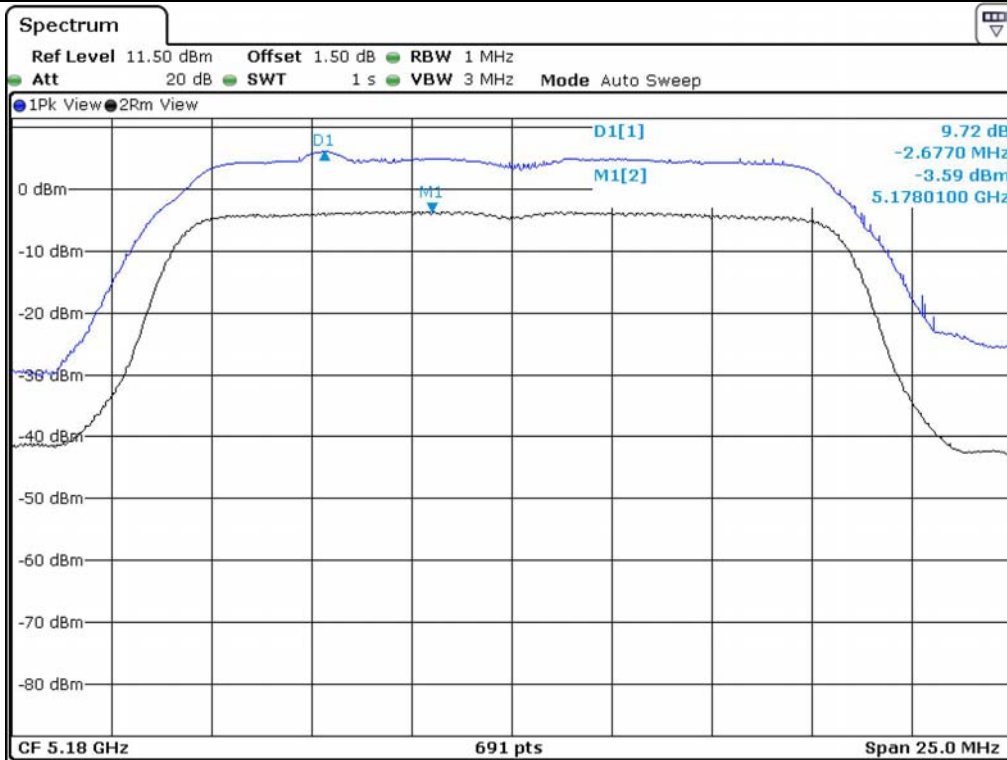
Low Channel (5 500 MHz)



Middle Channel (5 600 MHz)



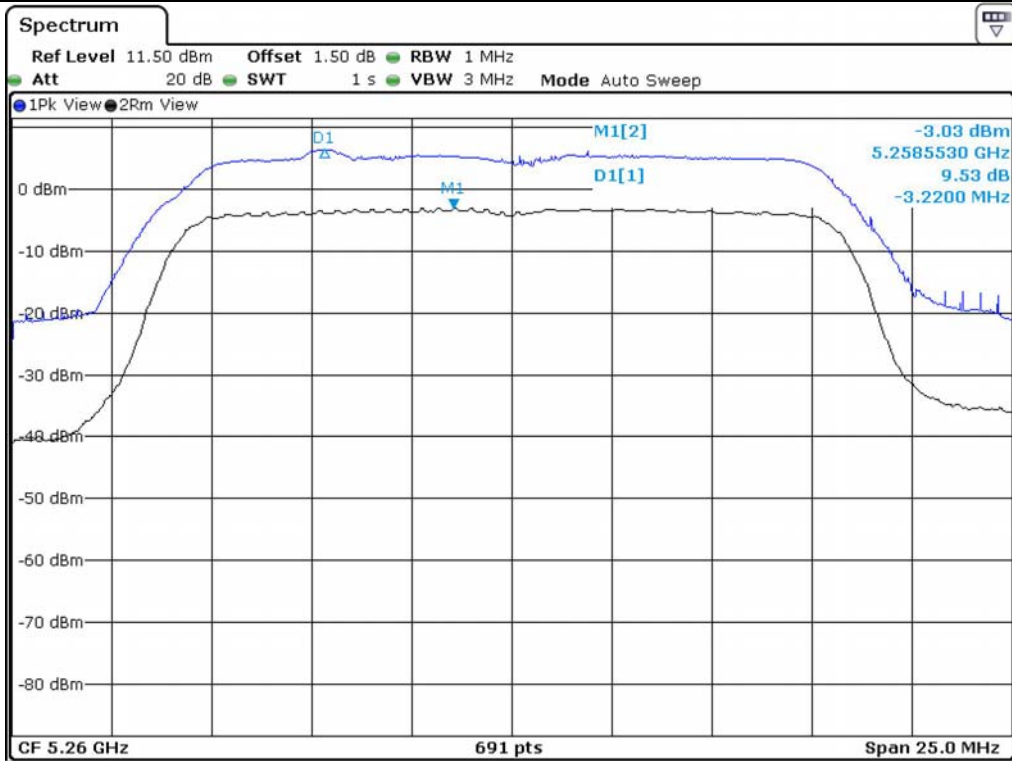
10.4.2 Test data for Antenna 1



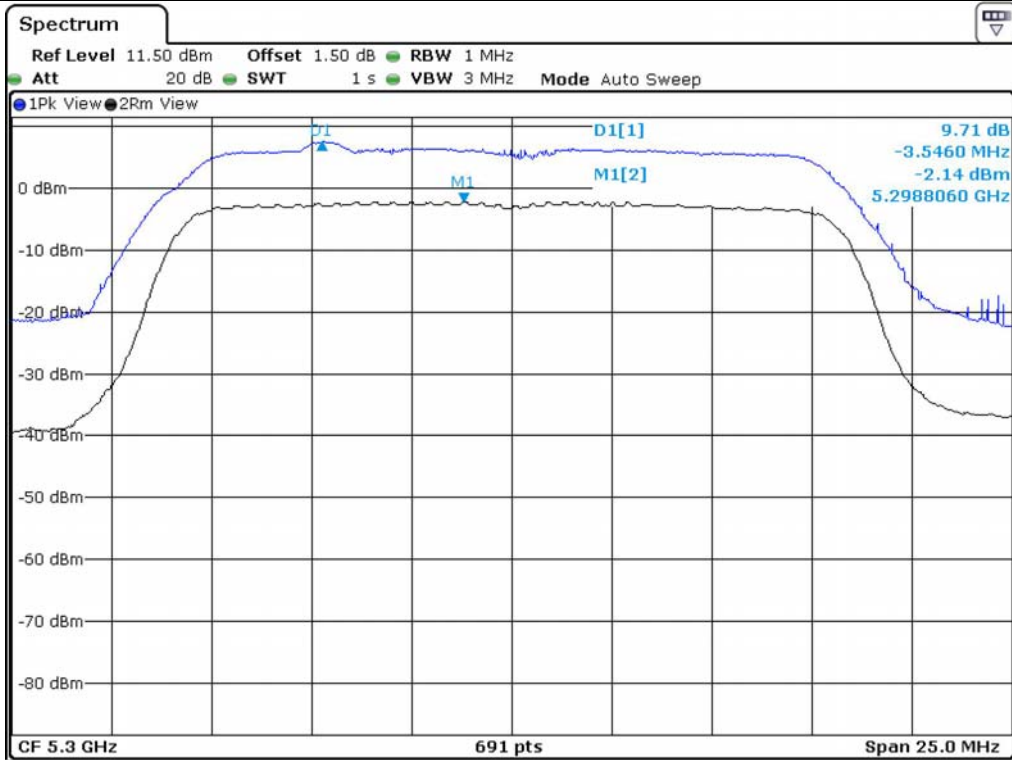
Low Channel (5 180 MHz)



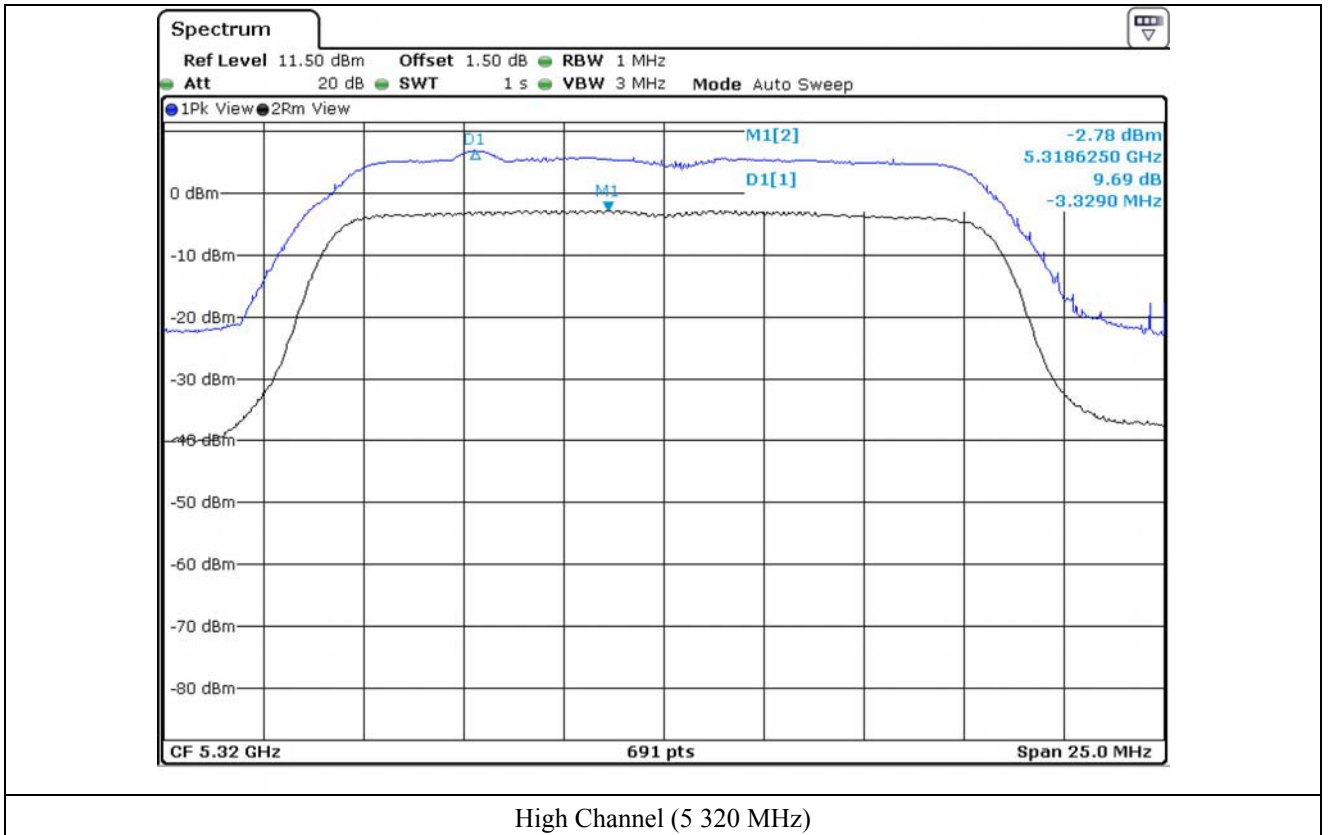
Middle Channel (5 200 MHz)

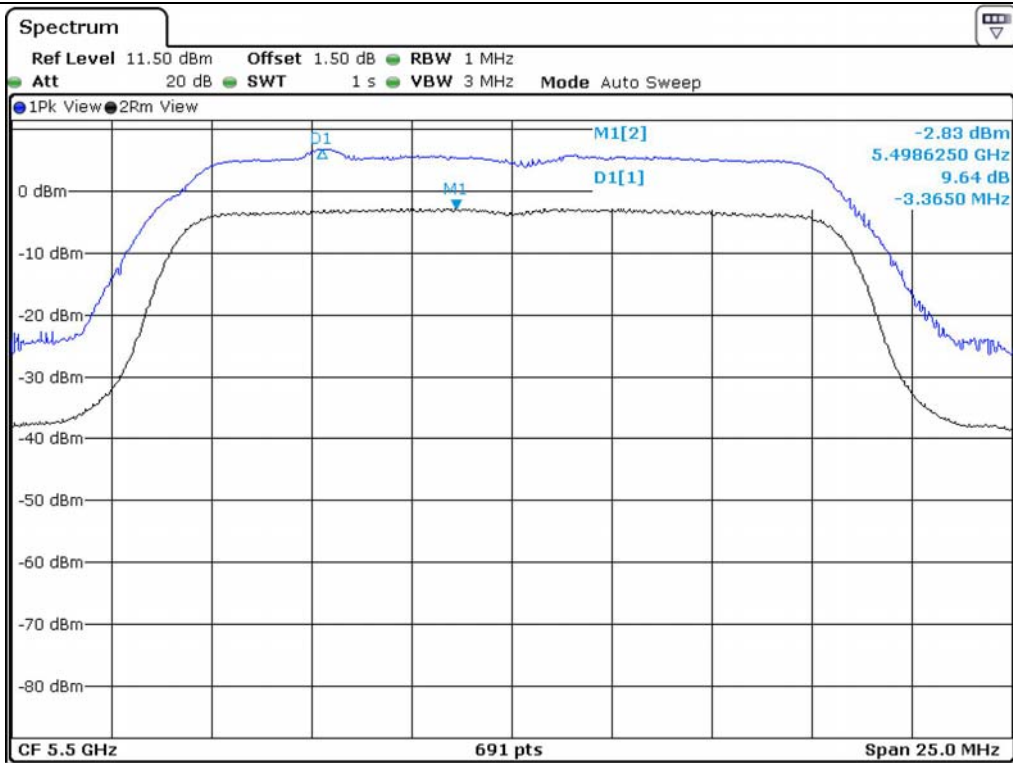


Low Channel (5 260 MHz)

