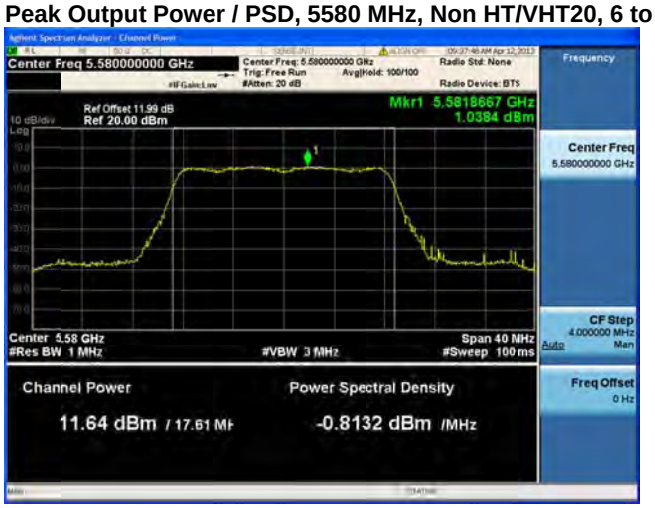
Peak Output Power / PSD, 5580 MHz, Non HT/VHT20, 6 to 54 Mbps

Antenna A

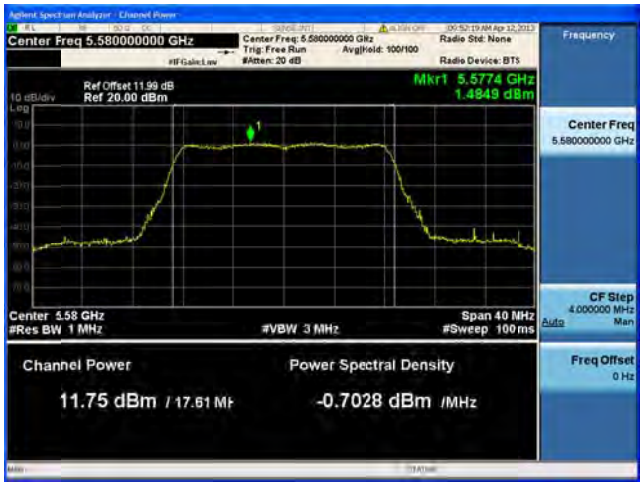
Antenna B

Peak Output Power / PSD, 5580 MHz, Non HT/VHT20, 6 to 54 Mbps



Antenna A

Antenna B



Antenna C

Peak Output Power / PSD, 5580 MHz, Non HT/VHT20, 6 to 54 Mbps

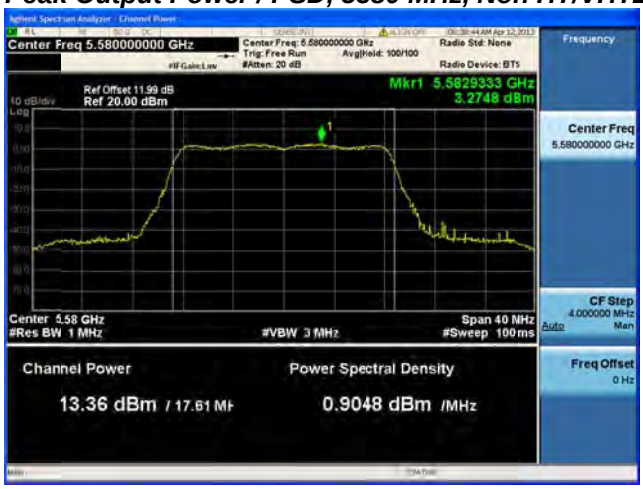
Antenna A

Antenna B

Antenna C

Antenna D

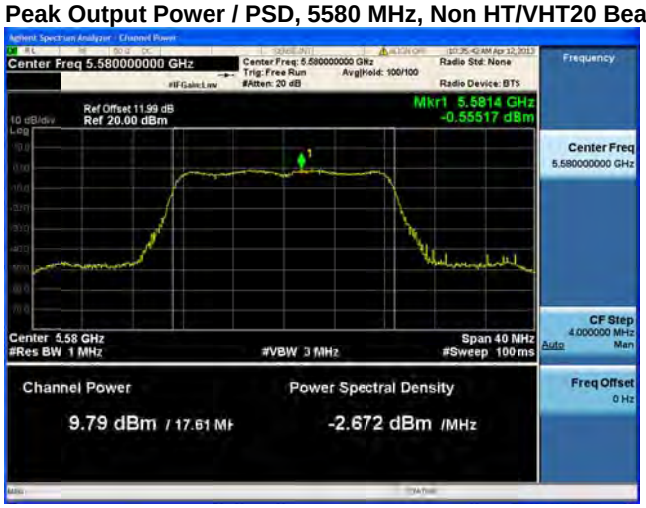
Peak Output Power / PSD, 5580 MHz, Non HT/VHT20 Beam Forming, 6 to 54 Mbps



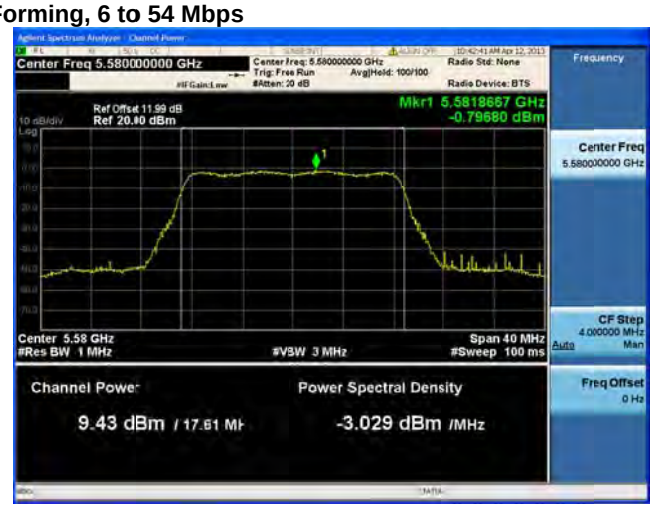
Antenna A

Antenna B

Peak Output Power / PSD, 5580 MHz, Non HT/VHT20 Beam Forming, 6 to 54 Mbps



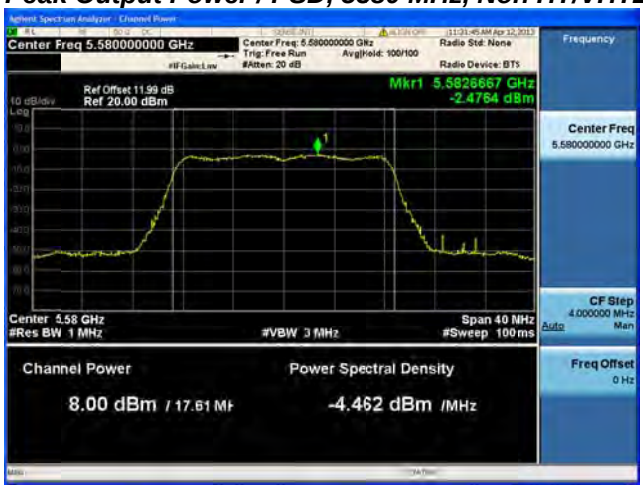
Antenna A



Antenna B

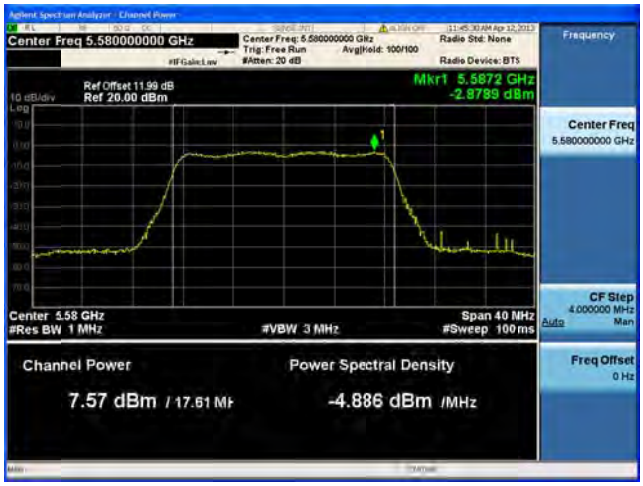
Antenna C

Peak Output Power / PSD, 5580 MHz, Non HT/VHT20 Beam Forming, 6 to 54 Mbps

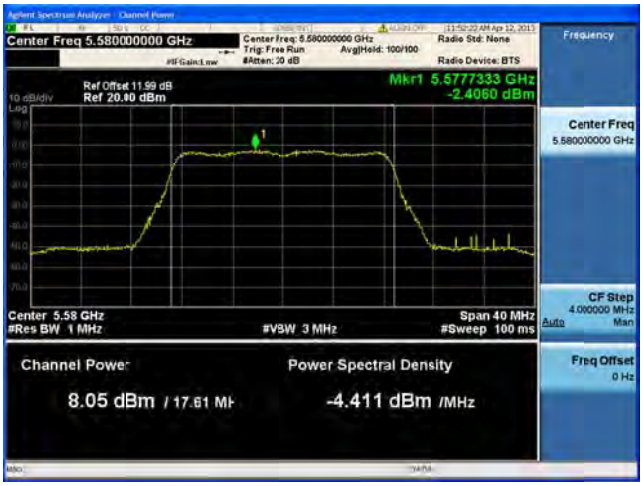


Antenna A

Antenna B



Antenna C



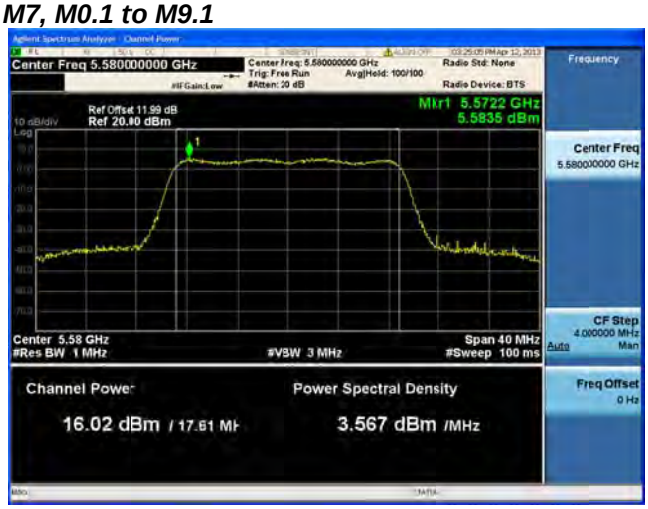
Antenna D

Peak Output Power / PSD, 5580 MHz, HT/VHT20, M0 to M7, M0.1 to M9.1

Antenna A

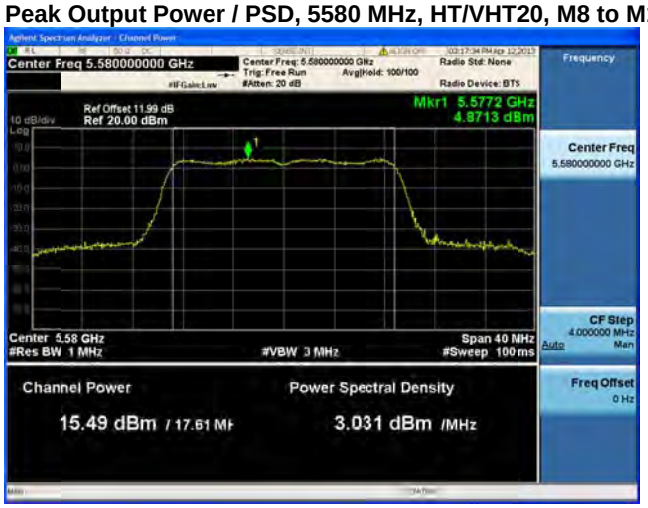
Peak Output Power / PSD, 5580 MHz, HT/VHT20, M0 to M7, M0.1 to M9.1