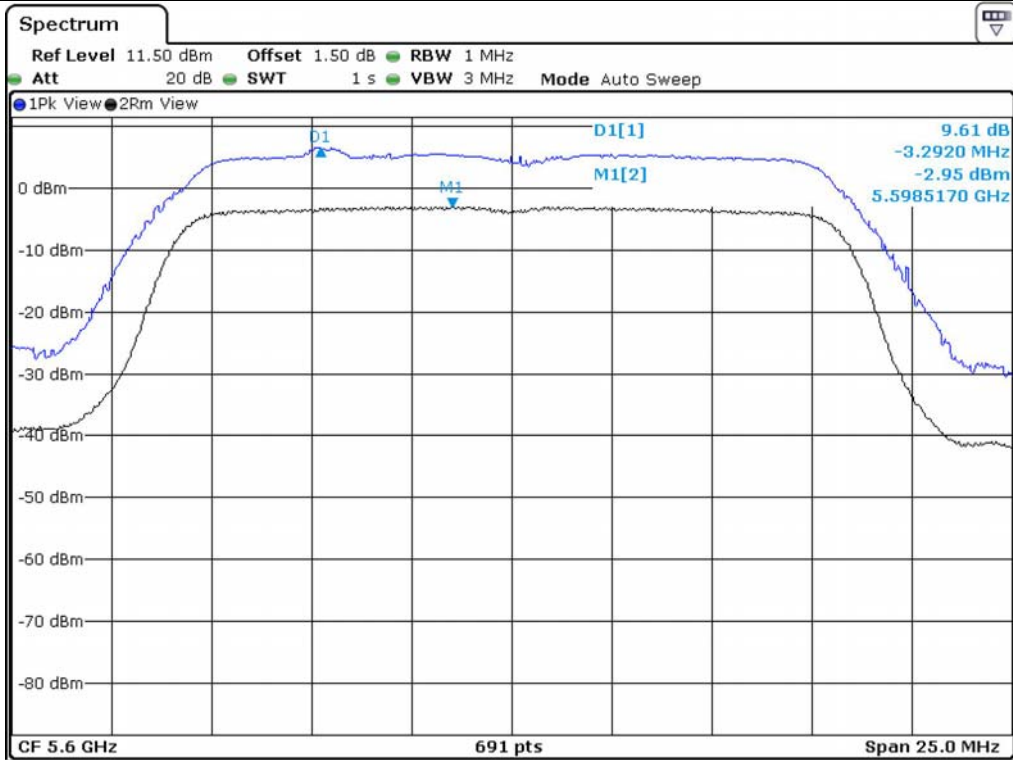


Middle Channel (5 300 MHz)

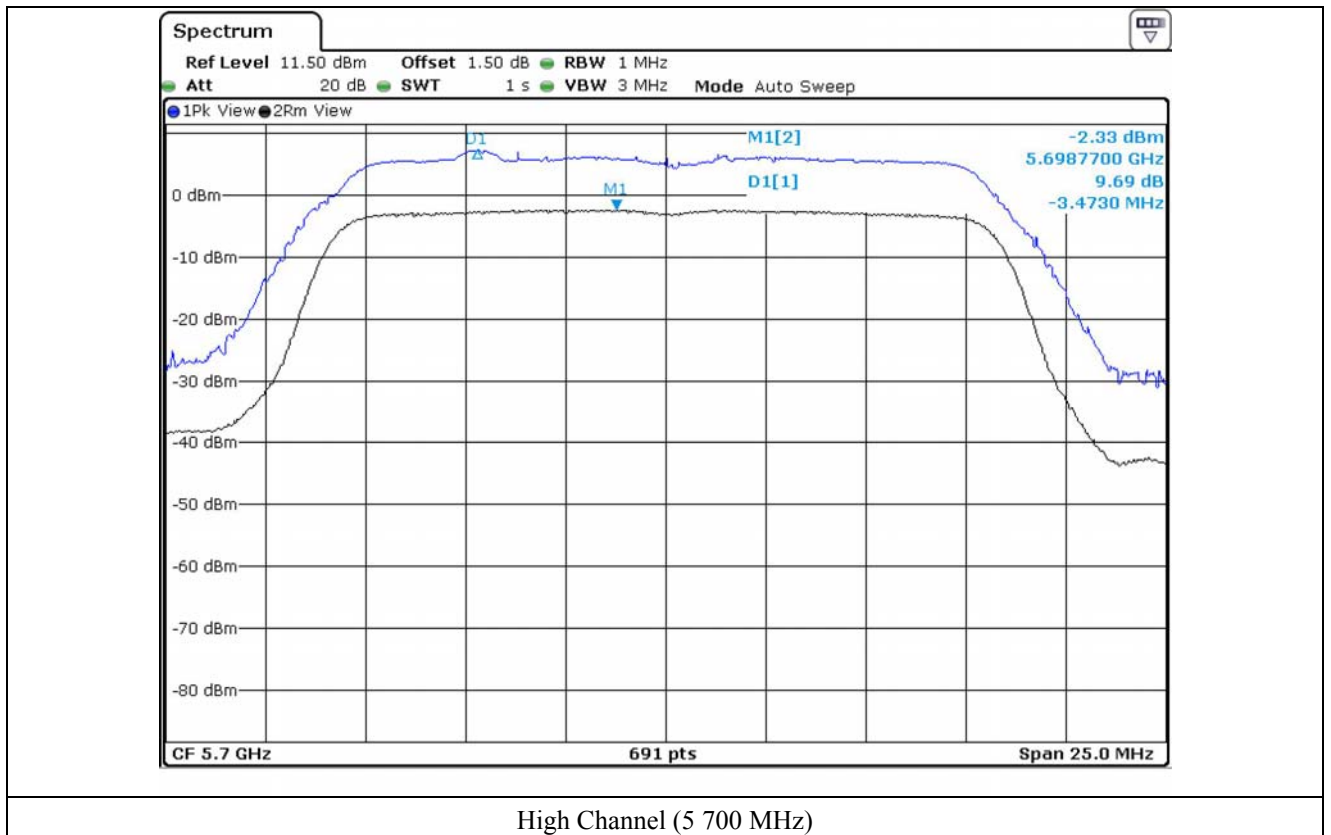




Low Channel (5 500 MHz)



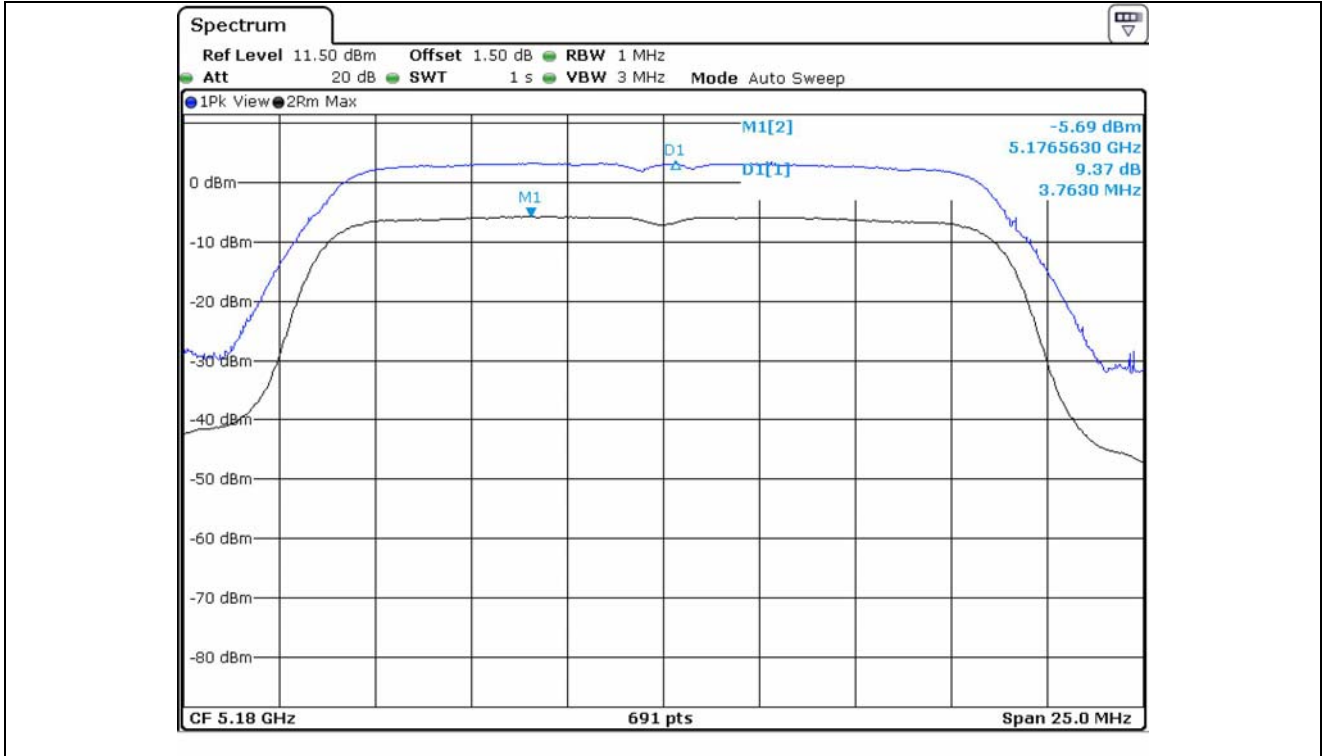
Middle Channel (5 600 MHz)



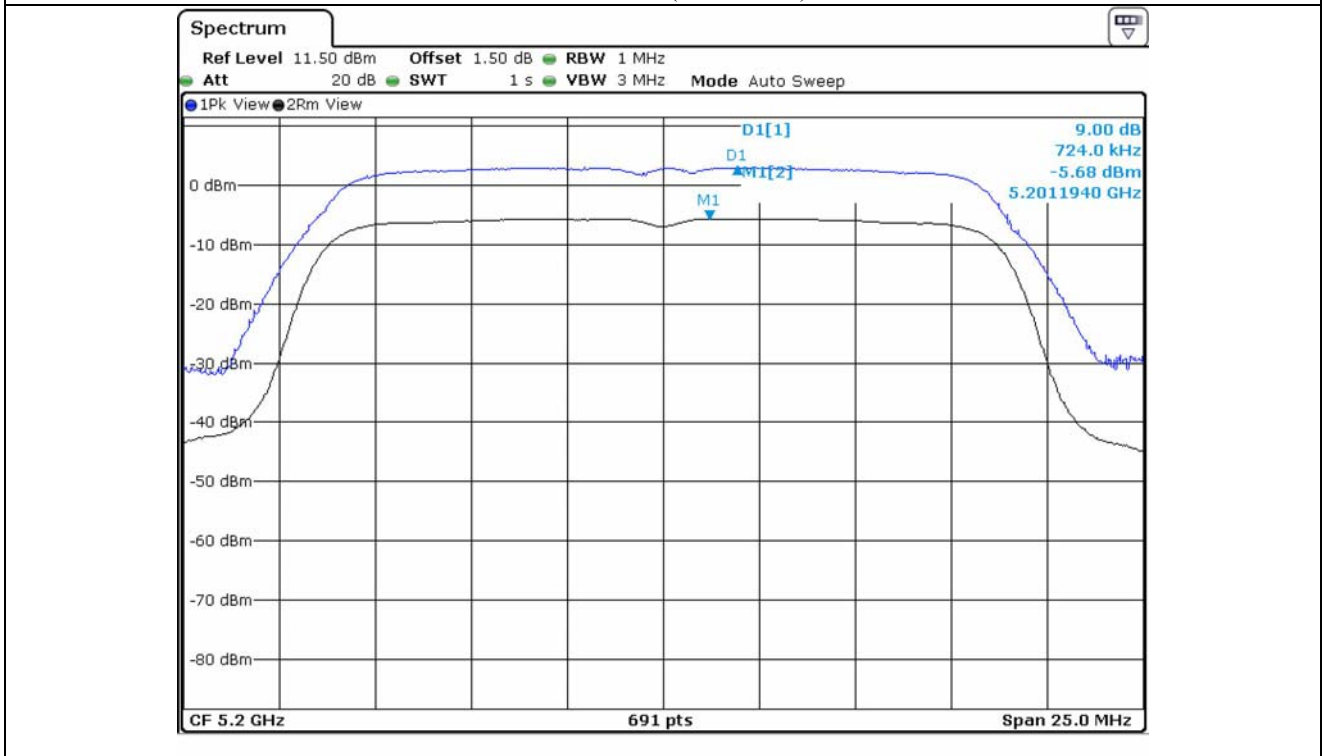
High Channel (5 700 MHz)