Antenna A

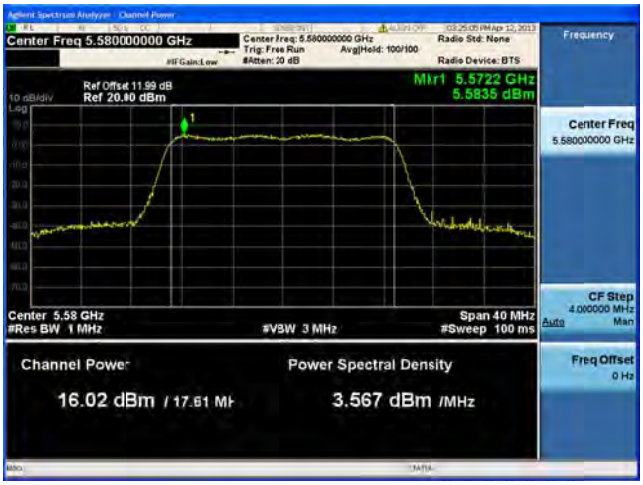


Antenna B

Peak Output Power / PSD, 5580 MHz, HT/VHT20, M8 to M15, M0.2 to M9.2

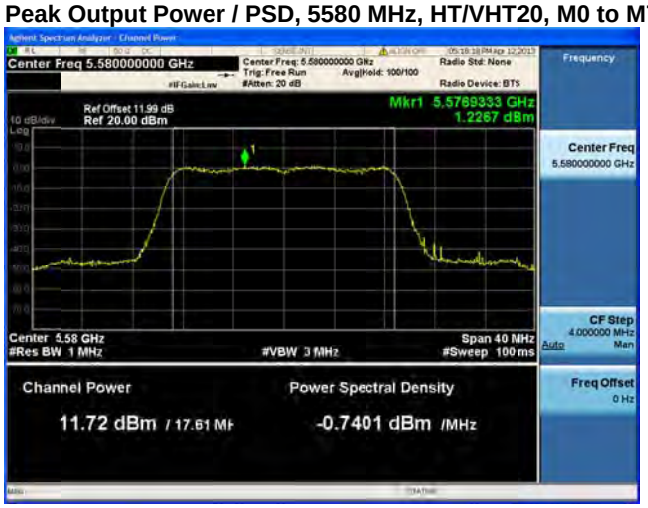


Antenna A



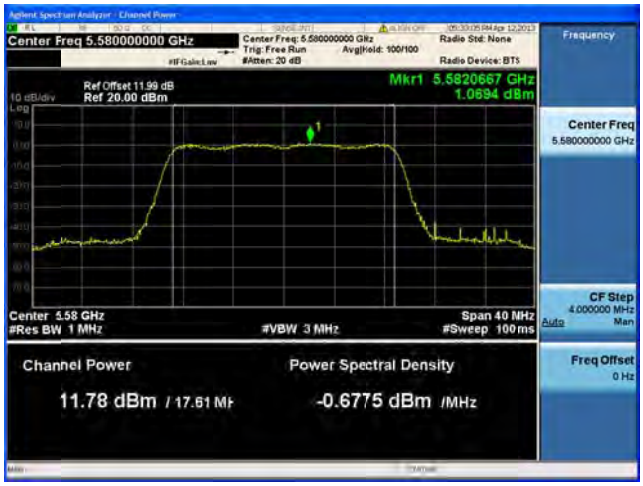
Antenna B

Peak Output Power / PSD, 5580 MHz, HT/VHT20, M0 to M7, M0.1 to M9.1



Antenna A

Antenna B



Antenna C

Peak Output Power / PSD, 5580 MHz, HT/VHT20, M8 to M15, M0.2 to M9.2

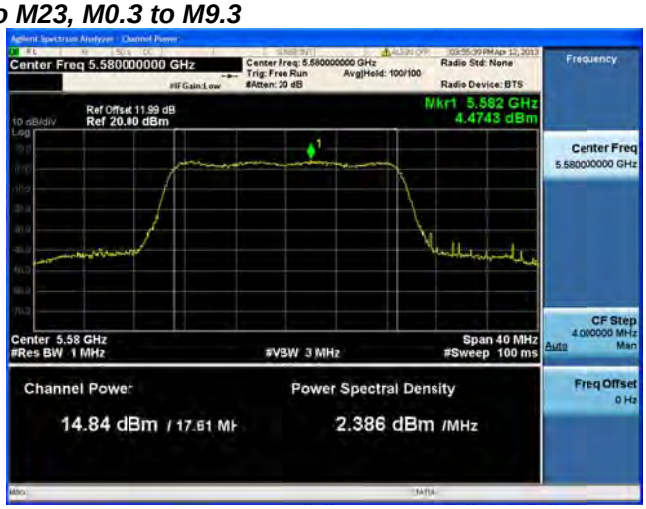
Antenna A

Antenna B

Antenna C

Peak Output Power / PSD, 5580 MHz, HT/VHT20, M16 to M23, M0.3 to M9.3

Antenna A

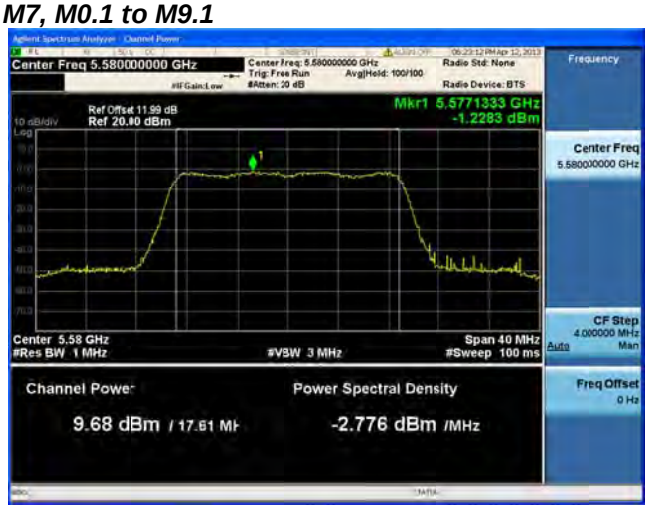


Antenna B

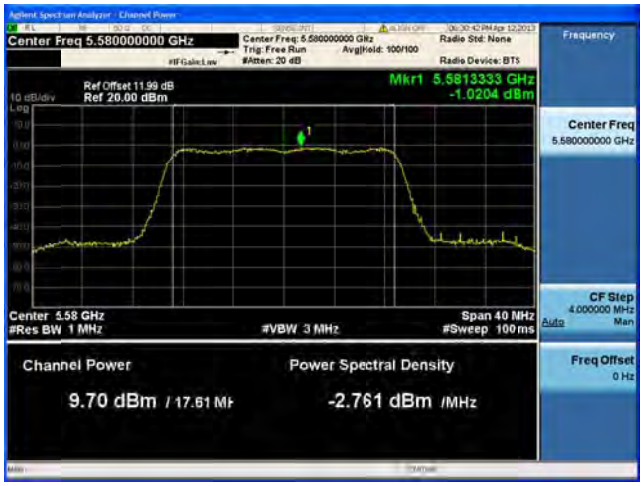
Antenna C

Peak Output Power / PSD, 5580 MHz, HT/VHT20, M0 to M7, M0.1 to M9.1

Antenna A



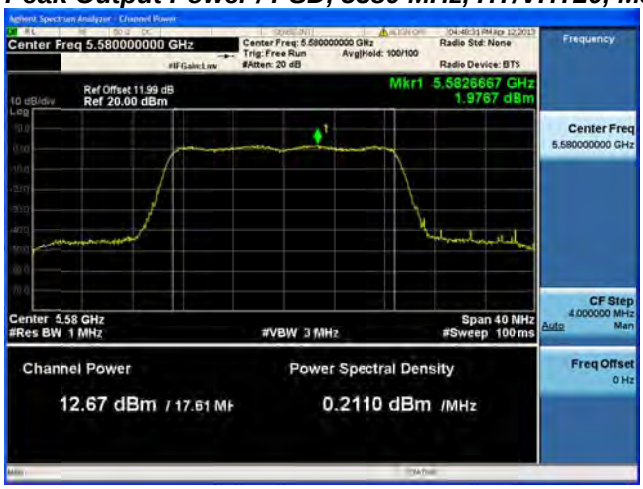
Antenna B



Antenna C

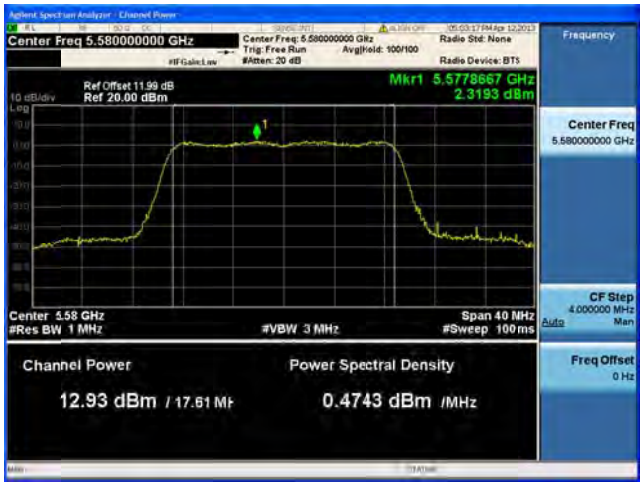
Antenna D

Peak Output Power / PSD, 5580 MHz, HT/VHT20, M8 to M15, M0.2 to M9.2

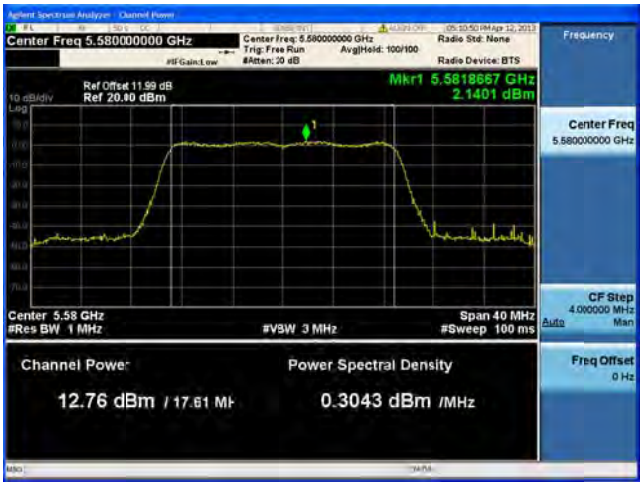


Antenna A

Antenna B



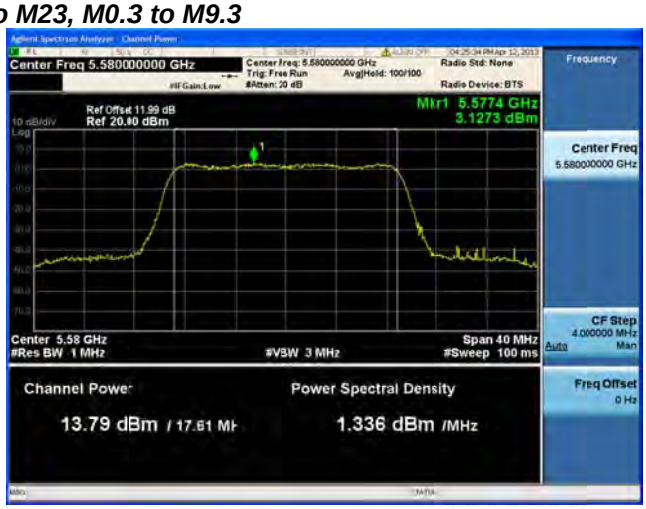
Antenna C



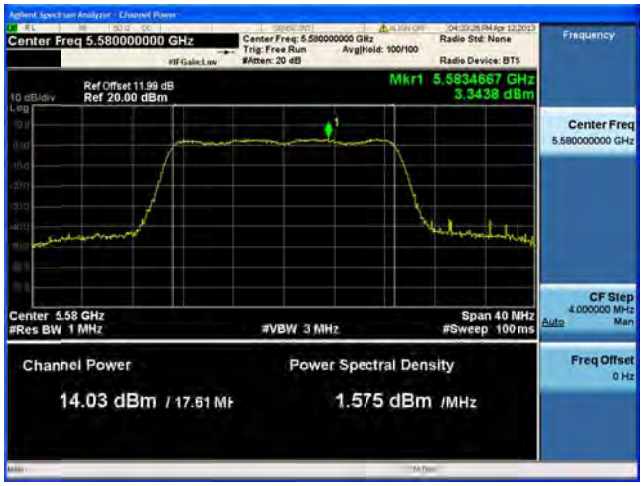
Antenna D

Peak Output Power / PSD, 5580 MHz, HT/VHT20, M16 to M23, M0.3 to M9.3

Antenna A



Antenna B



Antenna C

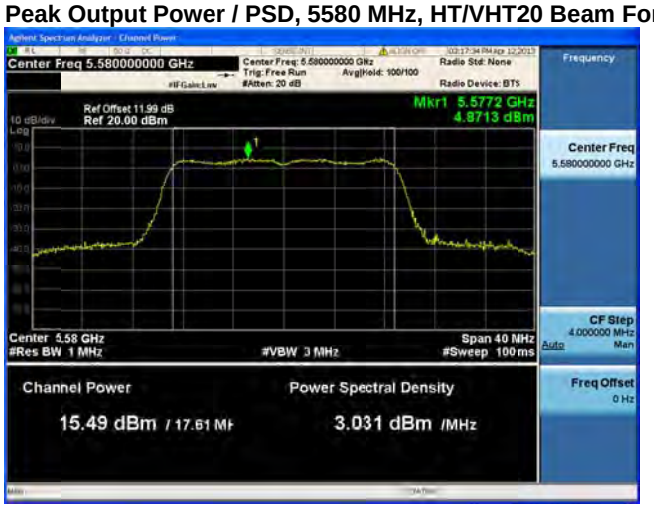
Antenna D

Peak Output Power / PSD, 5580 MHz, HT/VHT20 Beam Forming, M0 to M7, M0.1 to M9.1

Antenna A

Antenna B

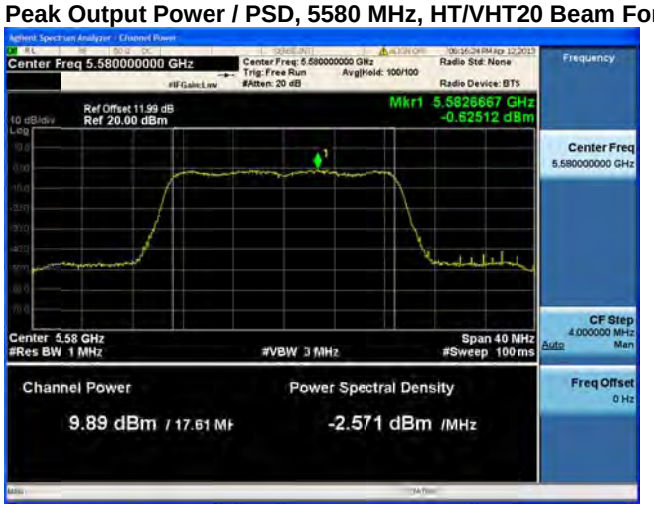
Peak Output Power / PSD, 5580 MHz, HT/VHT20 Beam Forming, M8 to M15, M0.2 to M9.2