10.5 Test data for 802.11n_HT20 RLAN Mode

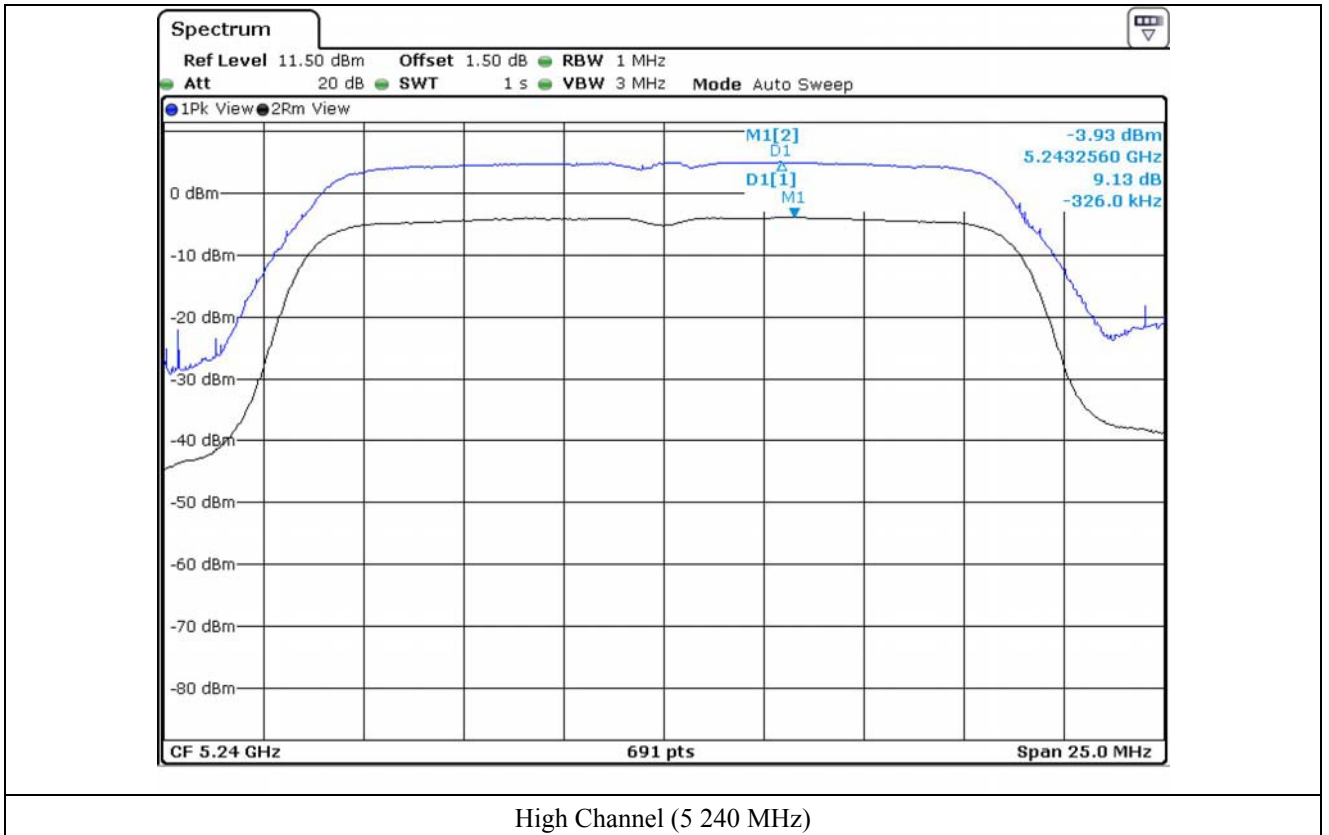
10.5.1 Test data for Antenna 0

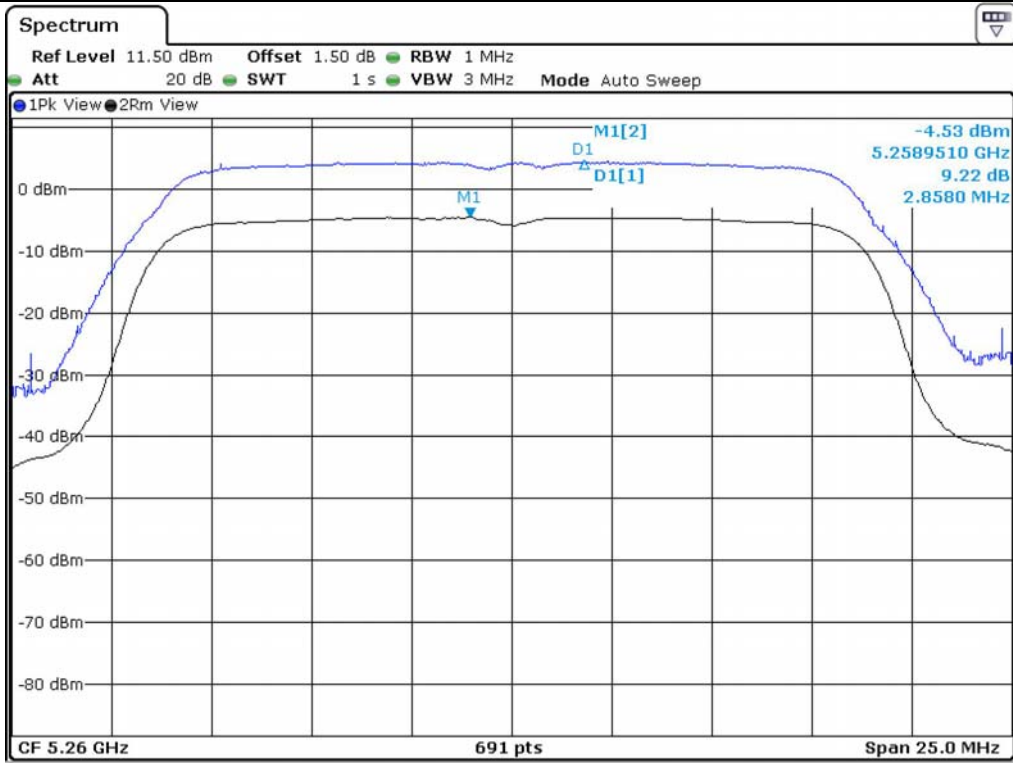


Low Channel (5 180 MHz)

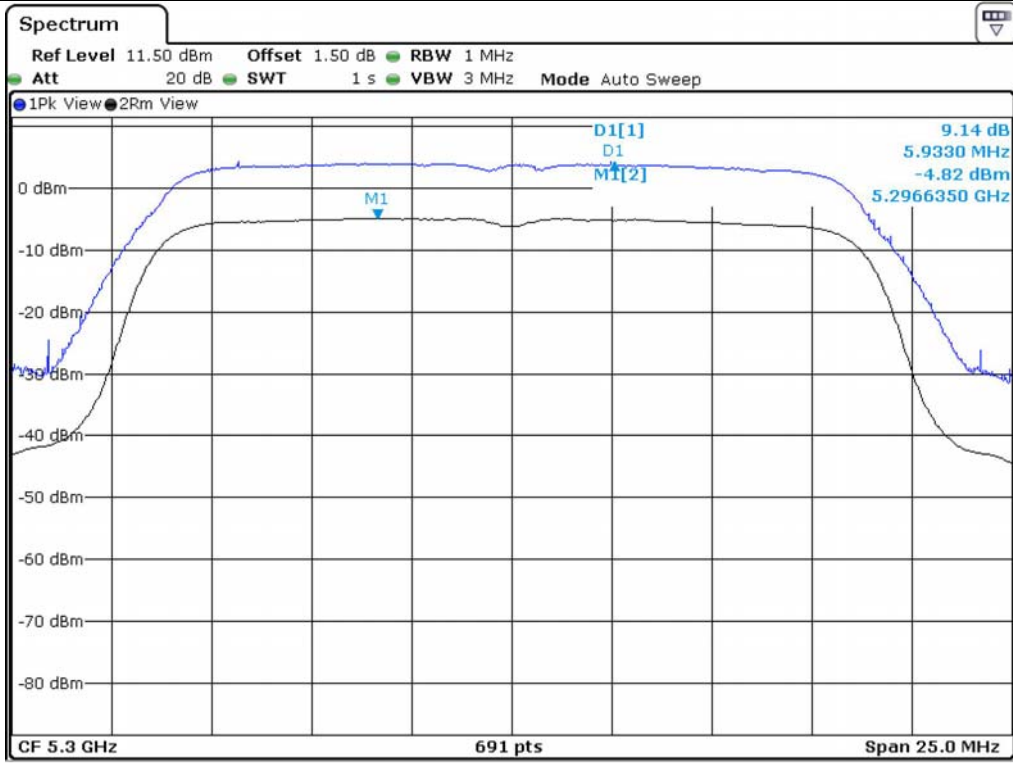


Middle Channel (5 200 MHz)

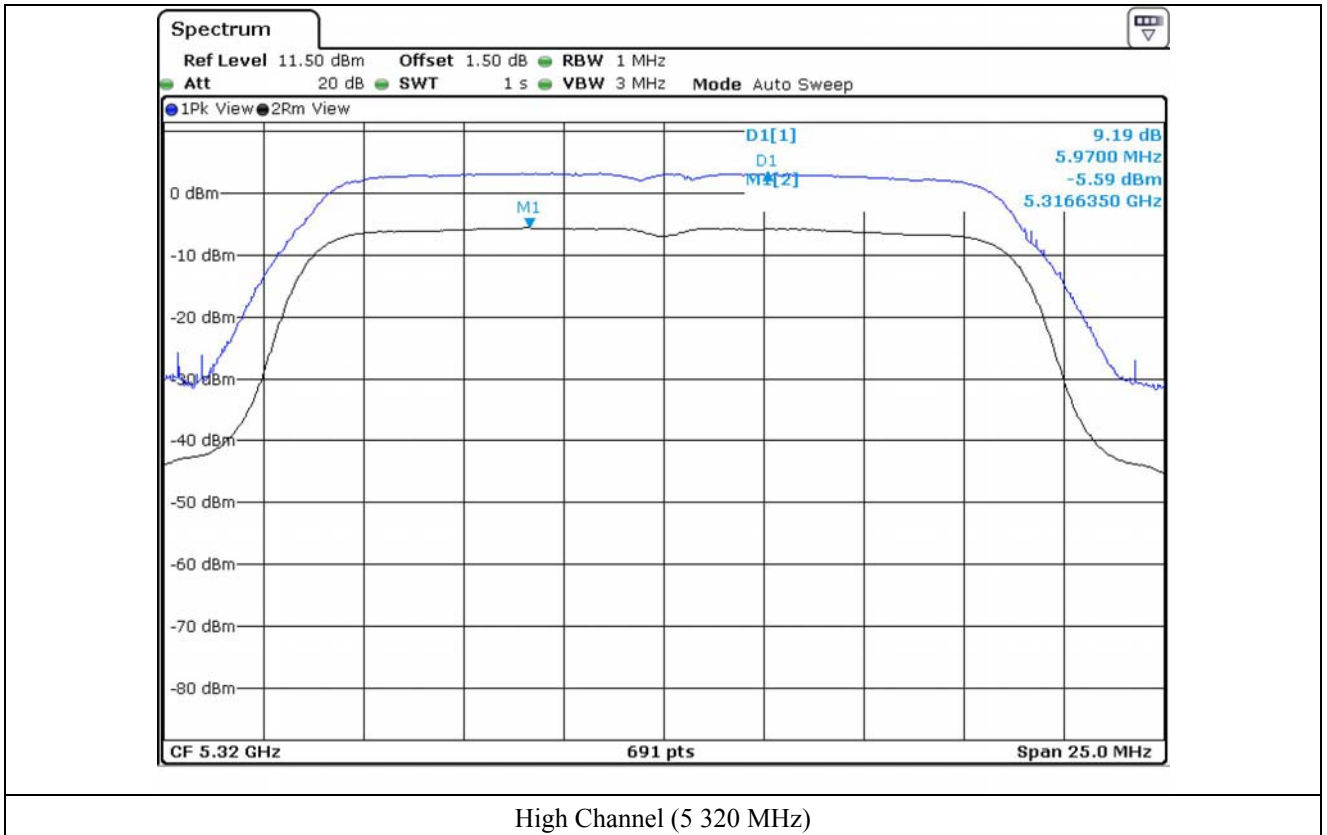


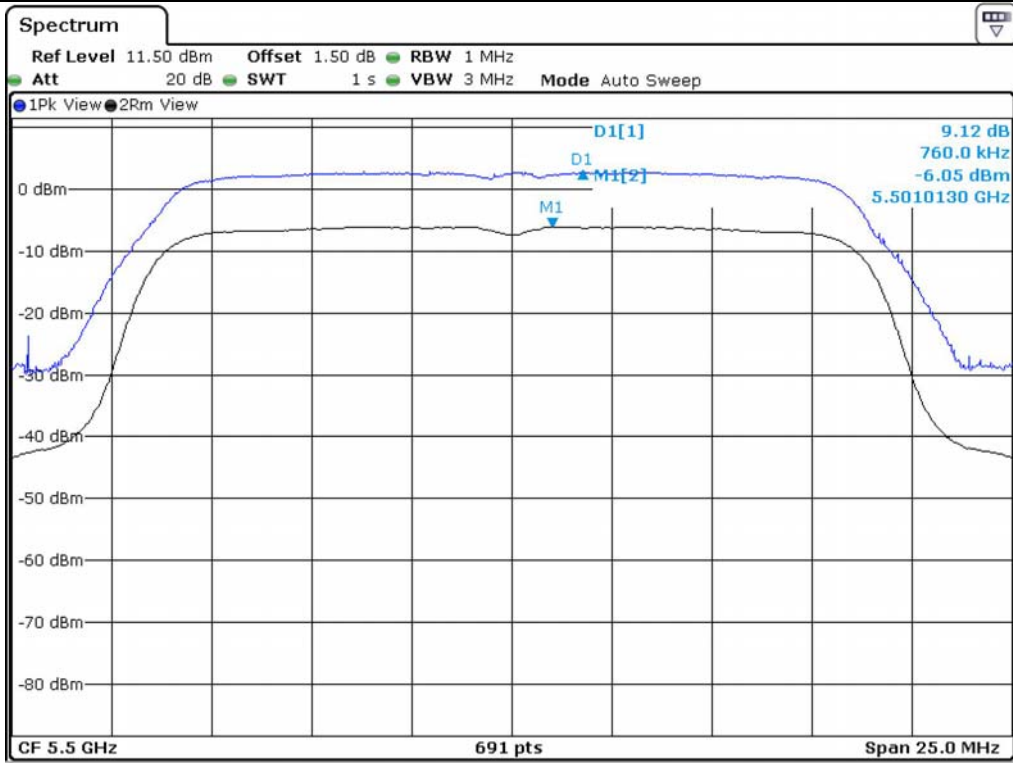


Low Channel (5 260 MHz)

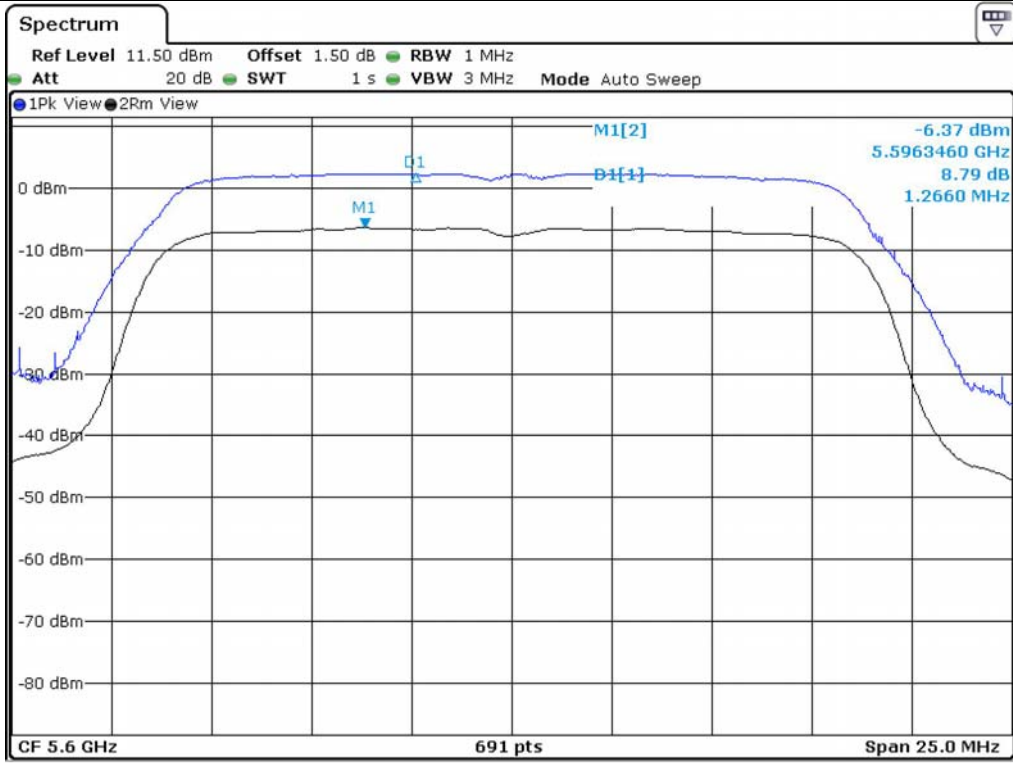


Middle Channel (5 300 MHz)