Antenna A

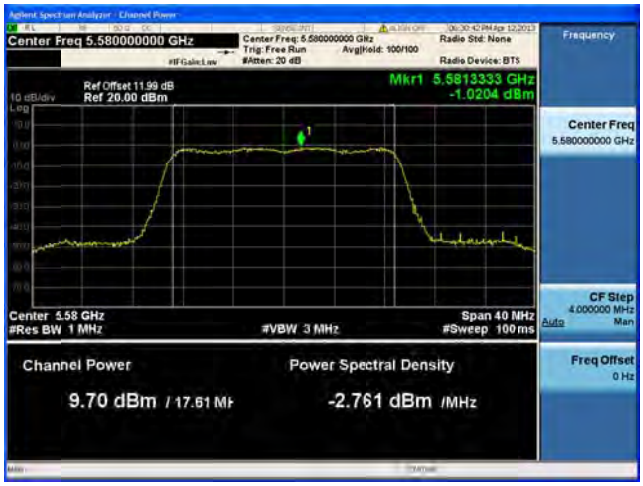
Antenna B

Peak Output Power / PSD, 5580 MHz, HT/VHT20 Beam Forming, M0 to M7, M0.1 to M9.1



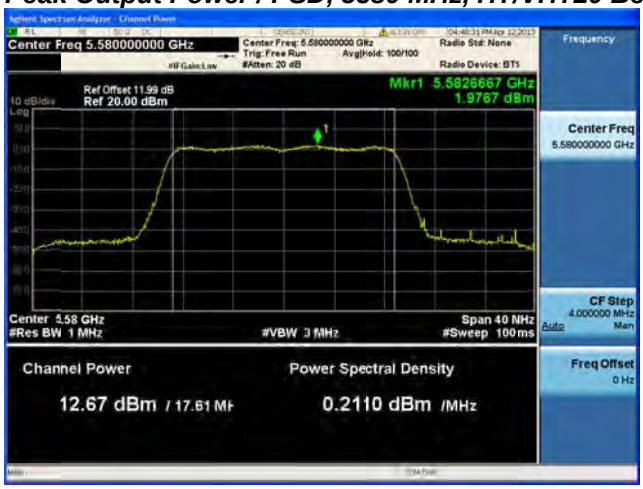
Antenna A

Antenna B



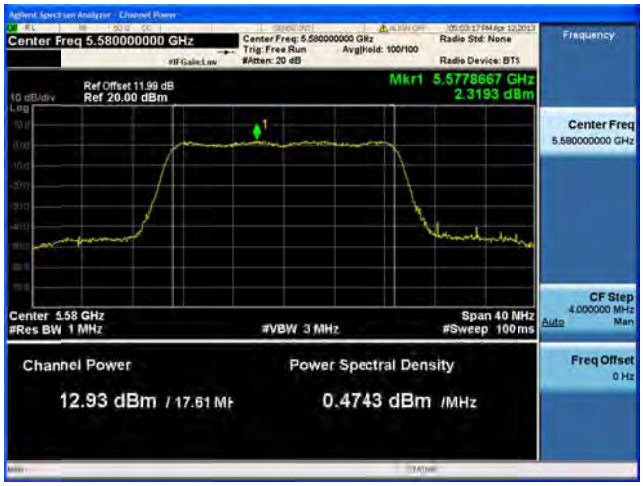
Antenna C

Peak Output Power / PSD, 5580 MHz, HT/VHT20 Beam Forming, M8 to M15, M0.2 to M9.2



Antenna A

Antenna B



Antenna C

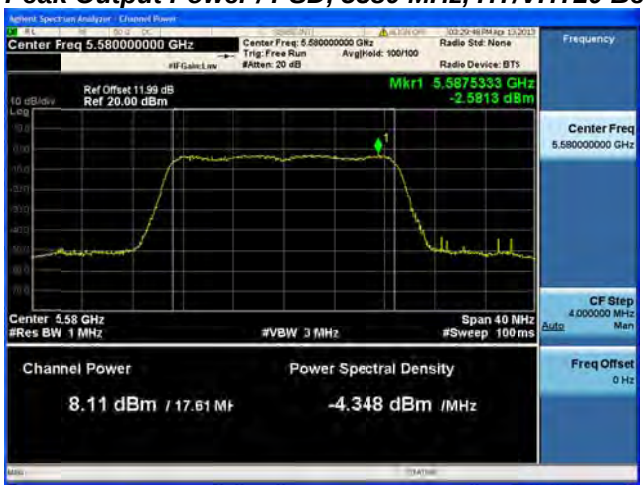
Peak Output Power / PSD, 5580 MHz, HT/VHT20 Beam Forming, M16 to M23, M0.3 to M9.3

Antenna A

Antenna B

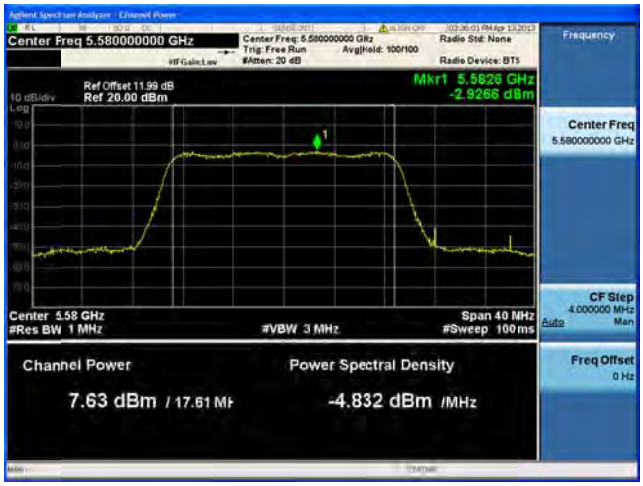
Antenna C

Peak Output Power / PSD, 5580 MHz, HT/VHT20 Beam Forming, M0 to M7, M0.1 to M9.1



Antenna A

Antenna B



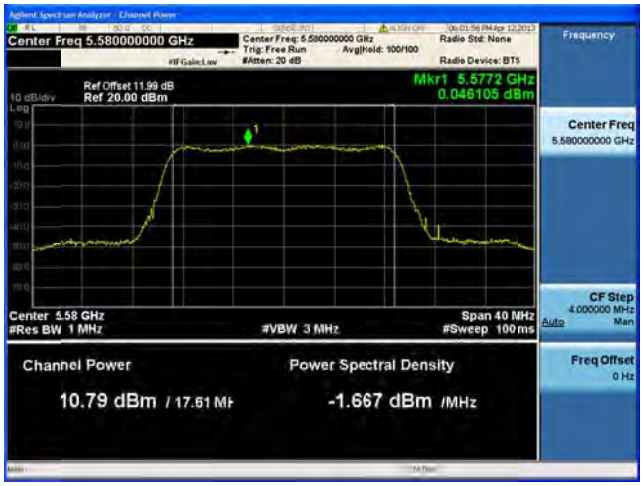
Antenna C

Antenna D

Peak Output Power / PSD, 5580 MHz, HT/VHT20 Beam Forming, M8 to M15, M0.2 to M9.2

Antenna A

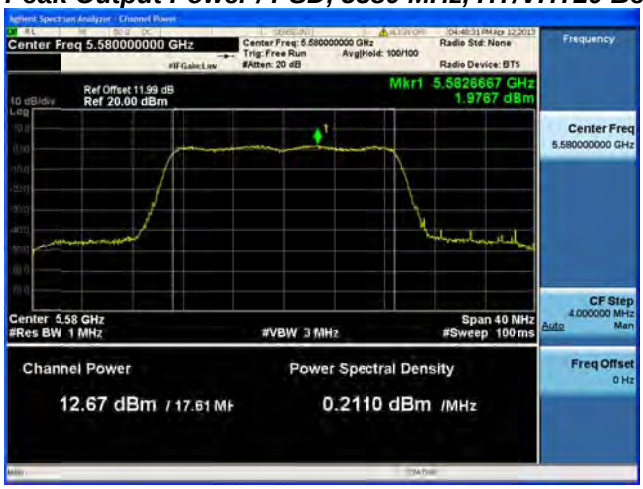
Antenna B



Antenna C

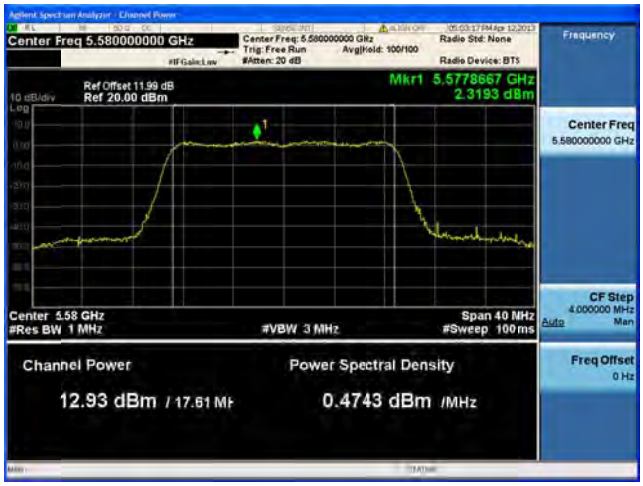
Antenna D

Peak Output Power / PSD, 5580 MHz, HT/VHT20 Beam Forming, M16 to M23, M0.3 to M9.3

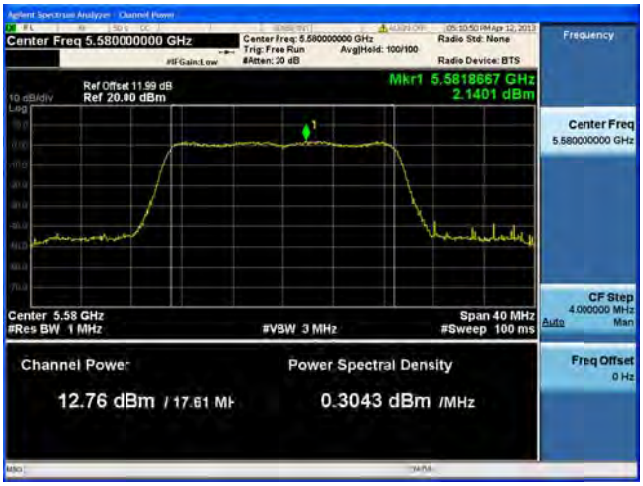


Antenna A

Antenna B



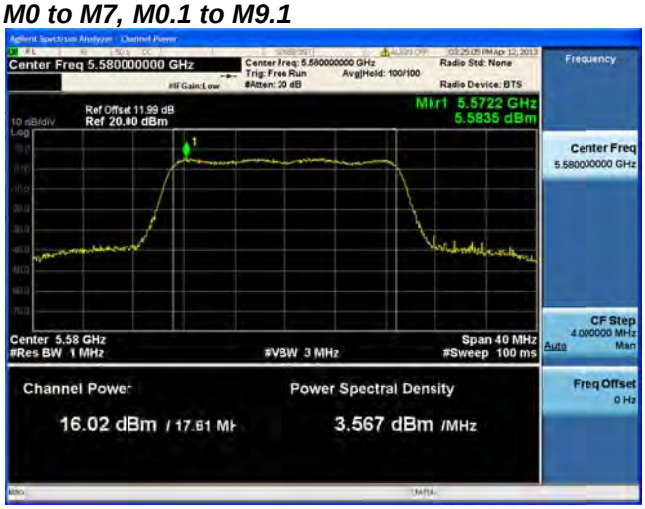
Antenna C



Antenna D

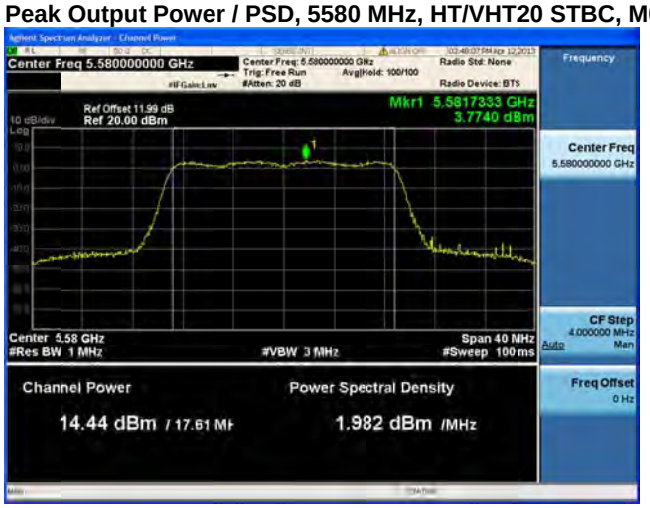
Peak Output Power / PSD, 5580 MHz, HT/VHT20 STBC, M0 to M7, M0.1 to M9.1

Antenna A

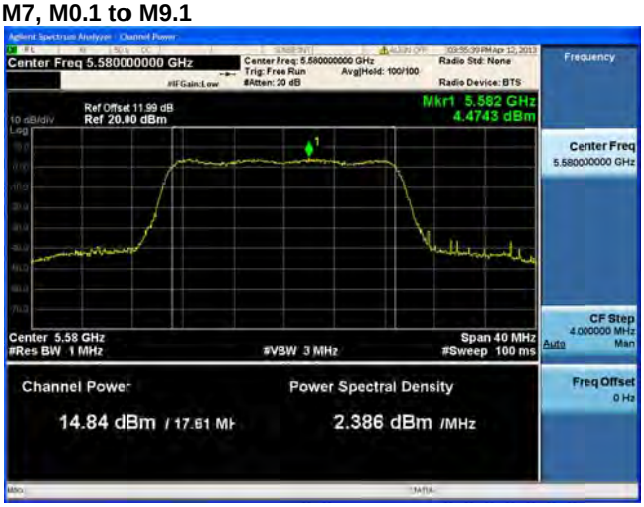


Antenna B

Peak Output Power / PSD, 5580 MHz, HT/VHT20 STBC, M0 to M7, M0.1 to M9.1



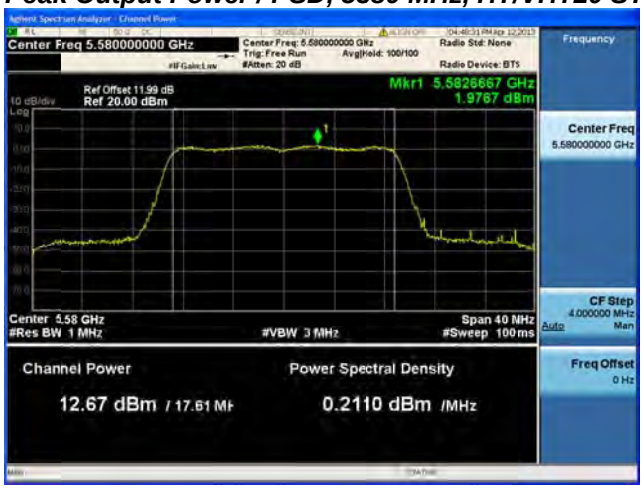
Antenna A



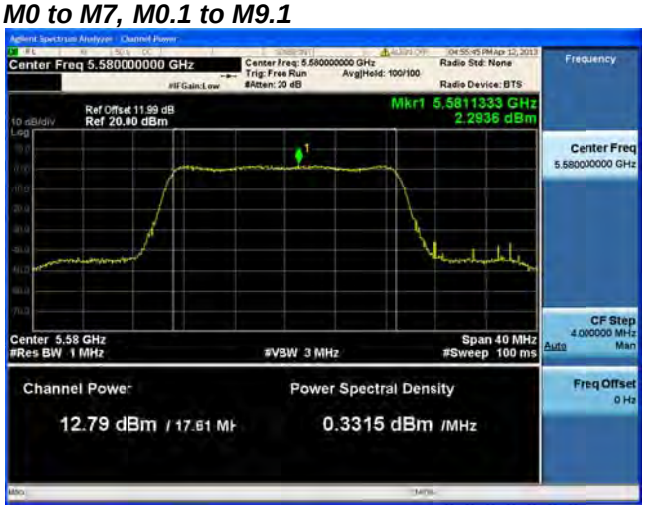
Antenna B

Antenna C

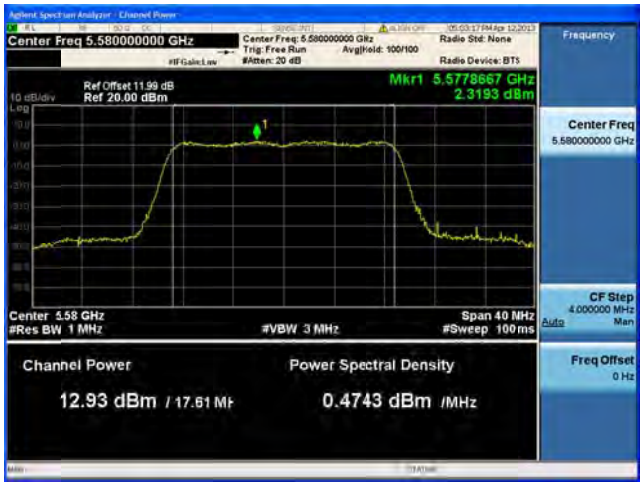
Peak Output Power / PSD, 5580 MHz, HT/VHT20 STBC, M0 to M7, M0.1 to M9.1



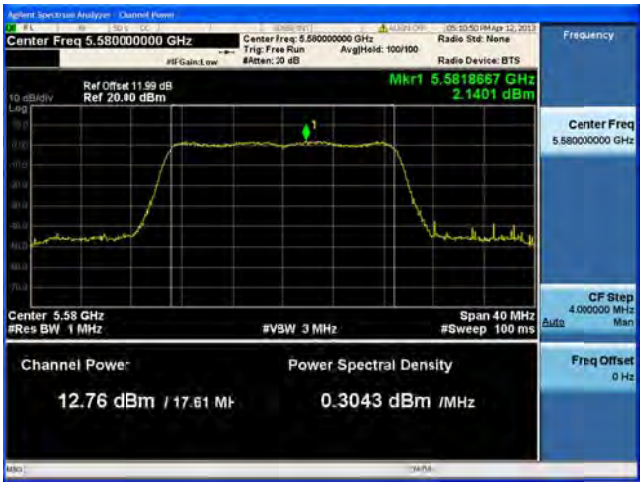
Antenna A



Antenna B



Antenna C



Antenna D

Peak Output Power / PSD, 5660 / 5680 MHz, Non HT/VHT40, 6 to 54 Mbps

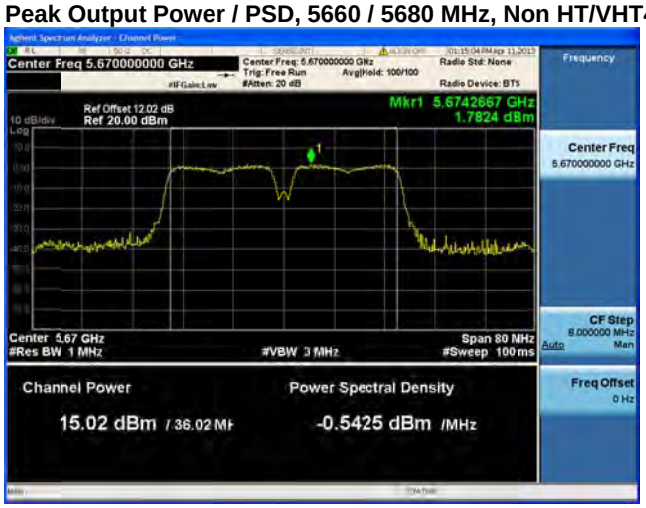
Antenna A

Peak Output Power / PSD, 5660 / 5680 MHz, Non HT/VHT40, 6 to 54 Mbps

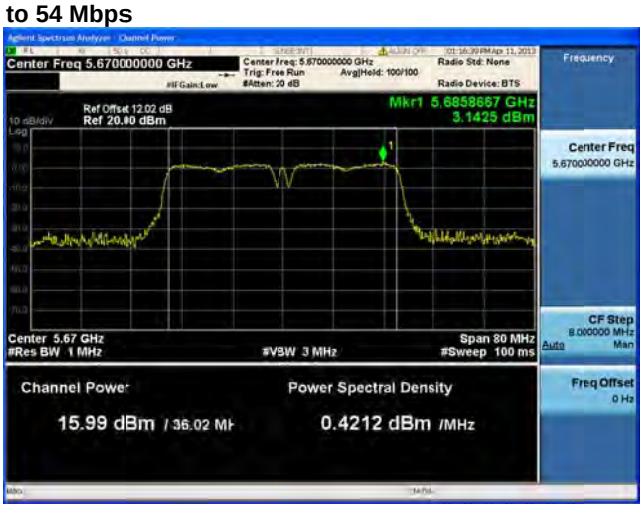
Antenna A

Antenna B

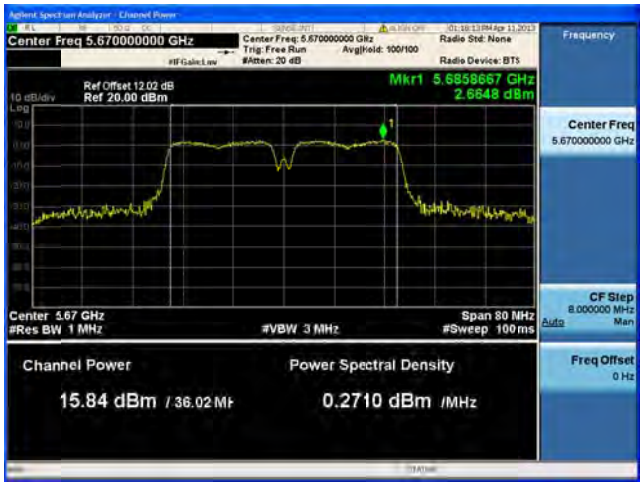
Peak Output Power / PSD, 5660 / 5680 MHz, Non HT/VHT40, 6 to 54 Mbps



Antenna A



Antenna B



Antenna C

Peak Output Power / PSD, 5660 / 5680 MHz, Non HT/VHT40, 6 to 54 Mbps

Antenna A

Antenna B

Antenna C

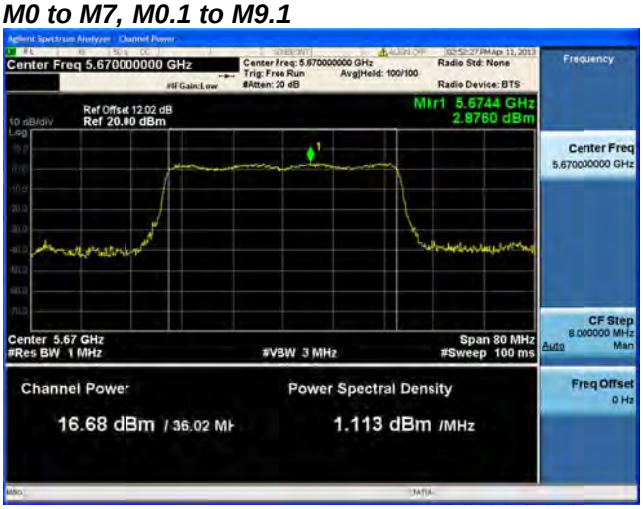
Antenna D

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40, M0 to M7, M0.1 to M9.1

Antenna A

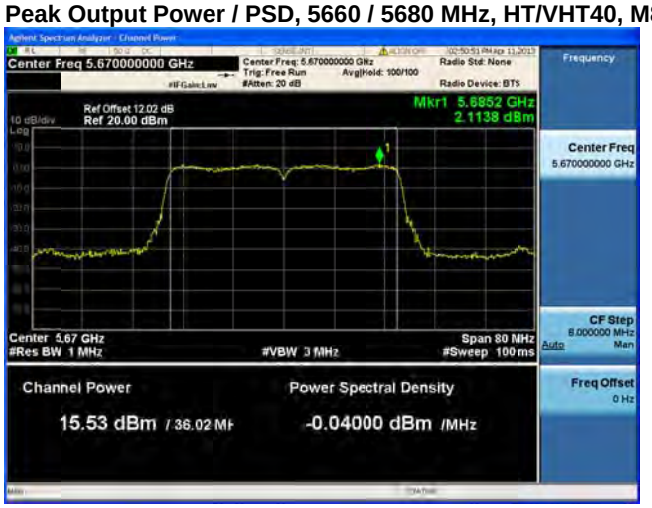
Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40, M0 to M7, M0.1 to M9.1

Antenna A



Antenna B

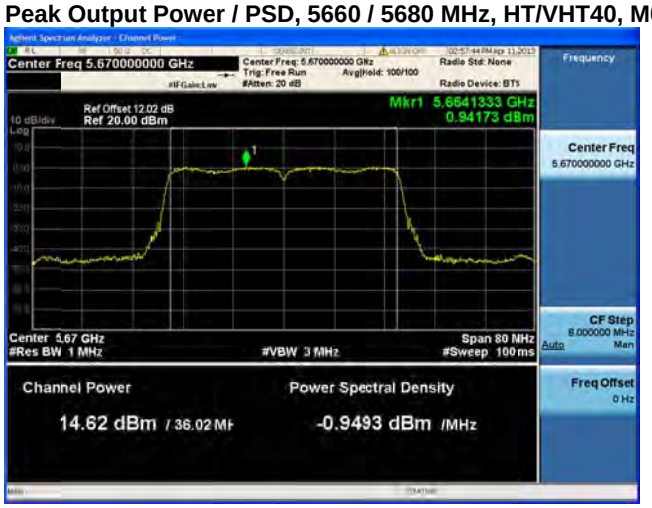
Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40, M8 to M15, M0.2 to M9.2