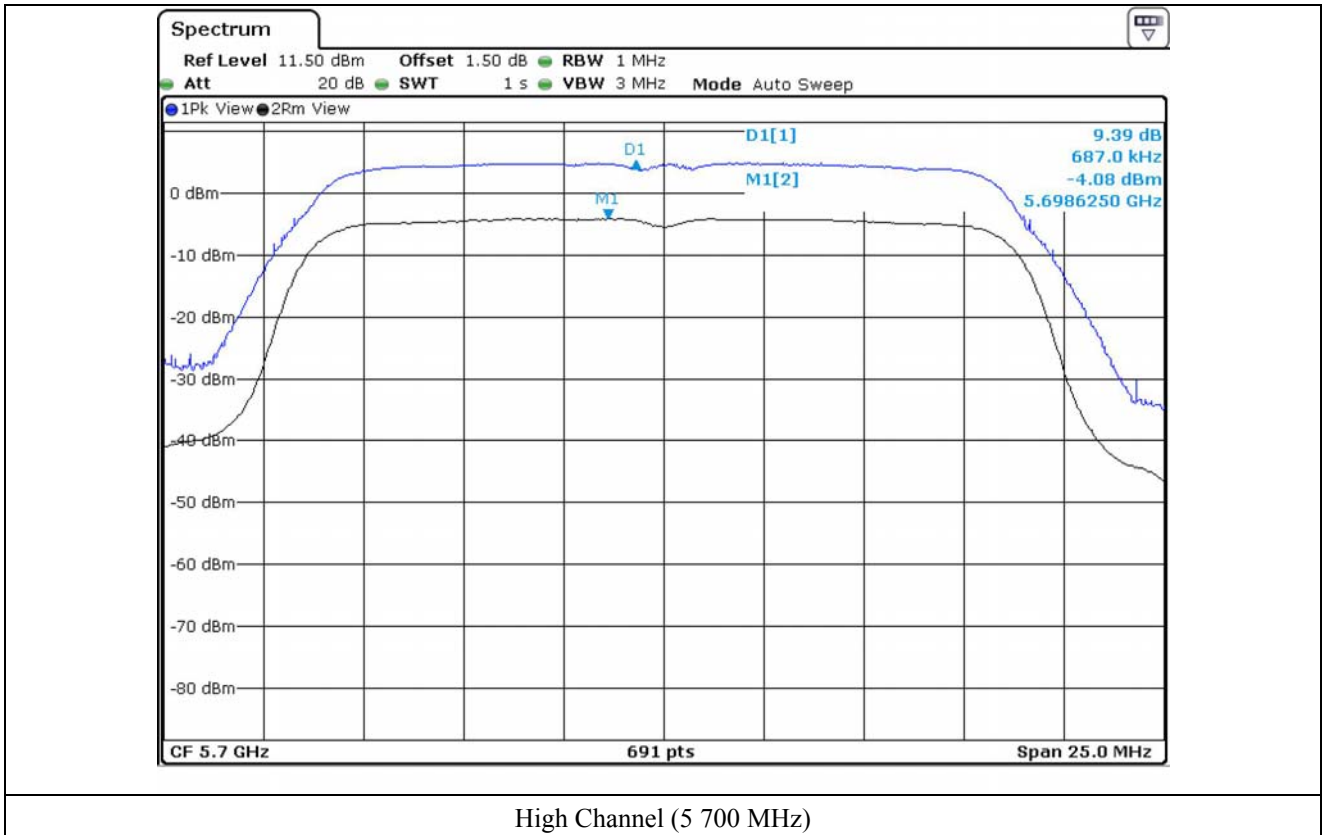




Low Channel (5 500 MHz)

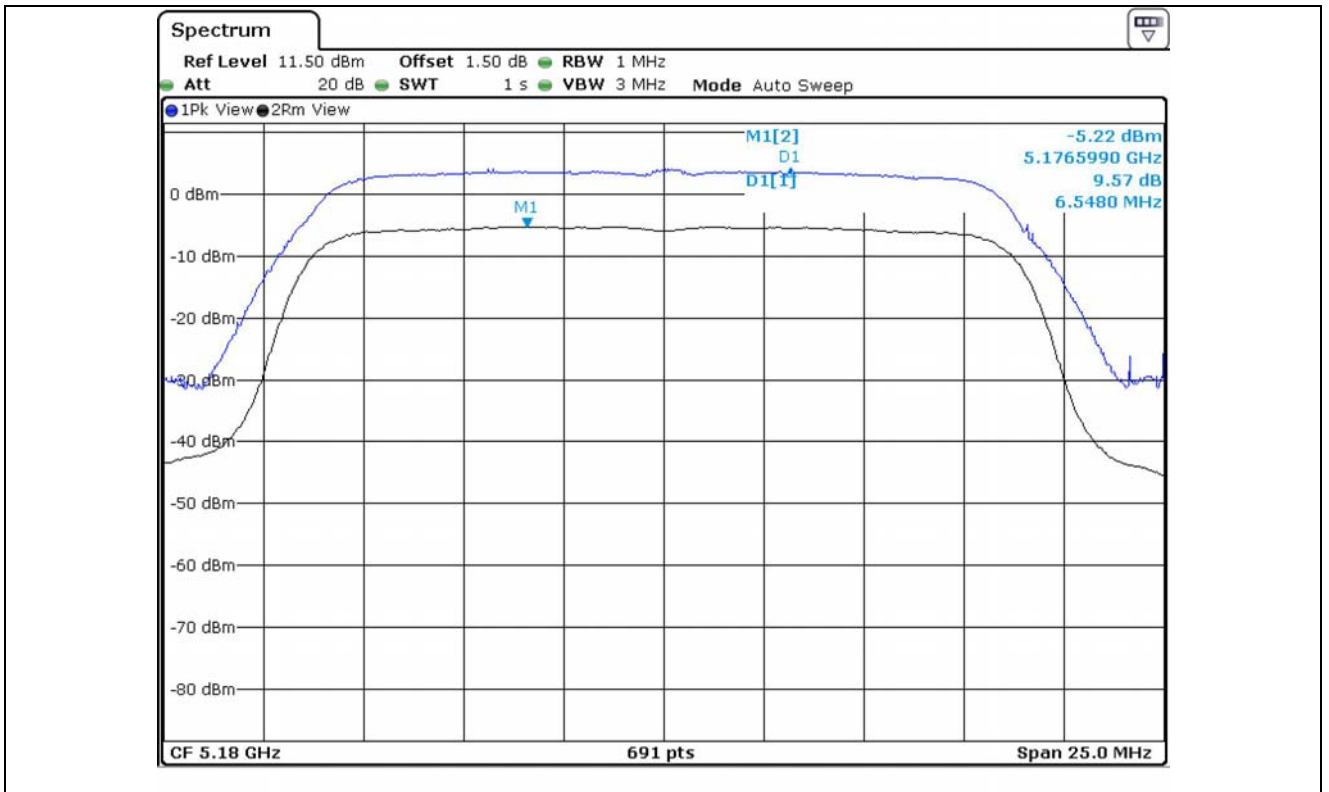


Middle Channel (5 600 MHz)

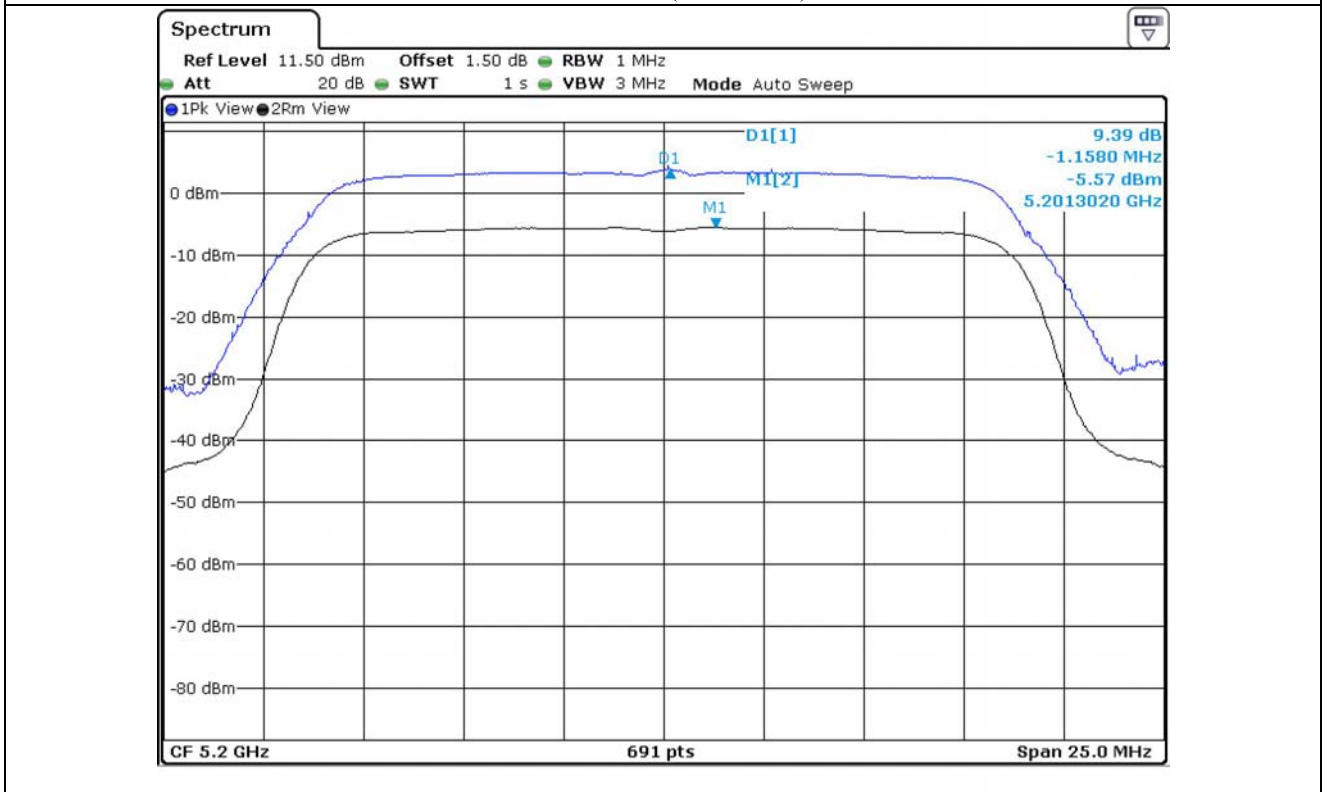


High Channel (5 700 MHz)

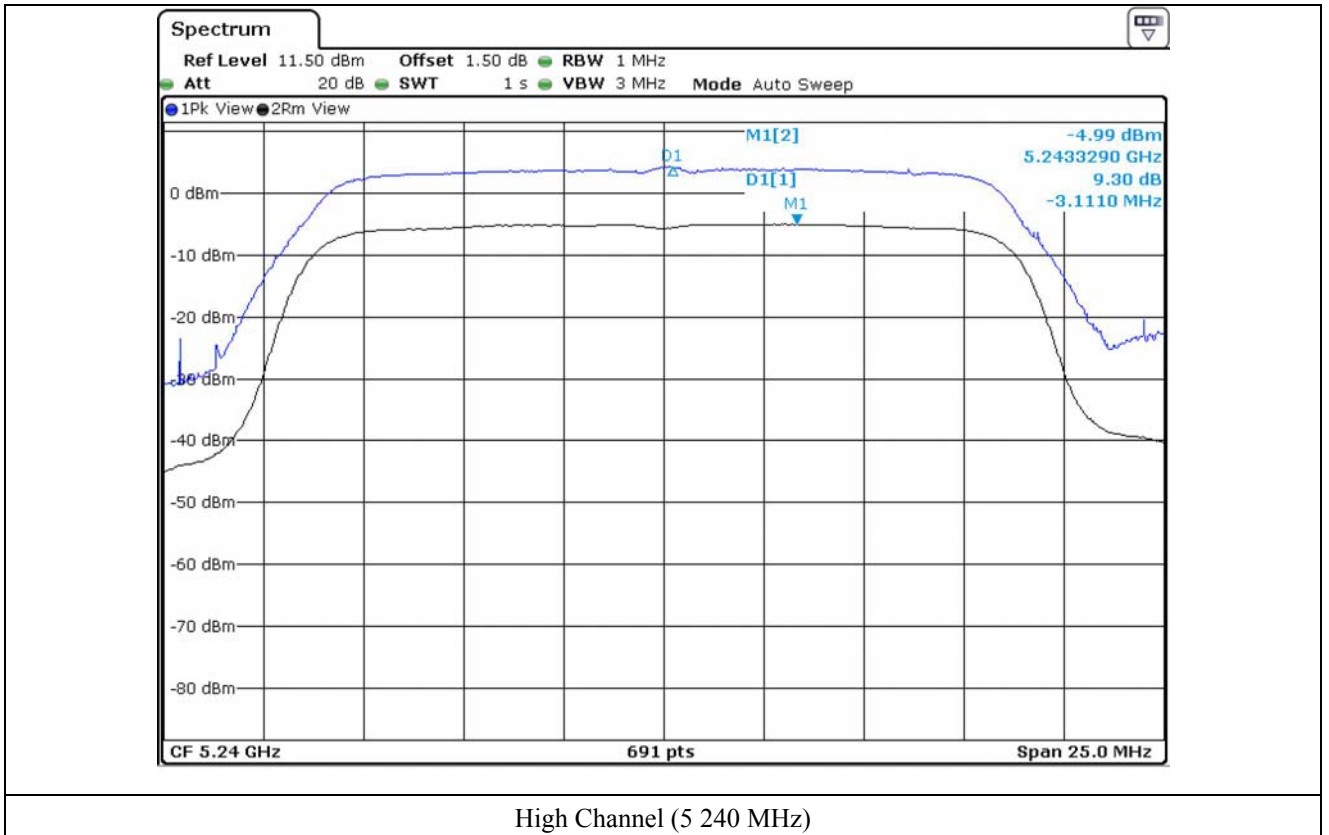
10.5.2 Test data for Antenna 1

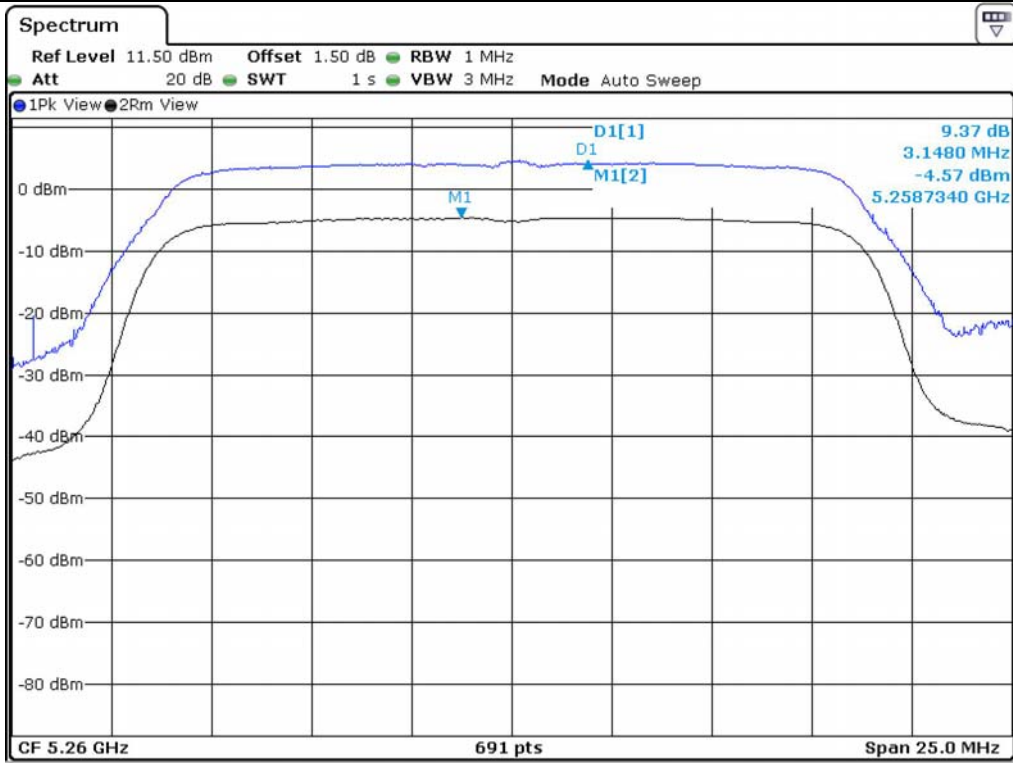


Low Channel (5 180 MHz)