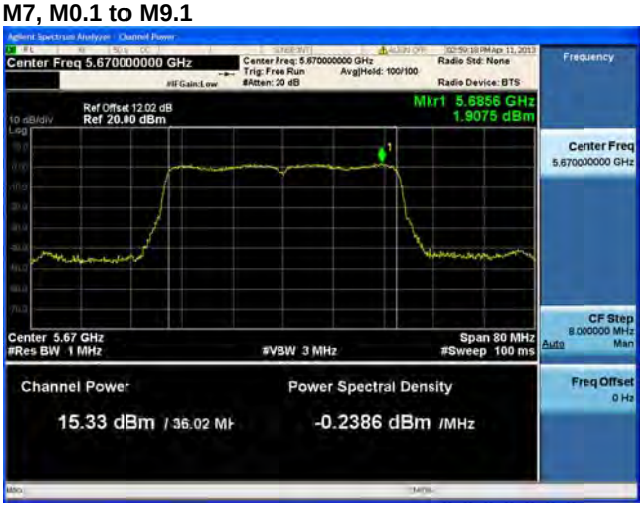
Antenna A

Antenna B

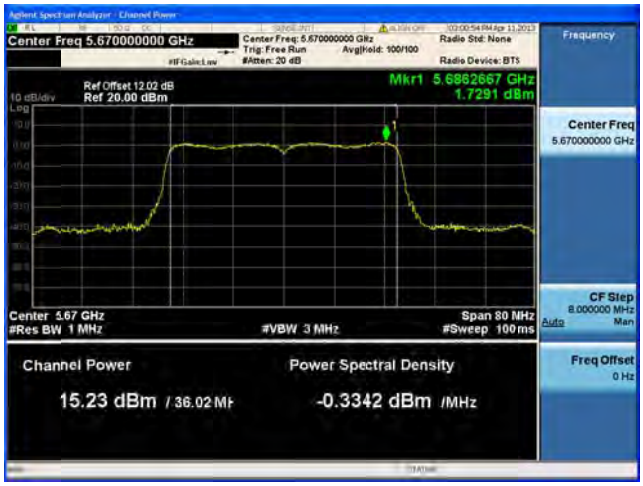
Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40, M0 to M7, M0.1 to M9.1



Antenna A



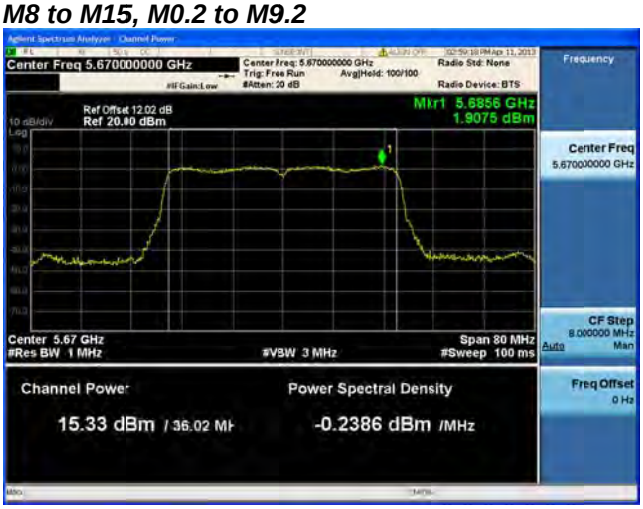
Antenna B



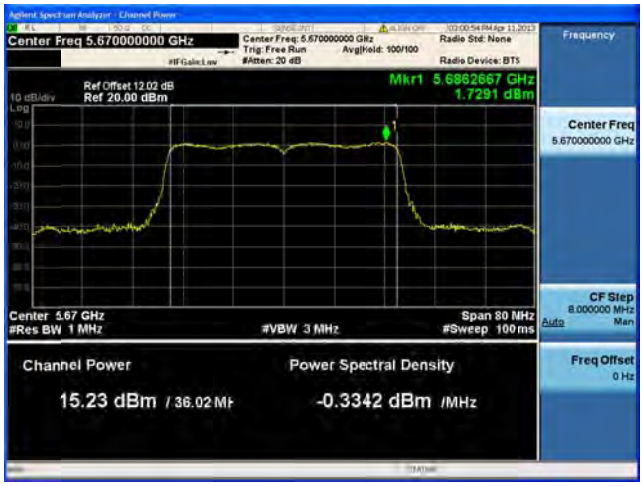
Antenna C

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40, M8 to M15, M0.2 to M9.2

Antenna A



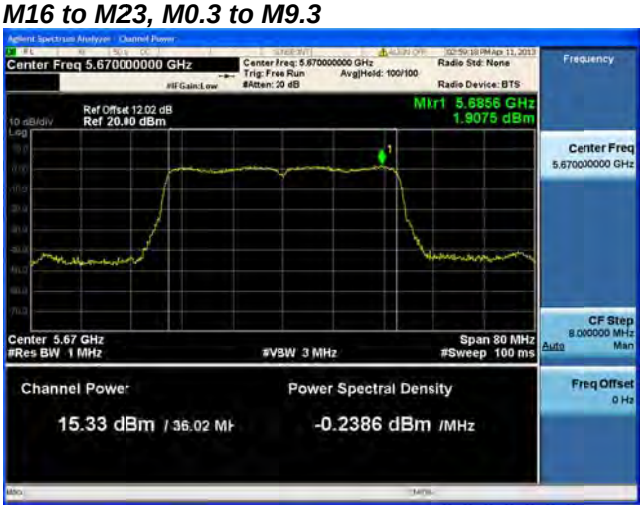
Antenna B



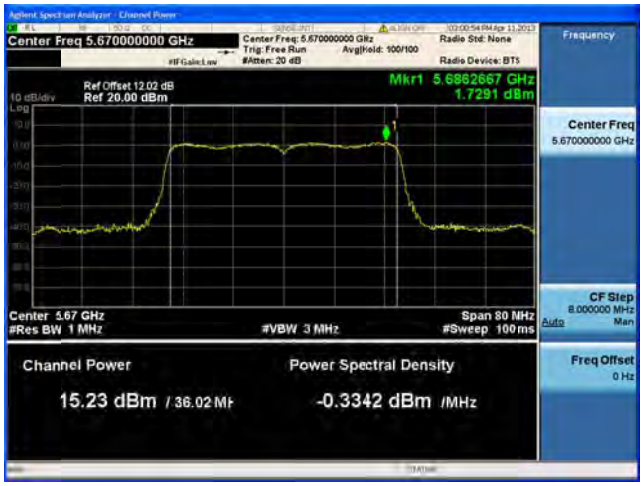
Antenna C

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40, M16 to M23, M0.3 to M9.3

Antenna A



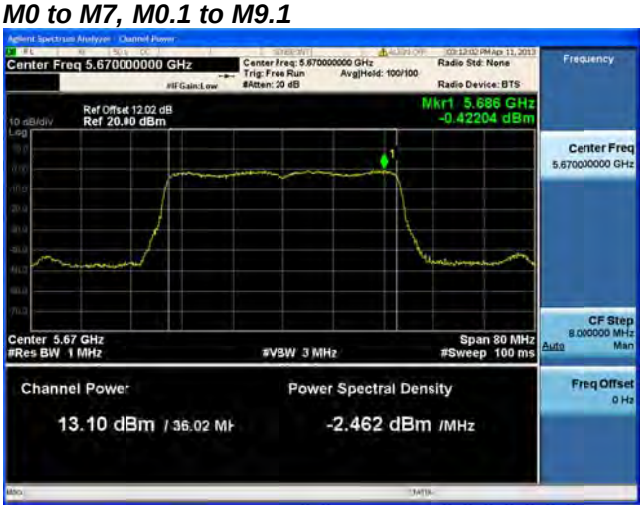
Antenna B



Antenna C

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40, M0 to M7, M0.1 to M9.1

Antenna A



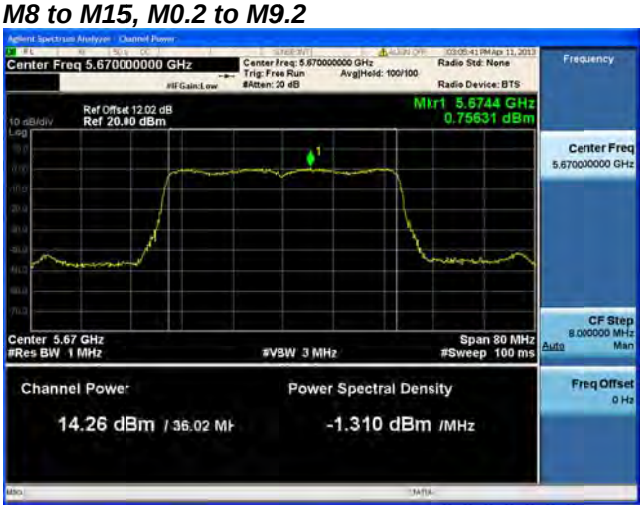
Antenna B

Antenna C

Antenna D

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40, M8 to M15, M0.2 to M9.2

Antenna A



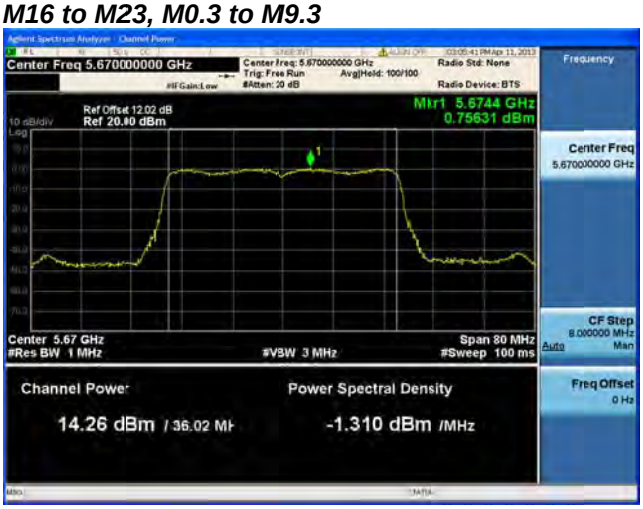
Antenna B

Antenna C

Antenna D

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40, M16 to M23, M0.3 to M9.3

Antenna A



Antenna B

Antenna C

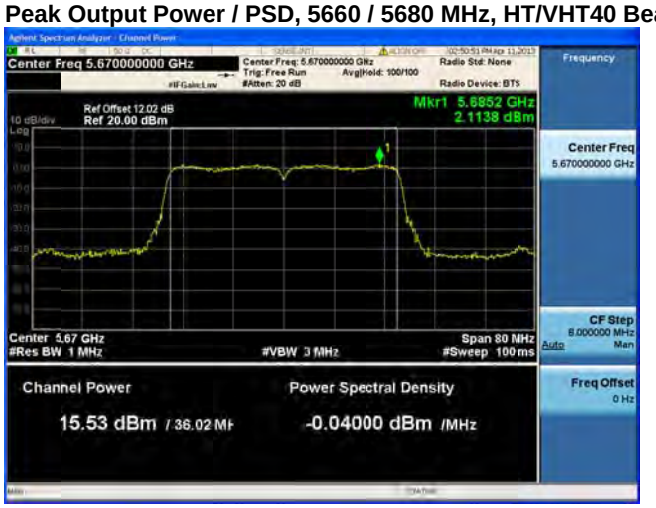
Antenna D

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40 Beam Forming, M0 to M7, M0.1 to M9.1

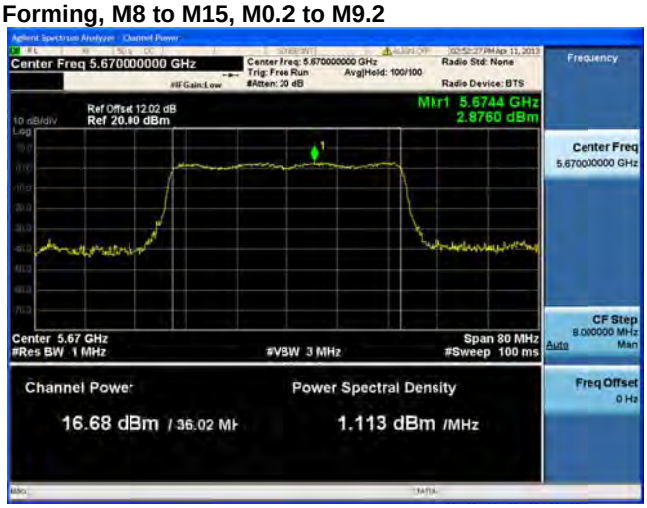
Antenna A

Antenna B

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40 Beam Forming, M8 to M15, M0.2 to M9.2

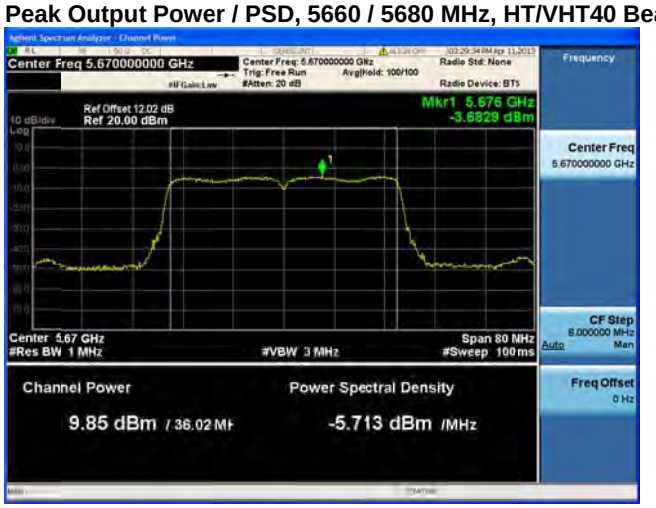


Antenna A



Antenna B

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40 Beam Forming, M0 to M7, M0.1 to M9.1



Antenna A

Antenna B

Antenna C

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40 Beam Forming, M8 to M15, M0.2 to M9.2

Antenna A

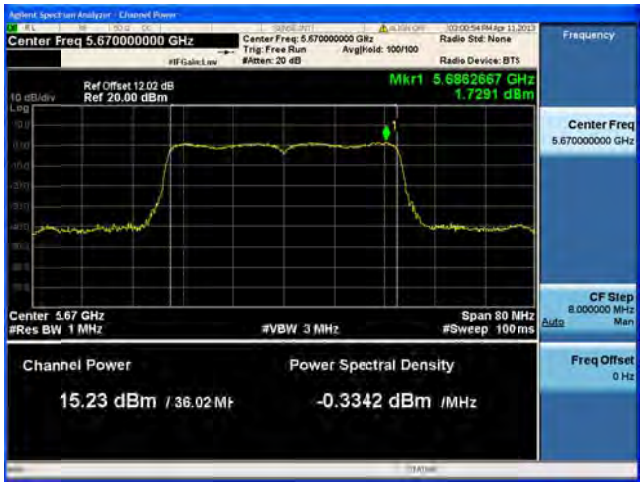
Antenna B

Antenna C

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40 Beam Forming, M16 to M23, M0.3 to M9.3

Antenna A

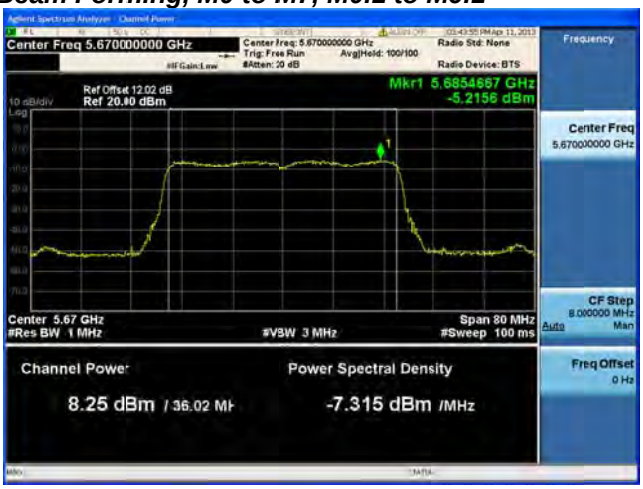
Antenna B



Antenna C

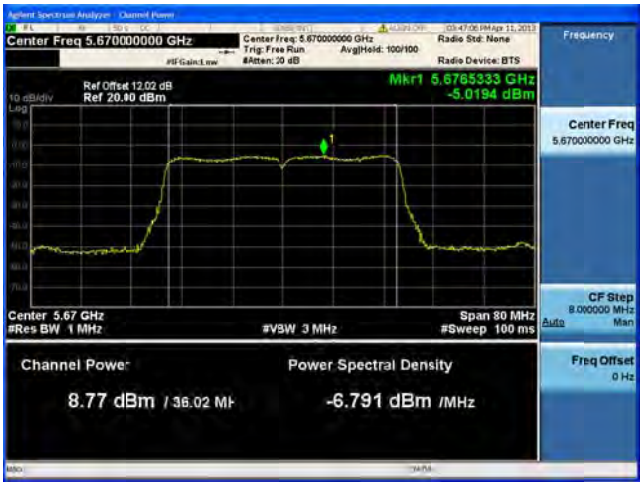
Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40 Beam Forming, M0 to M7, M0.1 to M9.1

Antenna A



Antenna B

Antenna C



Antenna D

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40 Beam Forming, M8 to M15, M0.2 to M9.2

Antenna A

Antenna B

Antenna C

Antenna D

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40 Beam Forming, M16 to M23, M0.3 to M9.3

Antenna A

Antenna B

Antenna C

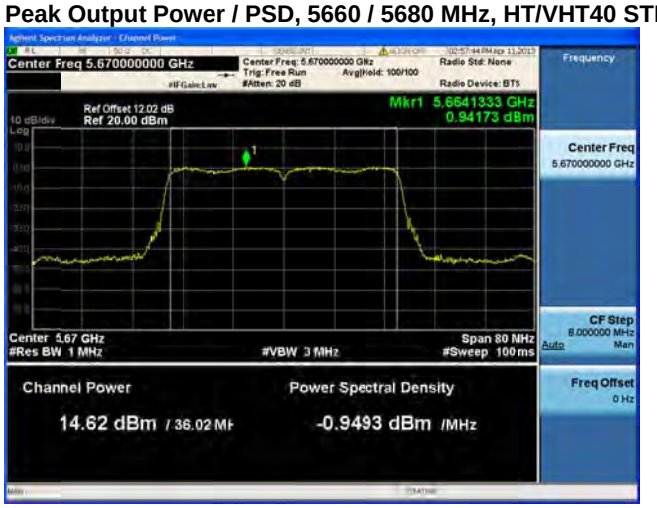
Antenna D

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40 STBC, M0 to M7, M0.1 to M9.1

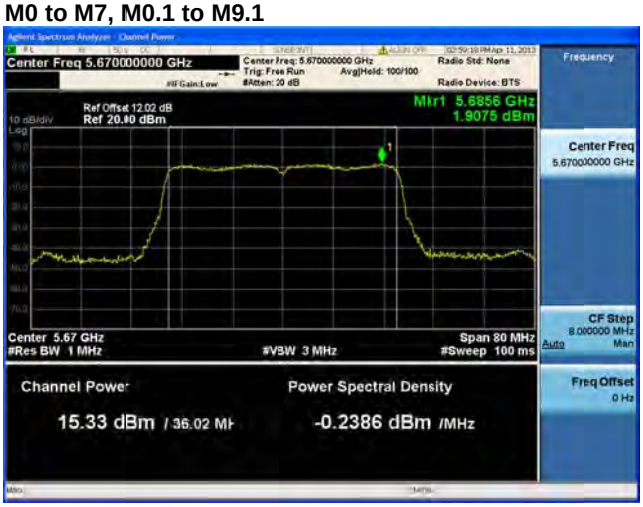
Antenna A

Antenna B

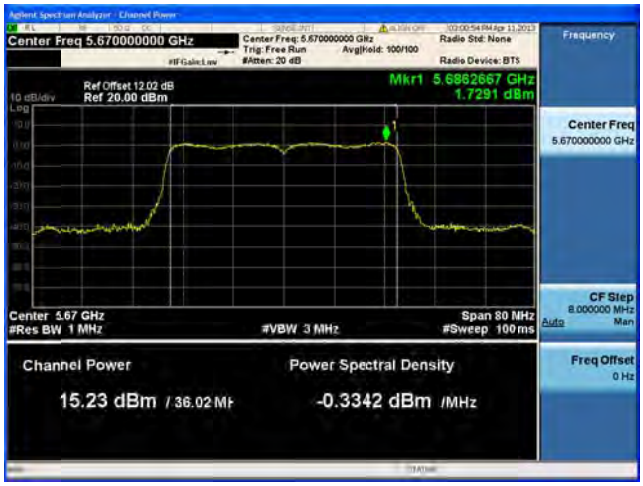
Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40 STBC, M0 to M7, M0.1 to M9.1



Antenna A



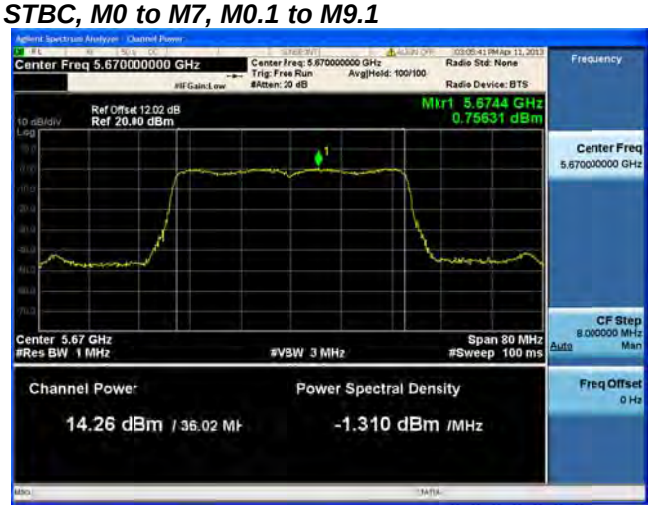
Antenna B



Antenna C

Peak Output Power / PSD, 5660 / 5680 MHz, HT/VHT40 STBC, M0 to M7, M0.1 to M9.1

Antenna A



Antenna B

Antenna C

Antenna D

Peak Output Power / PSD, 5700 MHz, Non HT/VHT20, 6 to 54 Mbps

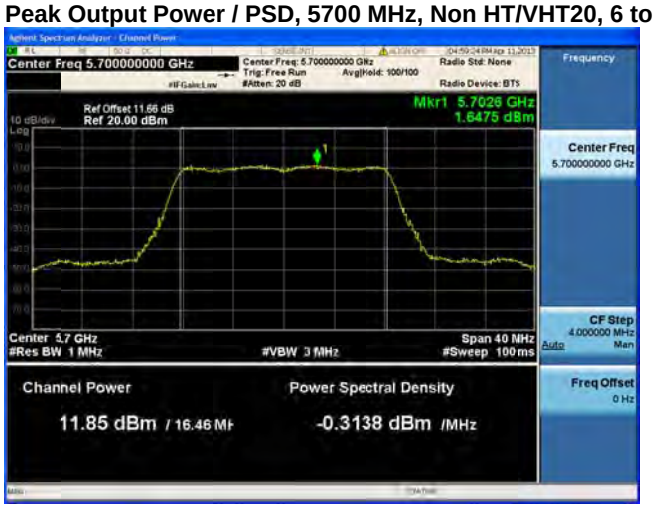
Antenna A

Peak Output Power / PSD, 5700 MHz, Non HT/VHT20, 6 to 54 Mbps

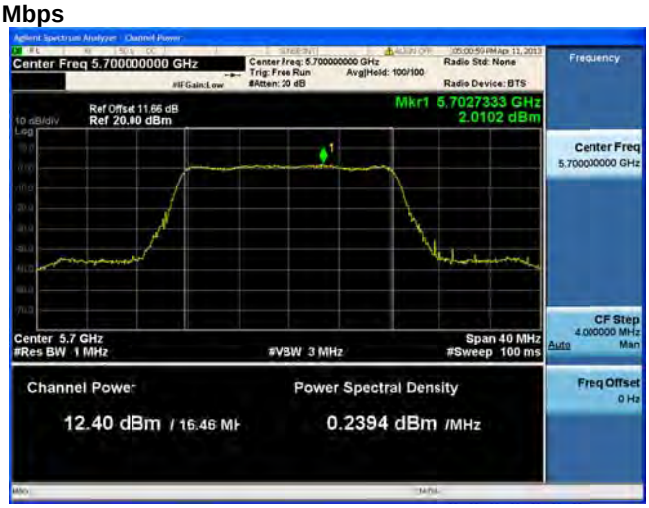
Antenna A

Antenna B

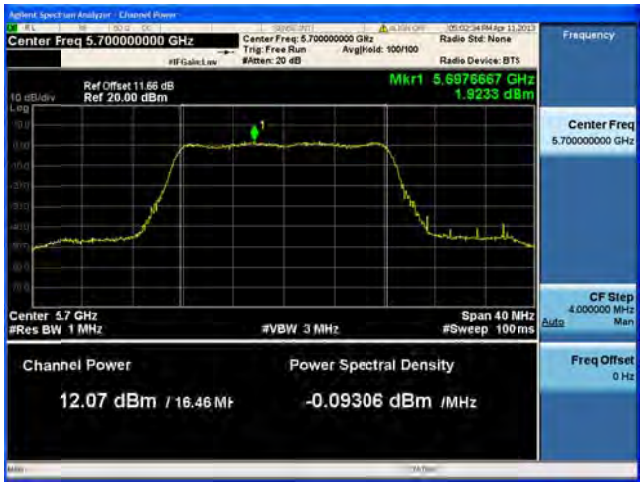
Peak Output Power / PSD, 5700 MHz, Non HT/VHT20, 6 to 54 Mbps