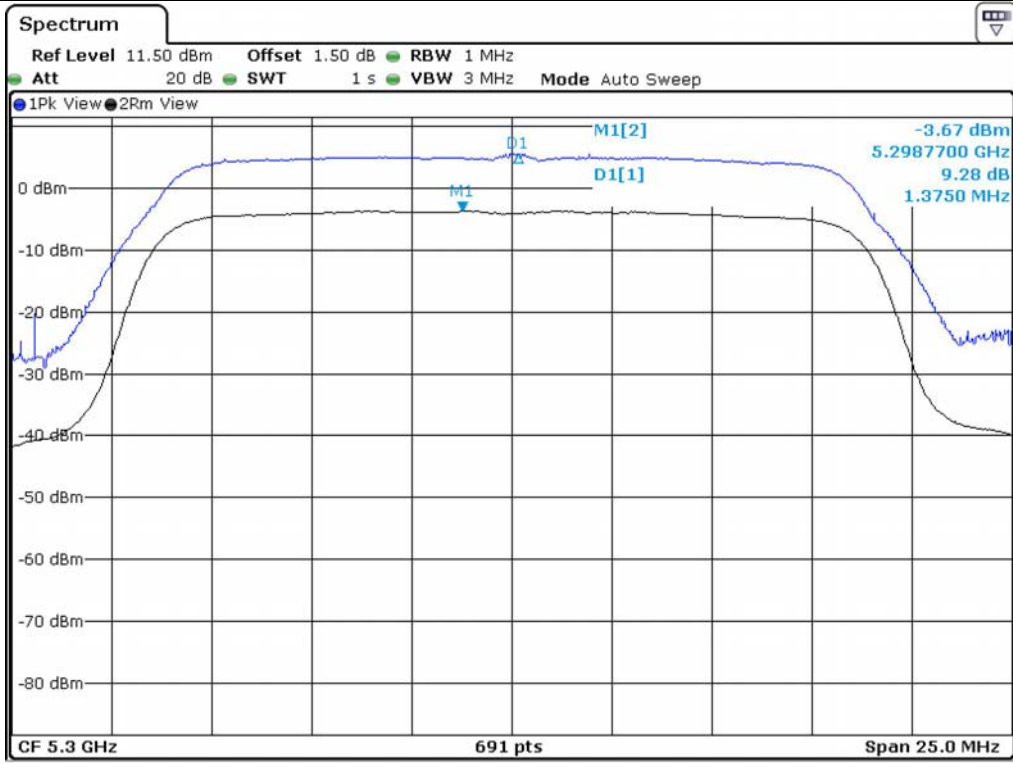


Middle Channel (5 200 MHz)

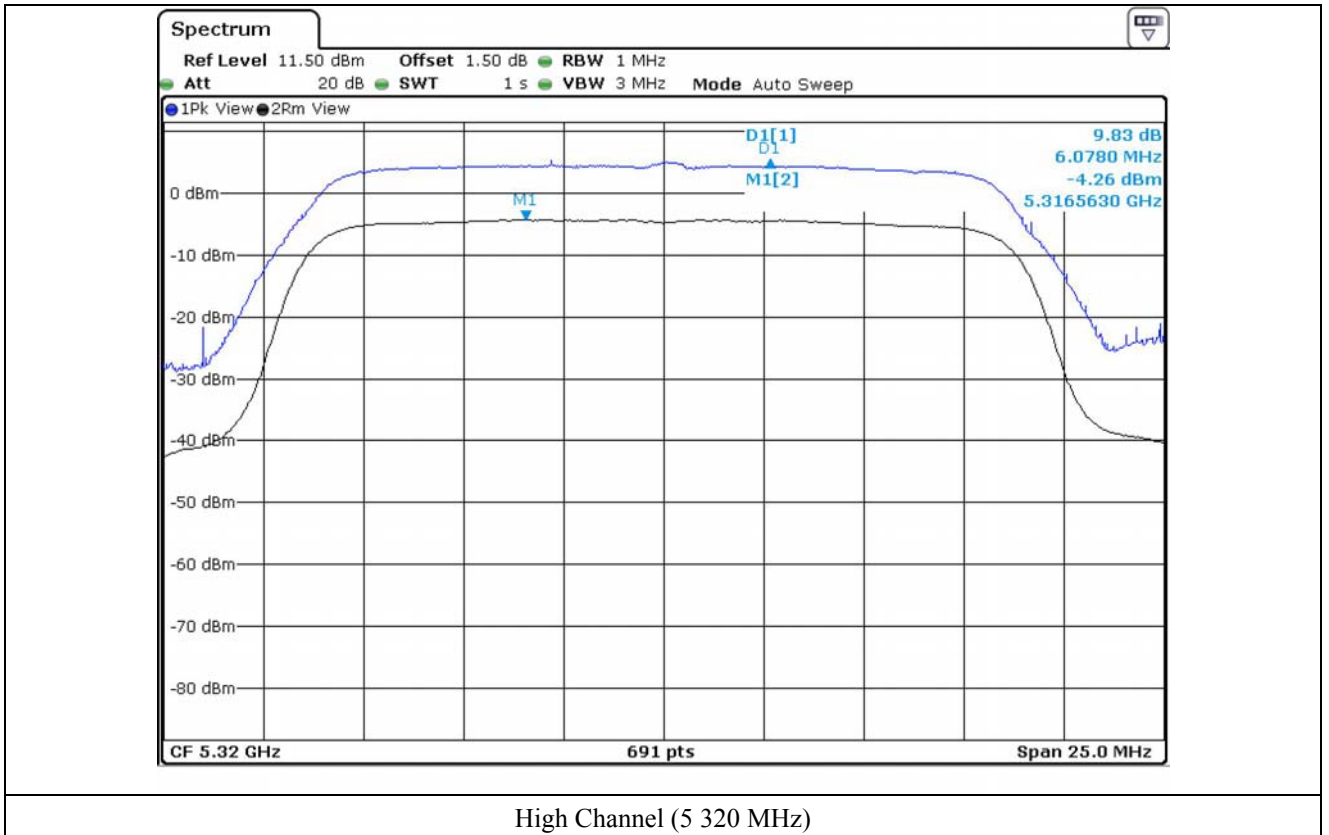


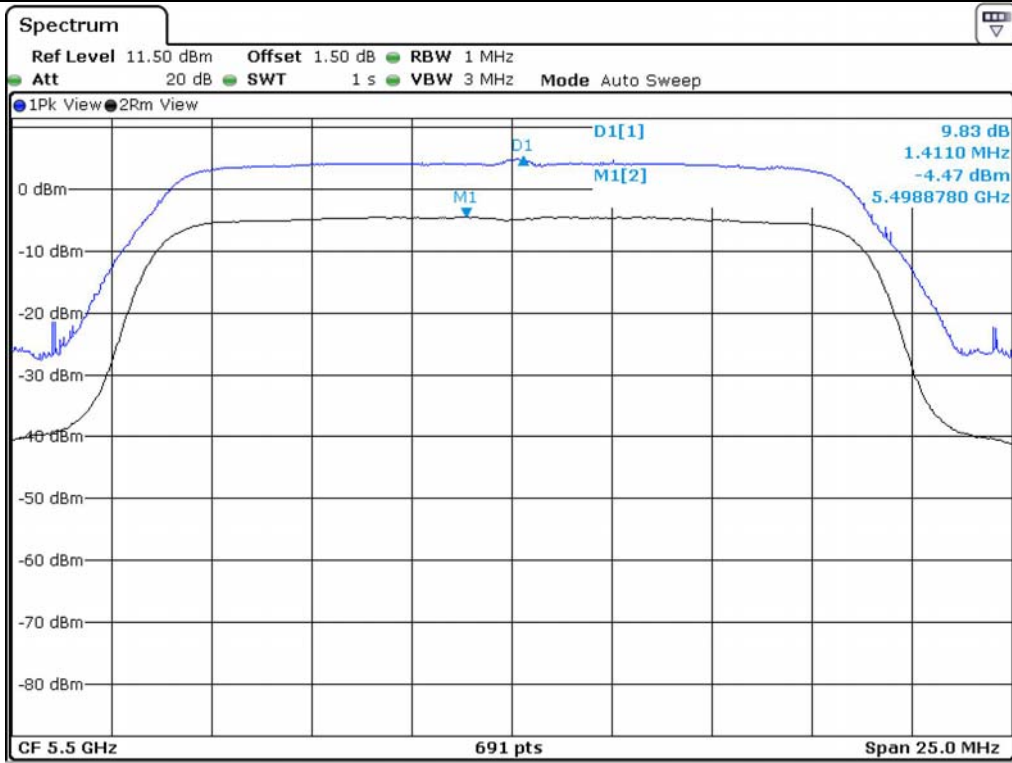


Low Channel (5 260 MHz)

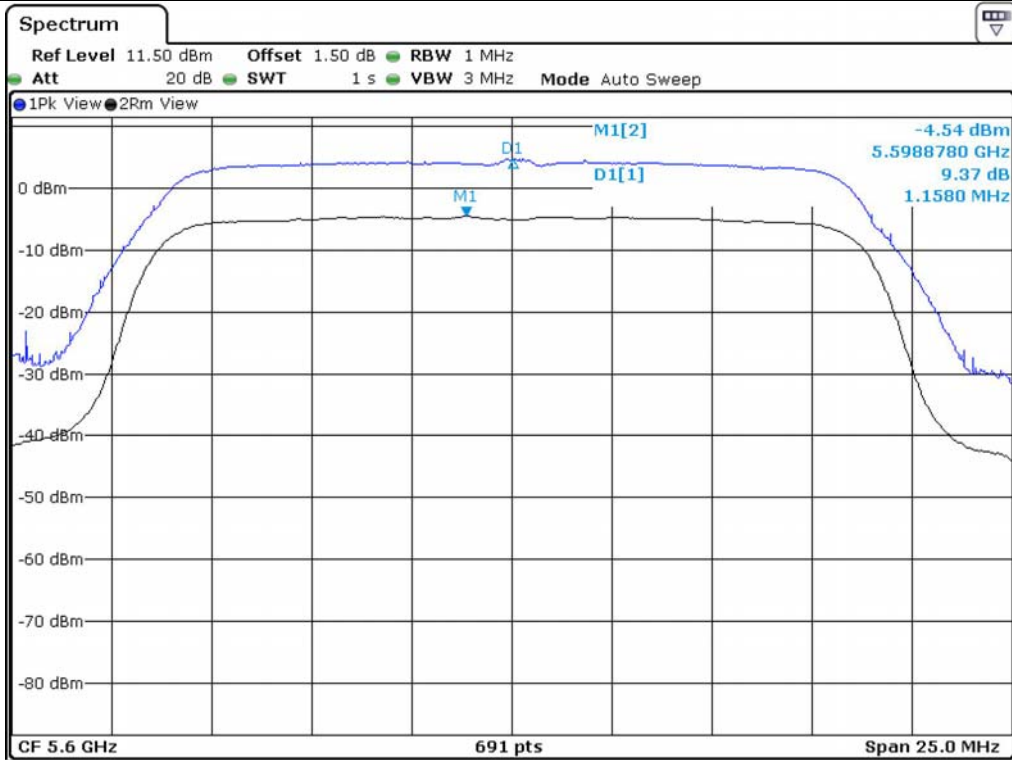


Middle Channel (5 300 MHz)