Antenna A



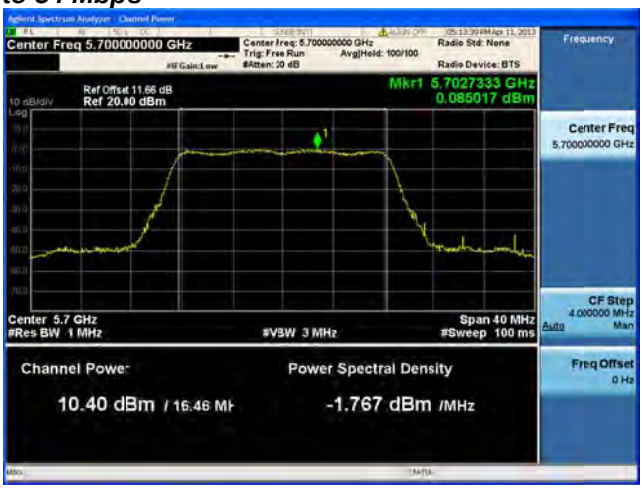
Antenna B



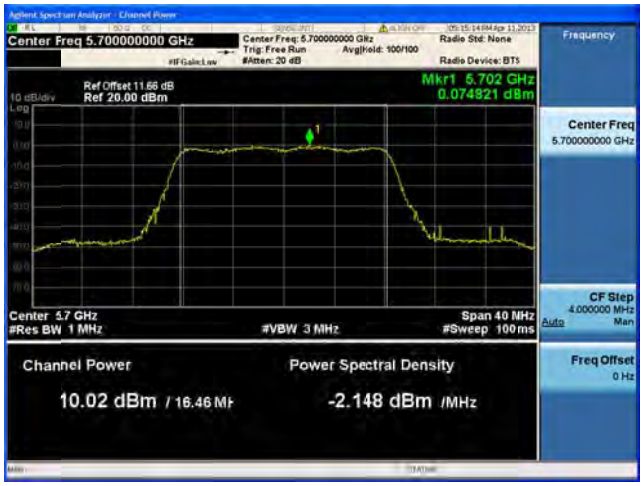
Antenna C

Peak Output Power / PSD, 5700 MHz, Non HT/VHT20, 6 to 54 Mbps

Antenna A



Antenna B

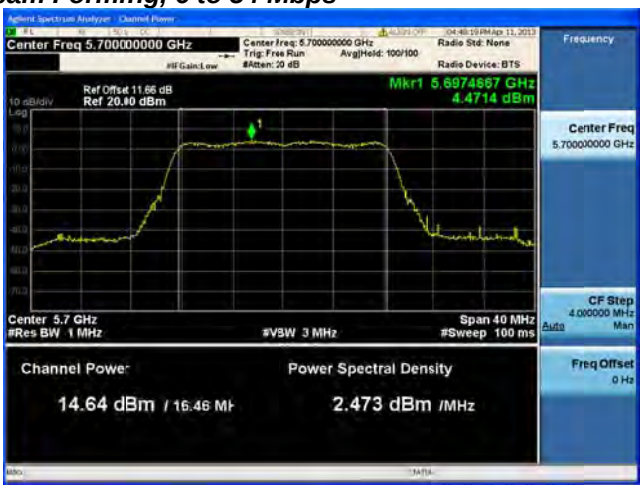


Antenna C

Antenna D

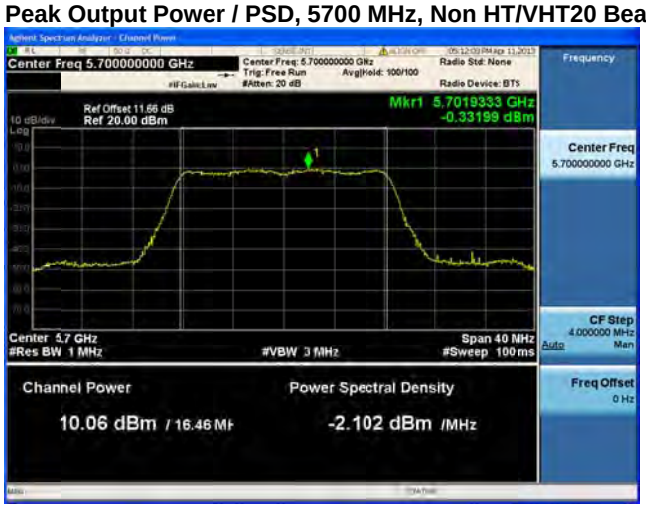
Peak Output Power / PSD, 5700 MHz, Non HT/VHT20 Beam Forming, 6 to 54 Mbps

Antenna A

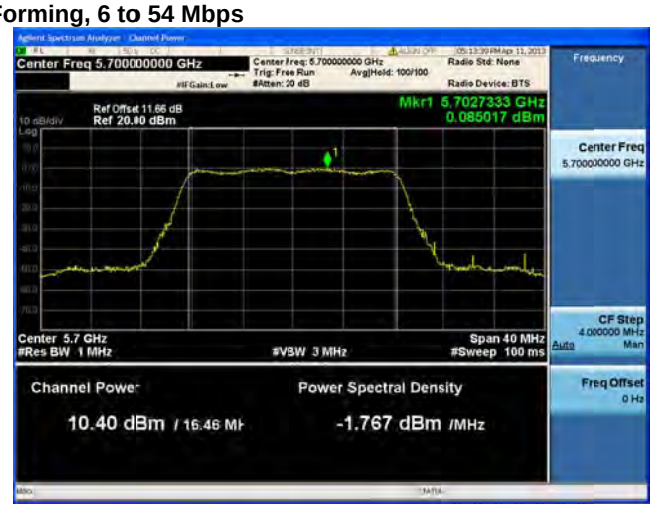


Antenna B

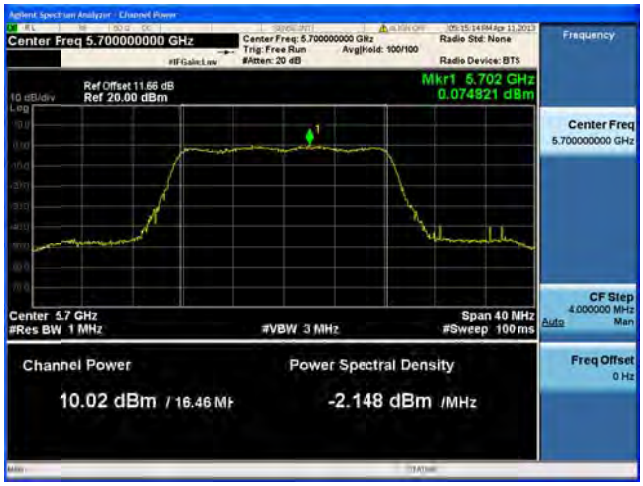
Peak Output Power / PSD, 5700 MHz, Non HT/VHT20 Beam Forming, 6 to 54 Mbps



Antenna A



Antenna B



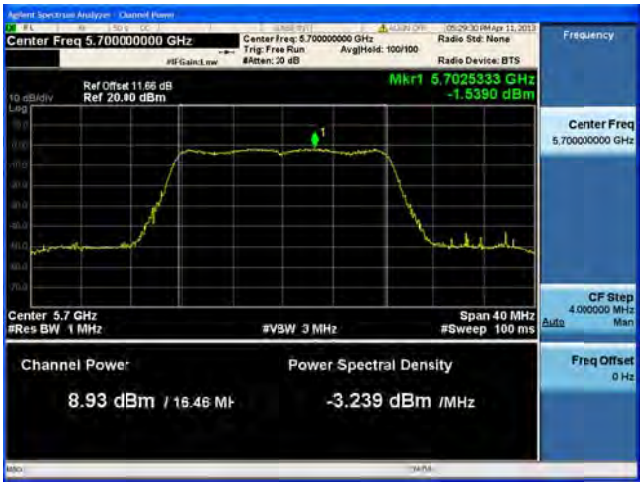
Antenna C

Peak Output Power / PSD, 5700 MHz, Non HT/VHT20 Beam Forming, 6 to 54 Mbps

Antenna A

Antenna B

Antenna C



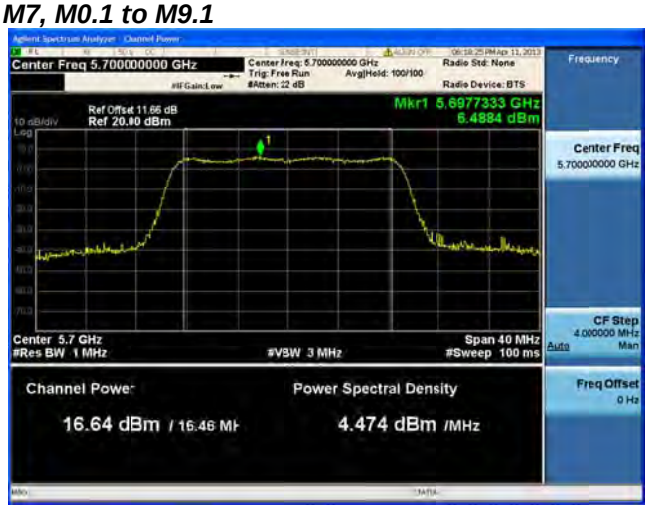
Antenna D

Peak Output Power / PSD, 5700 MHz, HT/VHT20, M0 to M7, M0.1 to M9.1

Antenna A

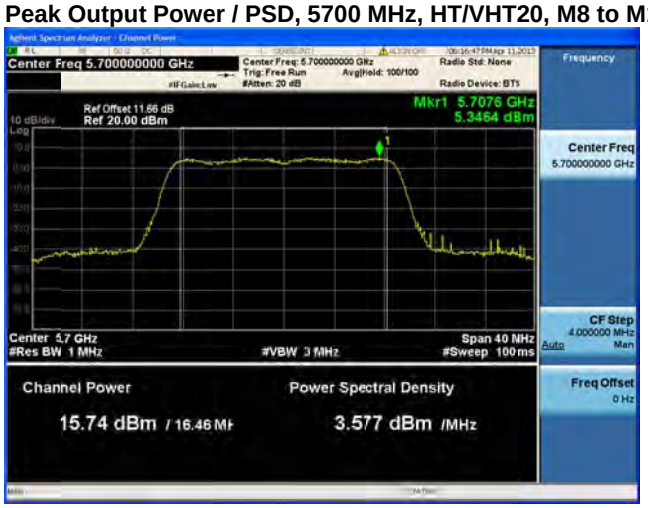
Peak Output Power / PSD, 5700 MHz, HT/VHT20, M0 to M7, M0.1 to M9.1

Antenna A

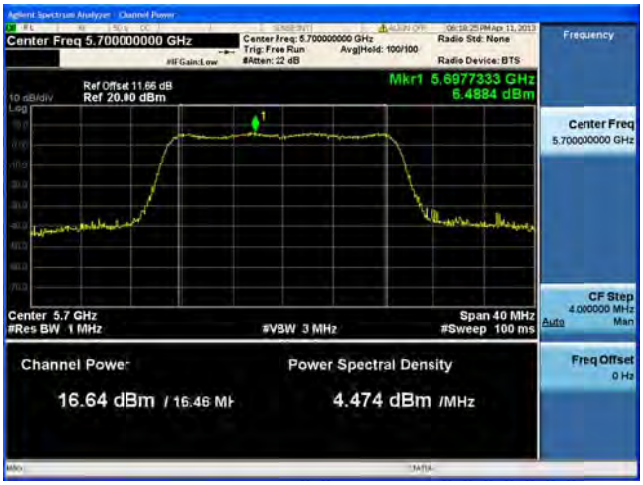


Antenna B

Peak Output Power / PSD, 5700 MHz, HT/VHT20, M8 to M15, M0.2 to M9.2

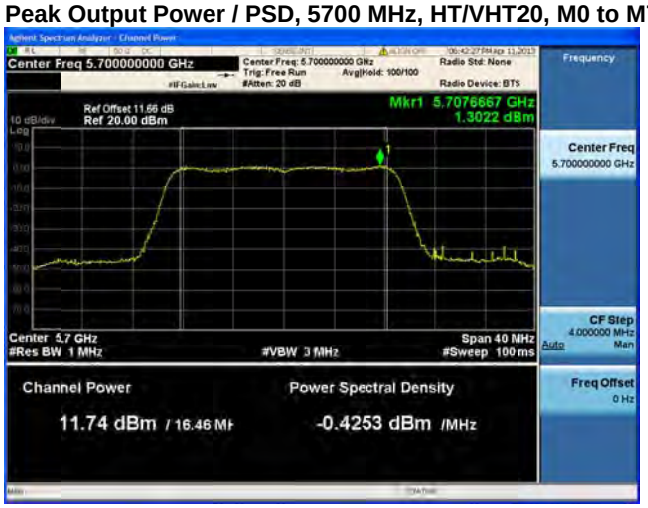


Antenna A

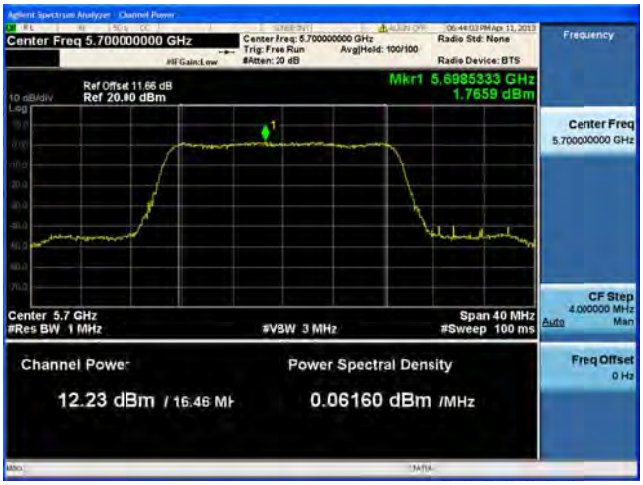


Antenna B

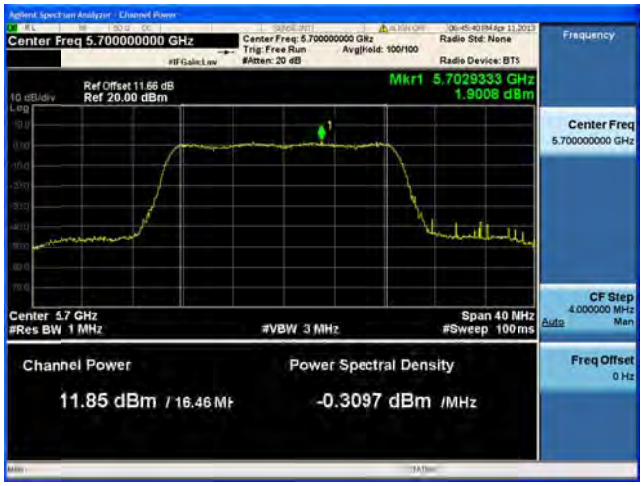
Peak Output Power / PSD, 5700 MHz, HT/VHT20, M0 to M7, M0.1 to M9.1