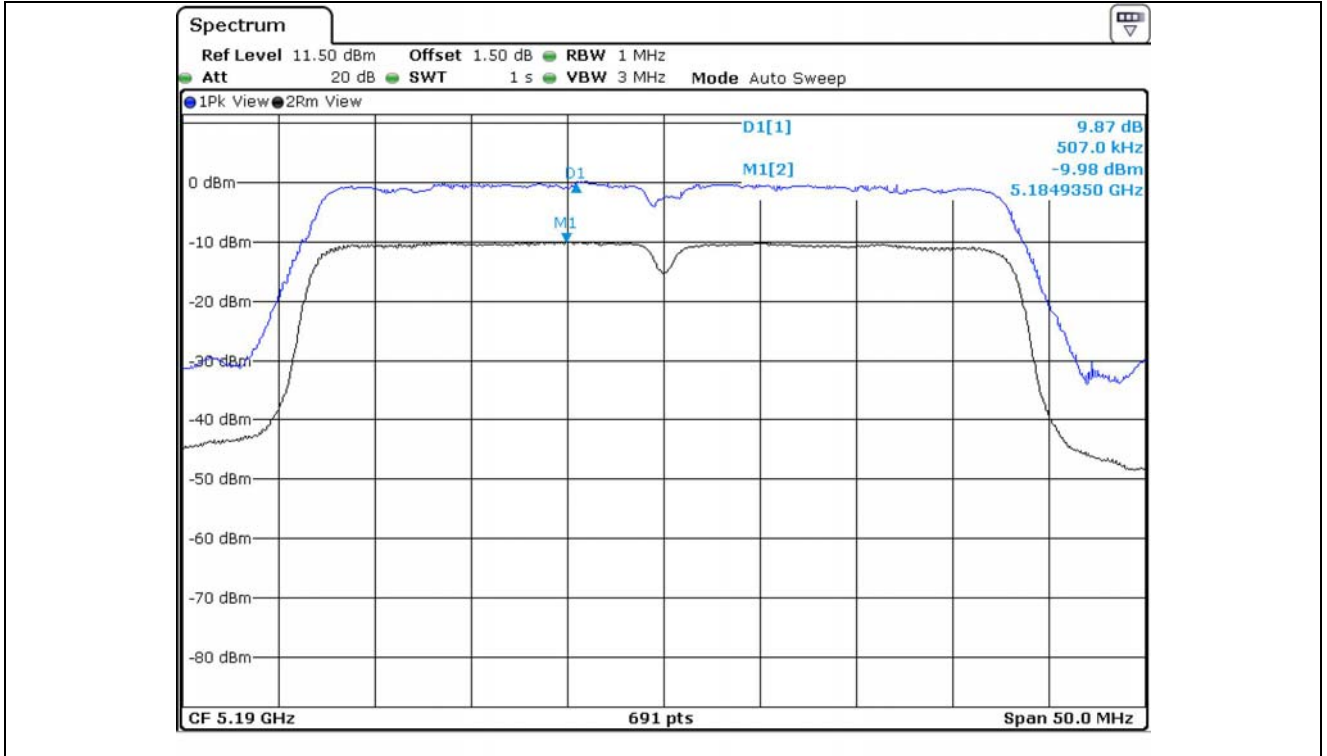
Low Channel (5 500 MHz)



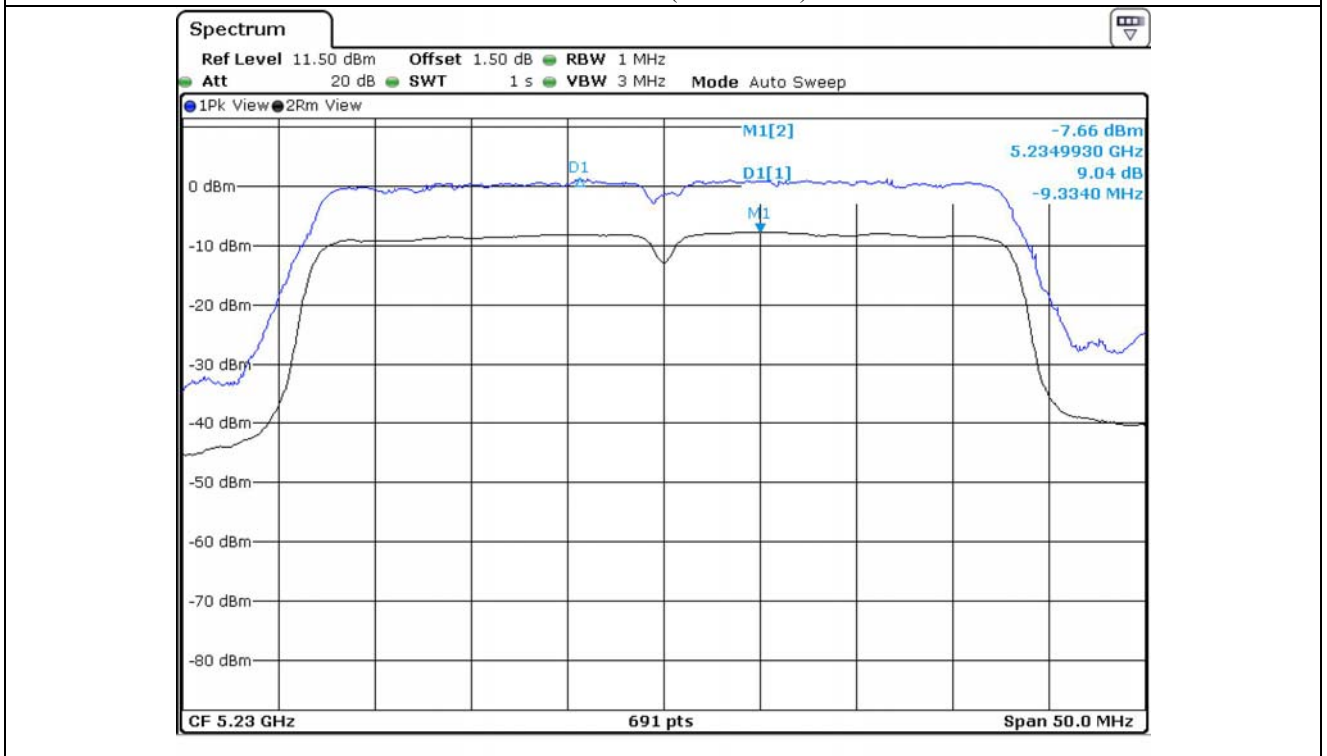
Middle Channel (5 600 MHz)

10.6 Test data for 802.11n_HT40 RLAN Mode

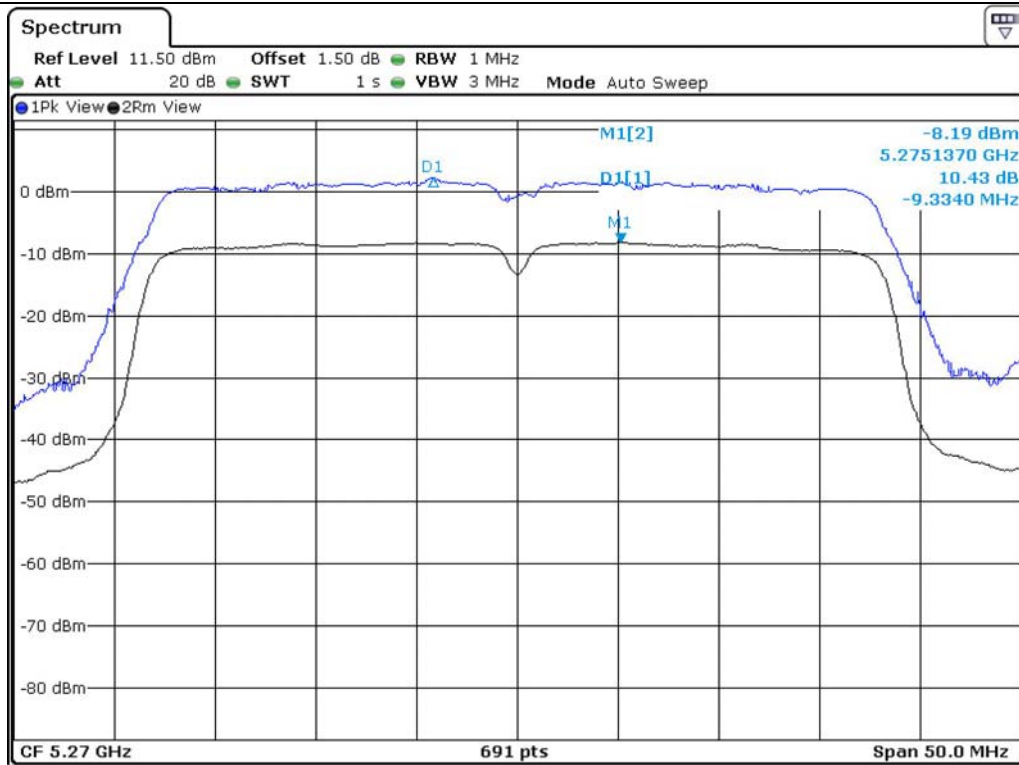
10.6.1 Test data for Antenna 0



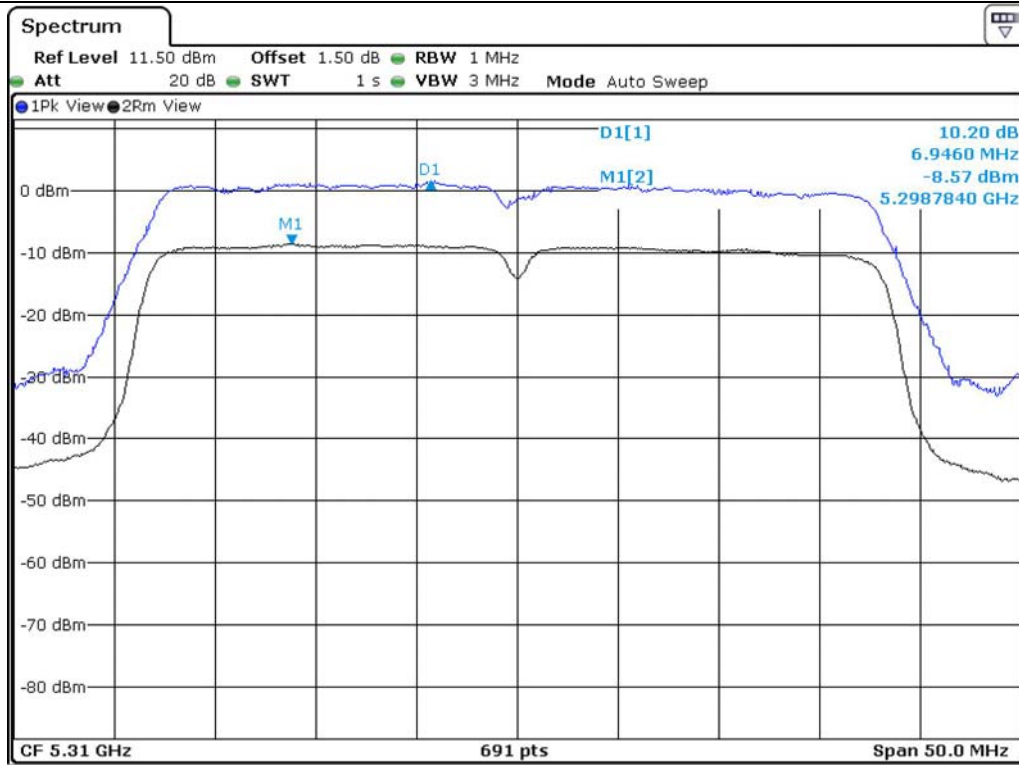
Low Channel (5 190 MHz)



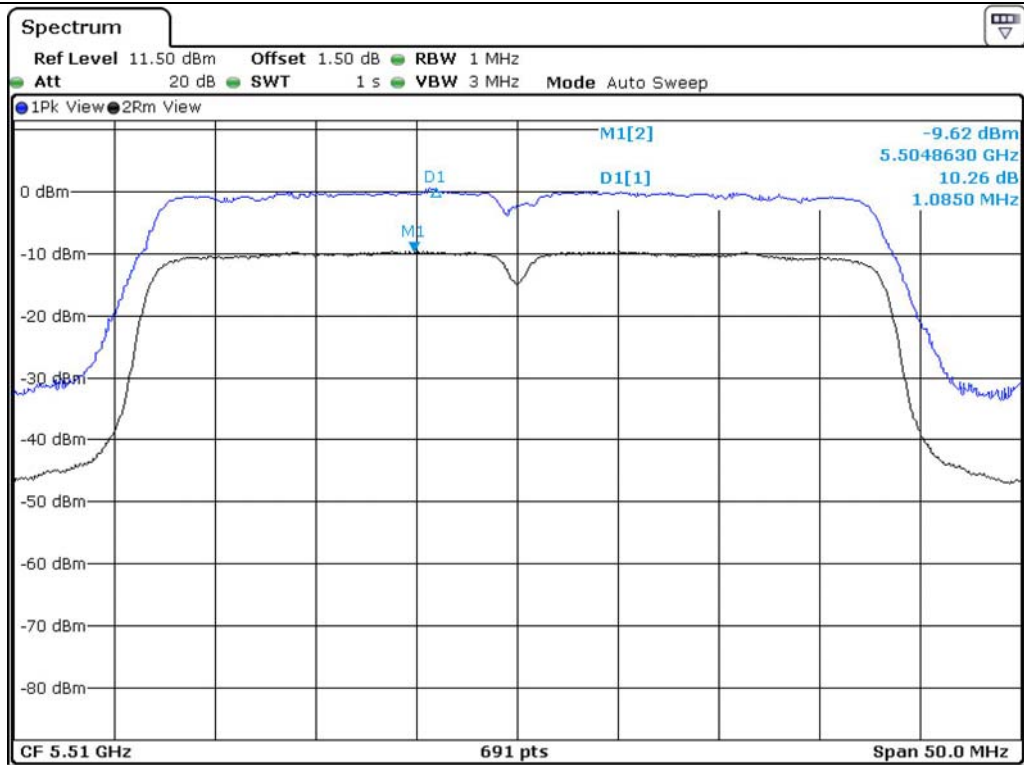
High Channel (5 230 MHz)



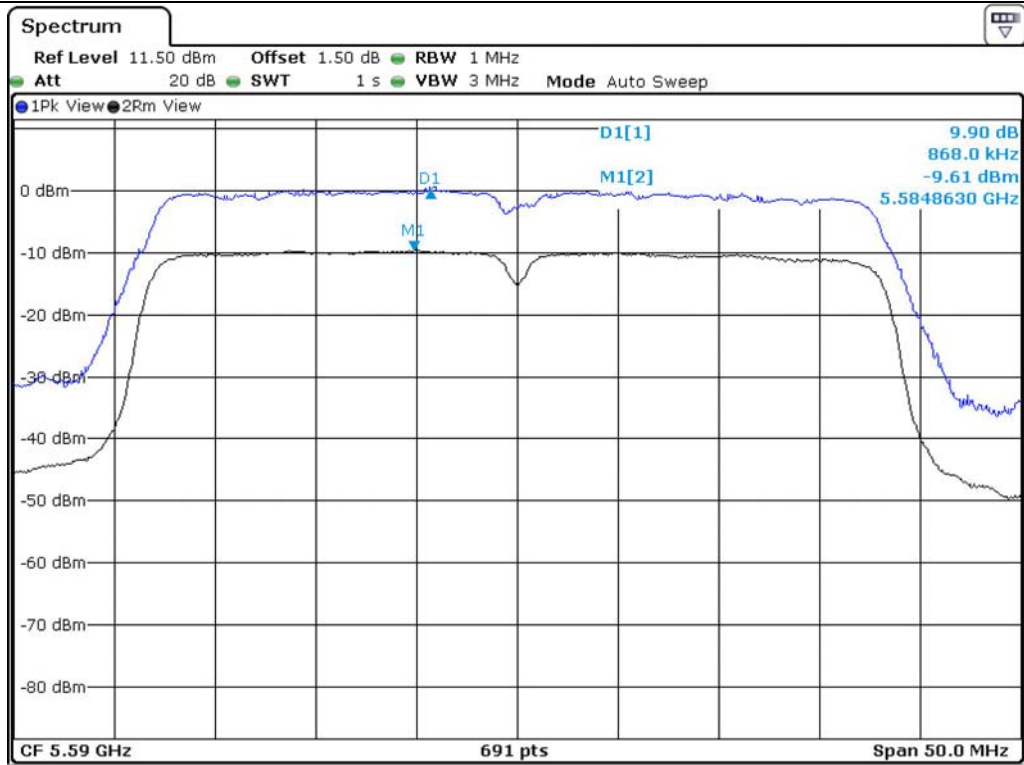
Low Channel (5 270 MHz)



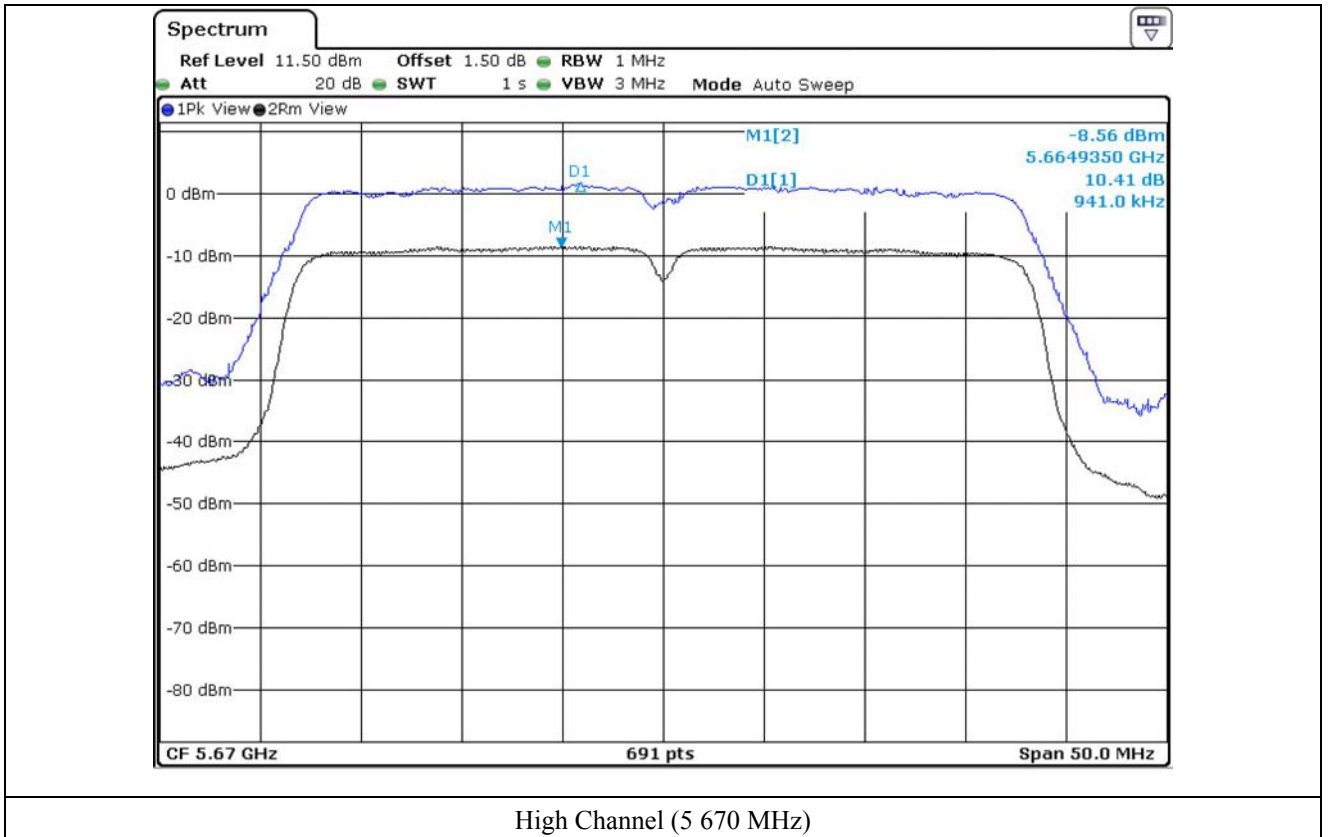
High Channel (5 310 MHz)



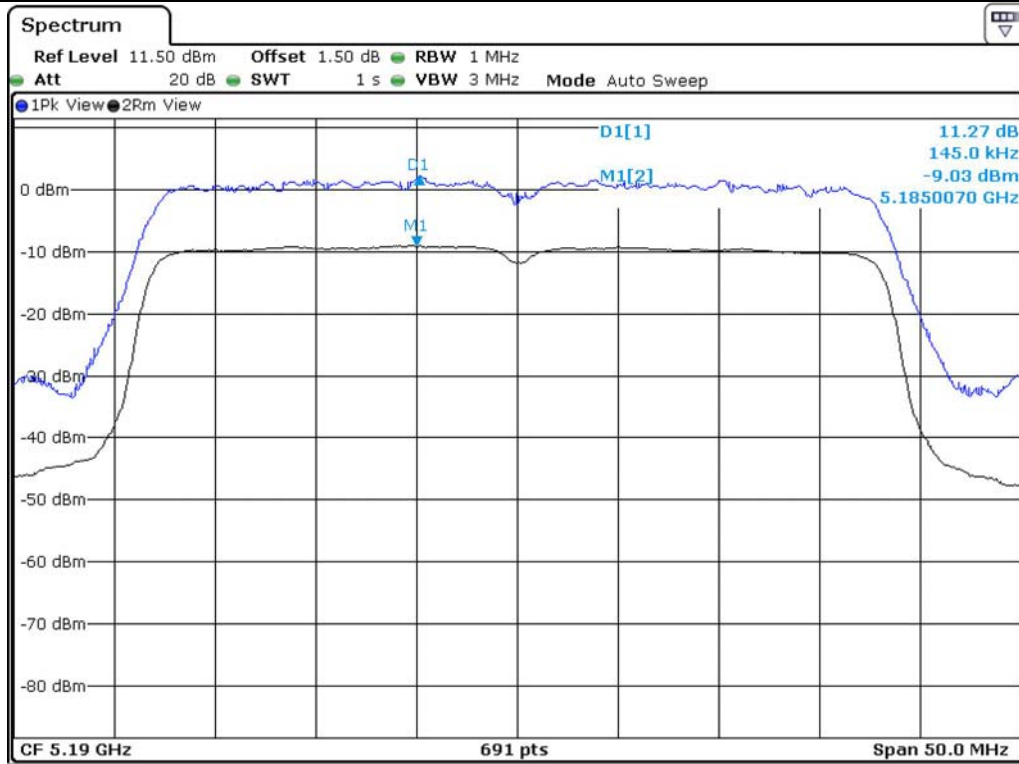
Low Channel (5 510 MHz)



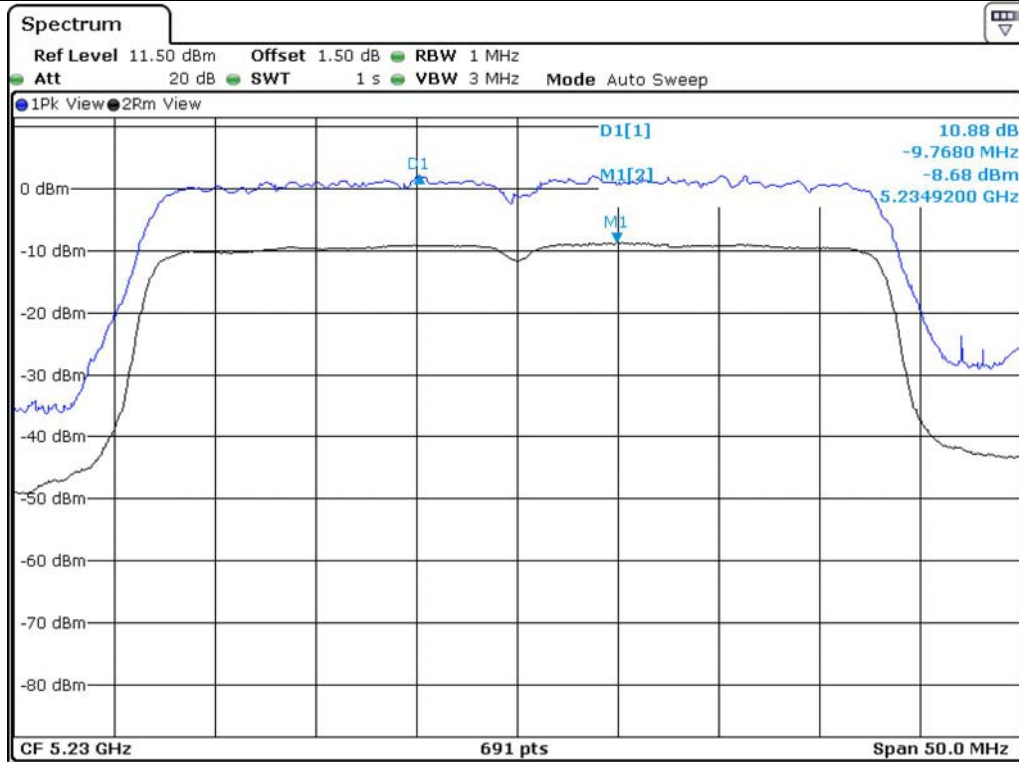
Middle Channel (5 590 MHz)



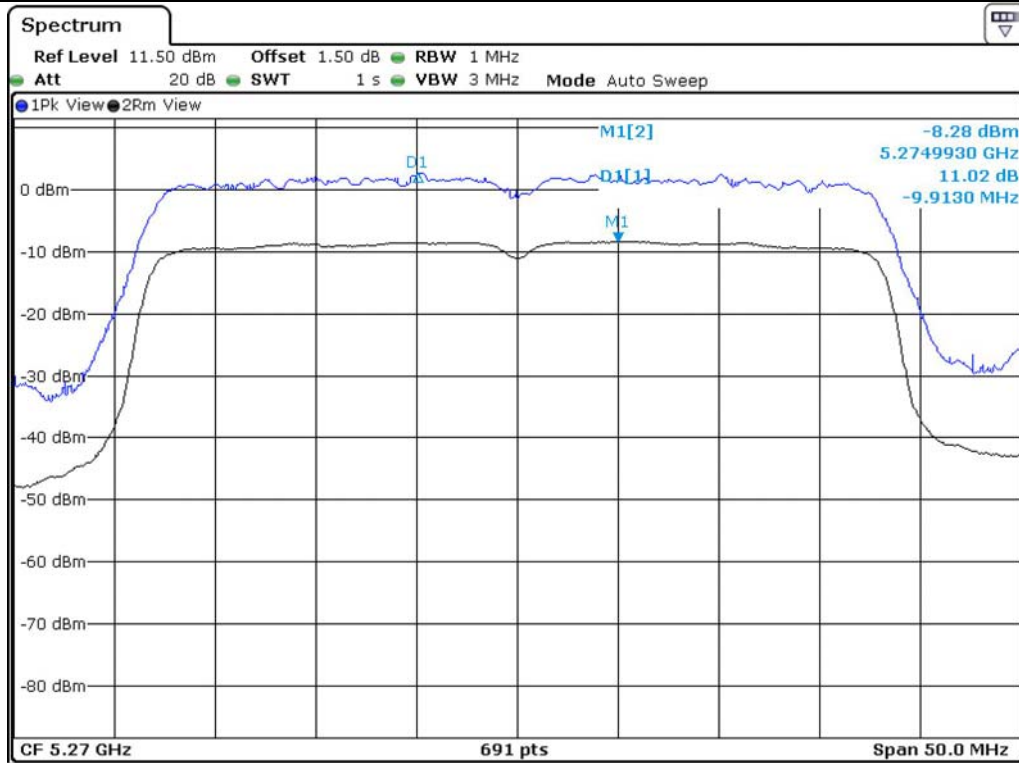
10.6.2 Test data for Antenna 1



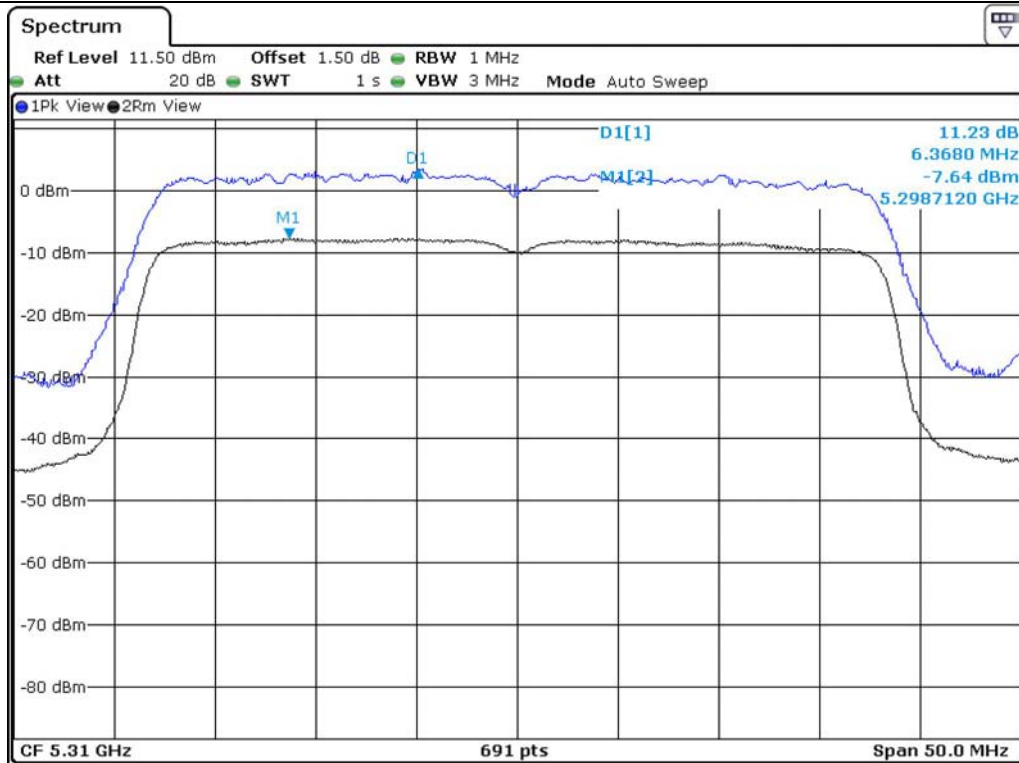
Low Channel (5 190 MHz)



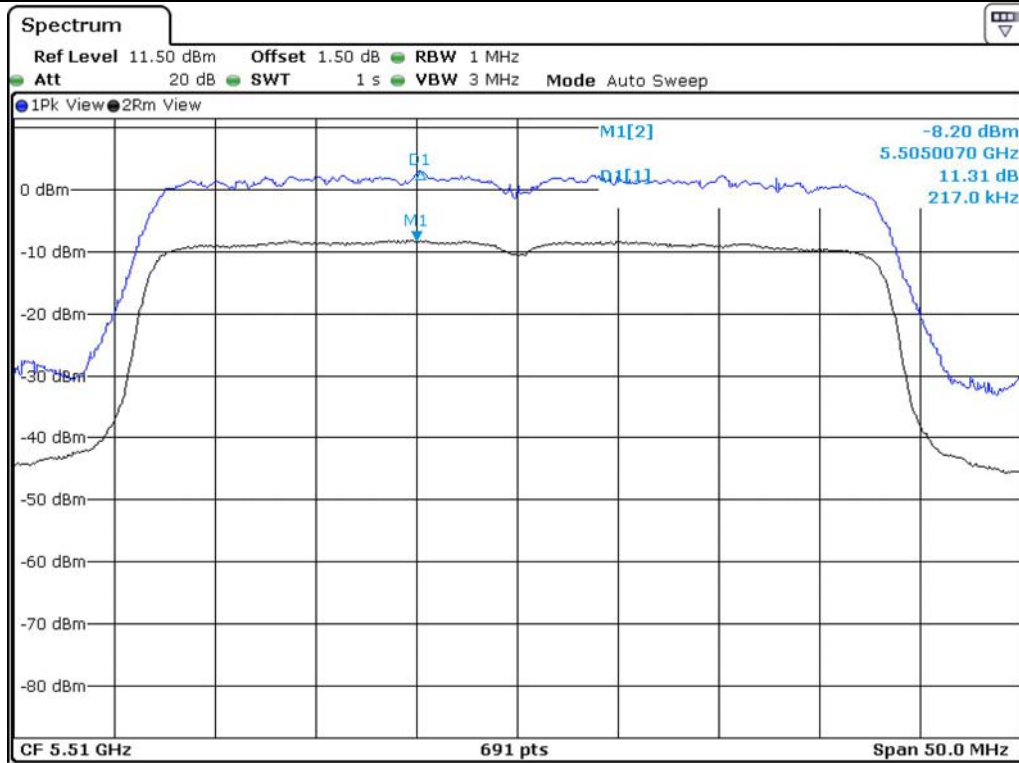
High Channel (5 230 MHz)



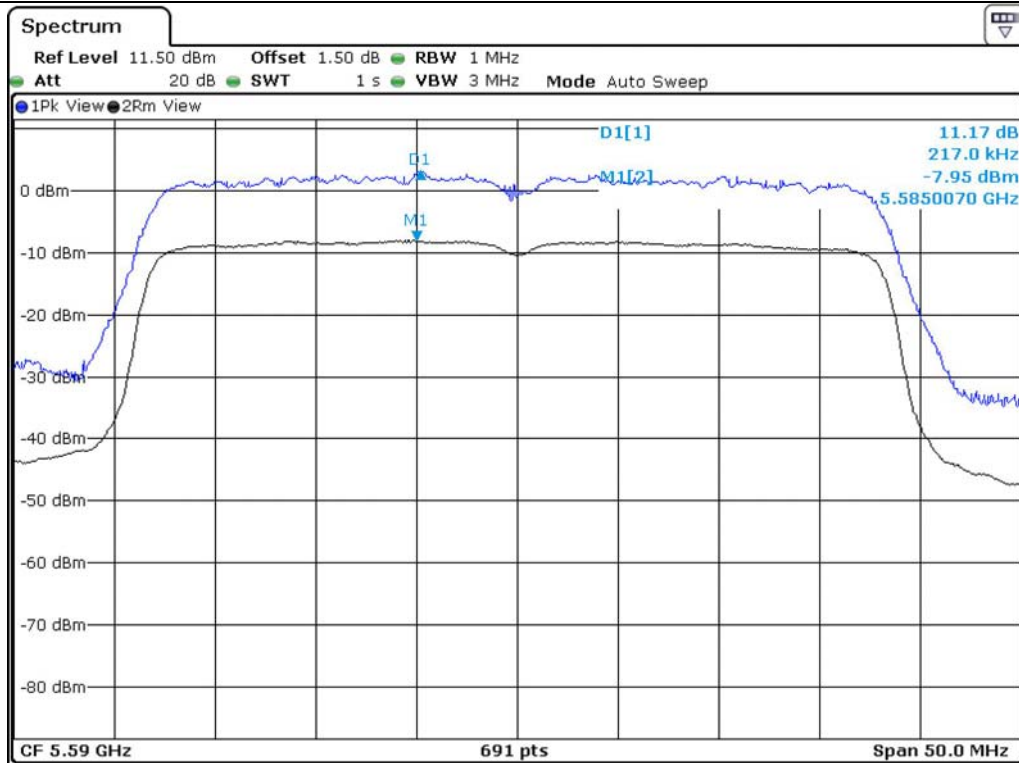
Low Channel (5 270 MHz)



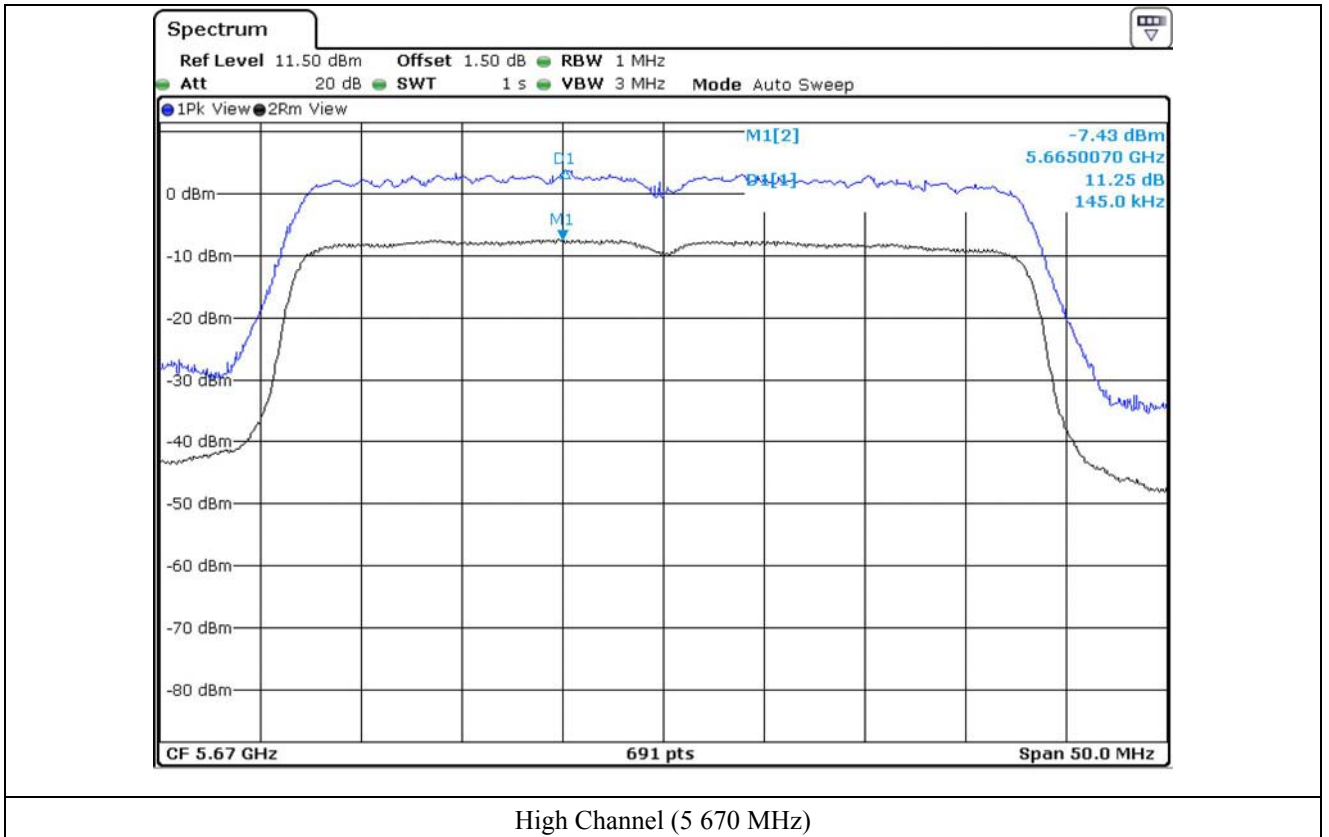
High Channel (5 310 MHz)



Low Channel (5 510 MHz)



Middle Channel (5 590 MHz)



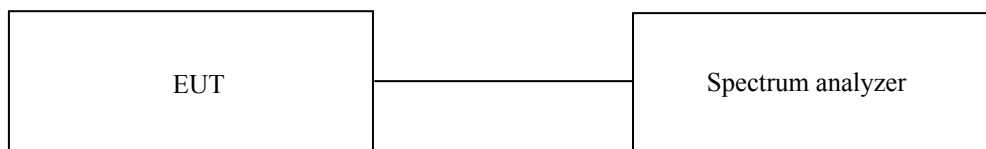
11. FREQUENCY STABILITY WITH TEMPERATURE VARIATION

11.1 Operating environment

Temperature : 24 °C
 Relative humidity : 43 % R.H.

11.2 Test set-up

Turn EUT off and set chamber temperature to -30 °C and then allow sufficient time (approximately 20 min to 30 min after chamber reach the assigned temperature) for EUT to stabilize. Turn on the EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 °C step from 0 °C to +65 °C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.



11.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ - FSV30	Rohde & Schwarz	Signal Analyzer	101372	May 20, 2013 (1Y)
■ - SSE-43CI-A	Samkun Tech	Humidity Chamber	060712	May 20, 2013 (1Y)
■ - DRP-305DN	DIGITAL Elec.	DC Power supply	4030195	Sep. 03, 20123(1Y)

All test equipment used is calibrated on a regular basis.

11.4 Test Data for 5 150 MHz ~ 5 250 MHz Band

- Test Date : December 16, 2013

- Result : Pass

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Frequency Error (kHz)
0	5 180 000 000	5 179 981 207	-18.793
10		5 179 979 867	-20.133
20		5 179 979 442	-20.558
30		5 179 979 317	-20.683
40		5 179 979 252	-20.748
50		5 179 978 142	-21.858
60		5 179 977 639	-22.361
65		5 179 977 674	-22.326
0		5 200 000 000	5 199 980 967
10	5 199 979 619		-20.381
20	5 199 979 311		-20.689
30	5 199 979 071		-20.929
40	5 199 979 003		-20.997
50	5 199 977 897		-22.103
60	5 199 977 404		-22.596
65	5 199 977 434		-22.566
0	5 240 000 000		5 239 980 788
10		5 239 979 459	-20.541
20		5 239 979 142	-20.858
30		5 239 978 910	-21.090
40		5 239 978 839	-21.161
50		5 239 977 727	-22.273
60		5 239 977 228	-22.772
65		5 239 977 262	-22.738



Tested by: Hong-Kyu, Lee/ Engineer

11.5 Test Data for 5 250 MHz ~ 5 350 MHz Band

- Test Date : December 16, 2013

- Result : Pass

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Frequency Error (kHz)
0	5 260 000 000	5 259 980 693	-19.307
10		5 259 979 340	-20.660
20		5 259 979 032	-20.968
30		5 259 978 796	-21.204
40		5 259 978 727	-21.273
50		5 259 977 625	-22.375
60		5 259 977 119	-22.881
65		5 259 977 153	-22.847
0		5 300 000 000	5 299 980 622
10	5 299 979 287		-20.713
20	5 299 978 963		-21.037
30	5 299 978 730		-21.270
40	5 299 978 667		-21.333
50	5 299 977 548		-22.452
60	5 299 977 054		-22.946
65	5 299 977 087		-22.913
0	5 320 000 000		5 319 980 388
10		5 319 979 035	-20.965
20		5 319 978 725	-21.275
30		5 319 978 495	-21.505
40		5 319 978 432	-21.568
50		5 319 977 323	-22.677
60		5 319 976 813	-23.187
65		5 319 976 846	-23.154



Tested by: Hong-Kyu, Lee/ Engineer

11.6 Test Data for 5 470 MHz ~ 5 725 MHz Band

- Test Date : December 16, 2013

- Result : Pass

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
0	5 500 000 000	5 499 979 765	-20.235
10		5 499 978 432	-21.568
20		5 499 978 117	-21.883
30		5 499 977 889	-22.111
40		5 499 977 809	-22.191
50		5 499 976 699	-23.301
60		5 499 976 203	-23.797
65		5 499 976 237	-23.763
0		5 600 000 000	5 599 979 314
10	5 599 977 958		-22.042
20	5 599 977 651		-22.349
30	5 599 977 420		-22.580
40	5 599 977 347		-22.653
50	5 599 976 246		-23.754
60	5 599 975 737		-24.263
65	5 599 975 777		-24.223
0	5 700 000 000		5 699 978 798
10		5 699 977 455	-22.545
20		5 699 977 138	-22.862
30		5 699 976 893	-23.107
40		5 699 976 847	-23.153
50		5 699 975 737	-24.263
60		5 699 975 226	-24.774
65		5 699 975 269	-24.731



Tested by: Hong-Kyu, Lee/ Engineer

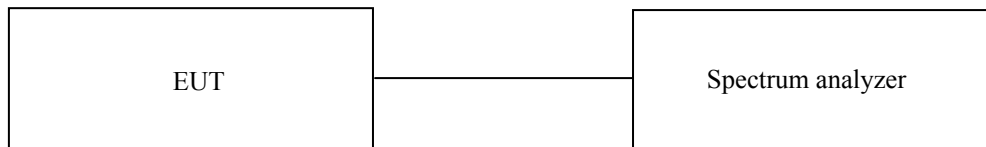
12. FREQUENCY STABILITY WITH VOLTAGE VARIATION

12.1 Operating environment

Temperature : 24 °C
 Relative humidity : 43 % R.H.

12.2 Test set-up

An external DC power supply was connected to the input of the EUT. The voltage of EUT set to 115 % of the nominal value and then was reduced to 85 % of nominal voltage. The output frequency was recorded at each step.



12.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ - FSV30	Rohde & Schwarz	Signal Analyzer	101372	May 20, 2013 (1Y)
□ - SSE-43CI-A	Samkun Tech	Humidity Chamber	060712	May 20, 2013 (1Y)
■ - DRP-305DN	DIGITAL Elec.	DC Power supply	4030195	Sep. 03, 2013 (1Y)

All test equipment used is calibrated on a regular basis.