Antenna A



Antenna B



Antenna C

Peak Output Power / PSD, 5700 MHz, HT/VHT20, M8 to M15, M0.2 to M9.2

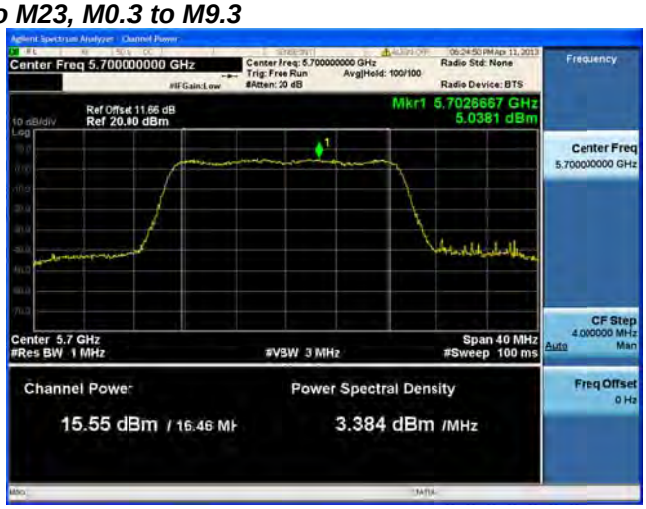
Antenna A

Antenna B

Antenna C

Peak Output Power / PSD, 5700 MHz, HT/VHT20, M16 to M23, M0.3 to M9.3

Antenna A

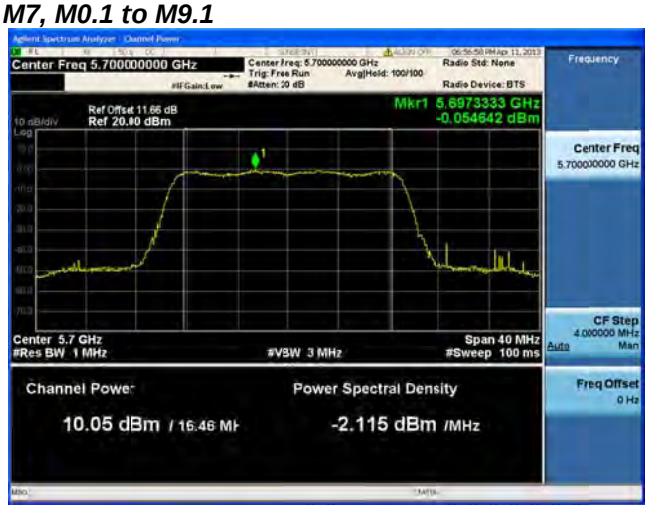


Antenna B

Antenna C

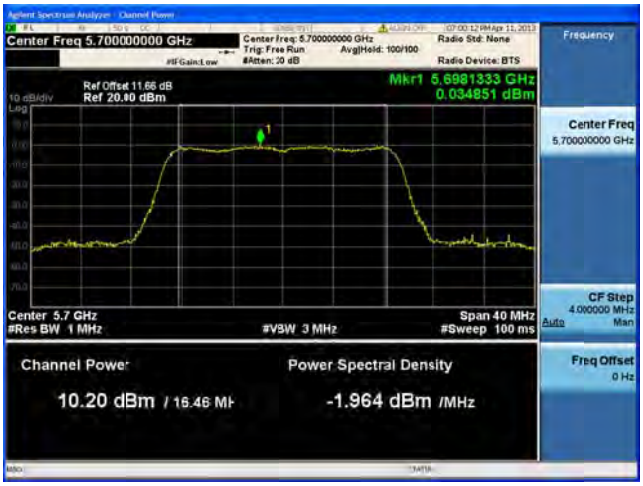
Peak Output Power / PSD, 5700 MHz, HT/VHT20, M0 to M7, M0.1 to M9.1

Antenna A



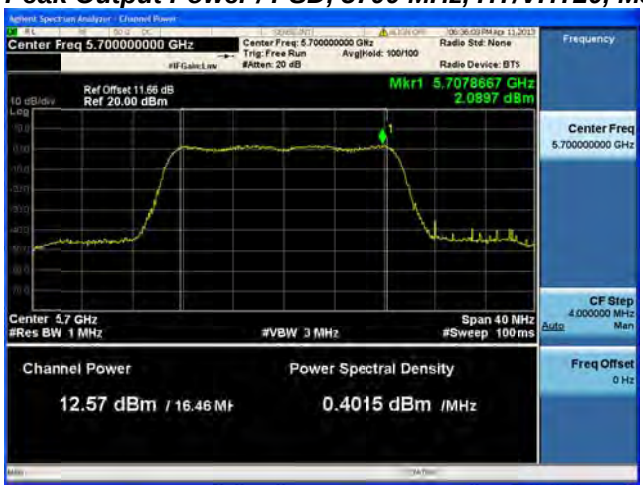
Antenna B

Antenna C



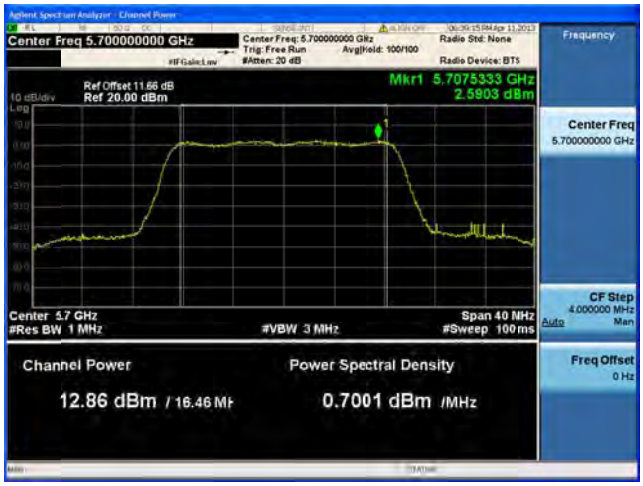
Antenna D

Peak Output Power / PSD, 5700 MHz, HT/VHT20, M8 to M15, M0.2 to M9.2

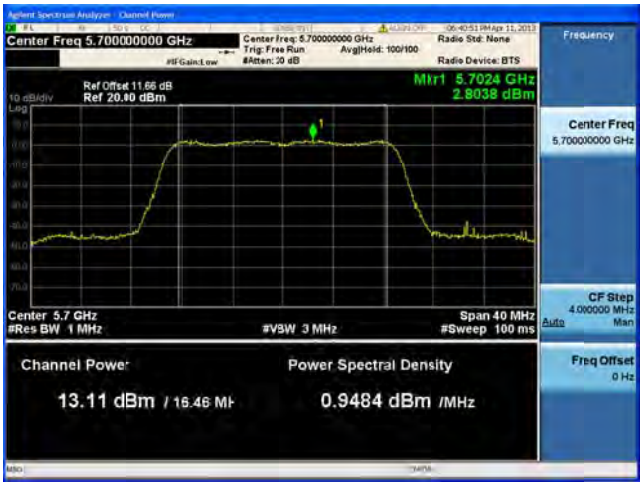


Antenna A

Antenna B



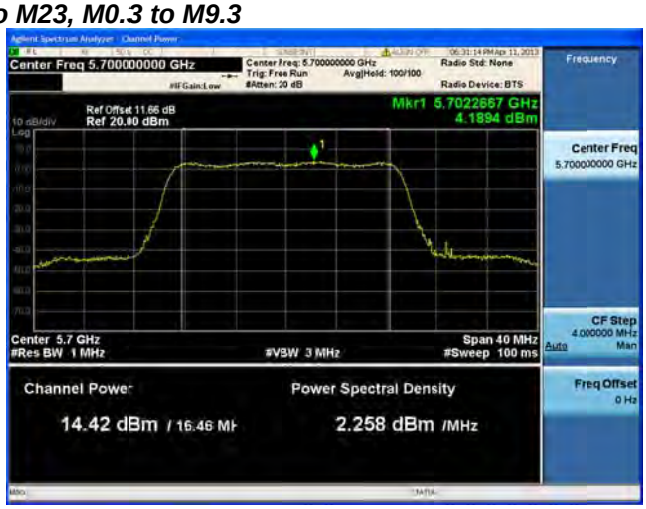
Antenna C



Antenna D

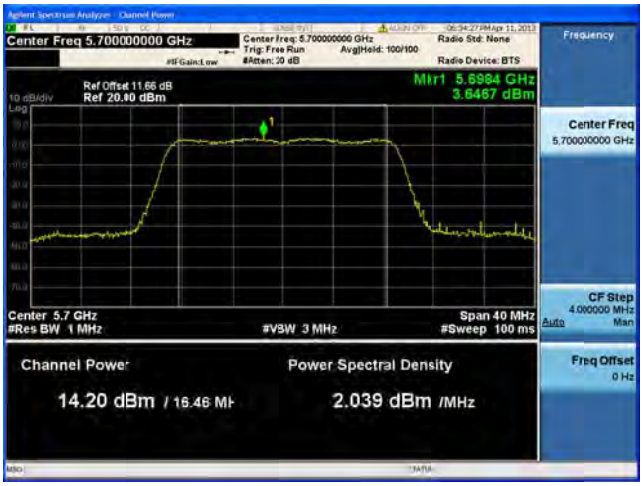
Peak Output Power / PSD, 5700 MHz, HT/VHT20, M16 to M23, M0.3 to M9.3

Antenna A



Antenna B

Antenna C



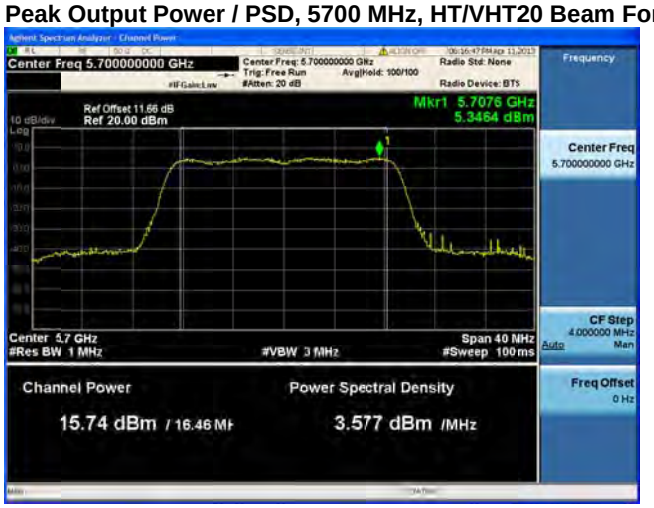
Antenna D

Peak Output Power / PSD, 5700 MHz, HT/VHT20 Beam Forming, M0 to M7, M0.1 to M9.1

Antenna A

Antenna B

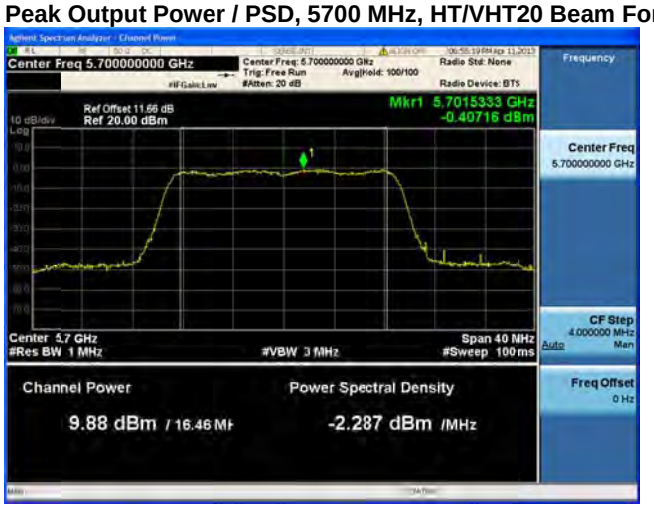
Peak Output Power / PSD, 5700 MHz, HT/VHT20 Beam Forming, M8 to M15, M0.2 to M9.2



Antenna A

Antenna B

Peak Output Power / PSD, 5700 MHz, HT/VHT20 Beam Forming, M0 to M7, M0.1 to M9.1

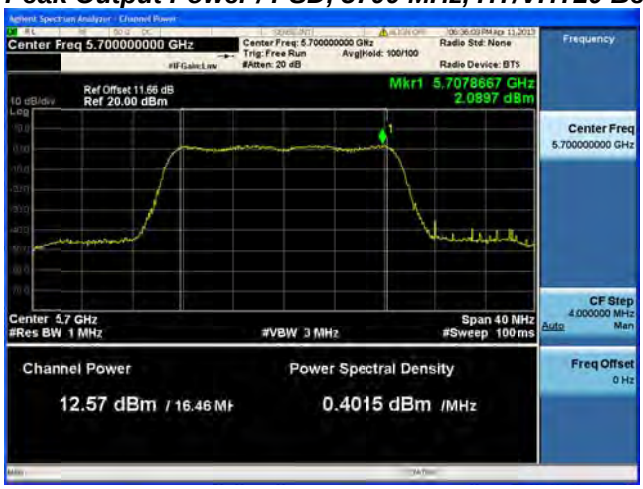


Antenna A

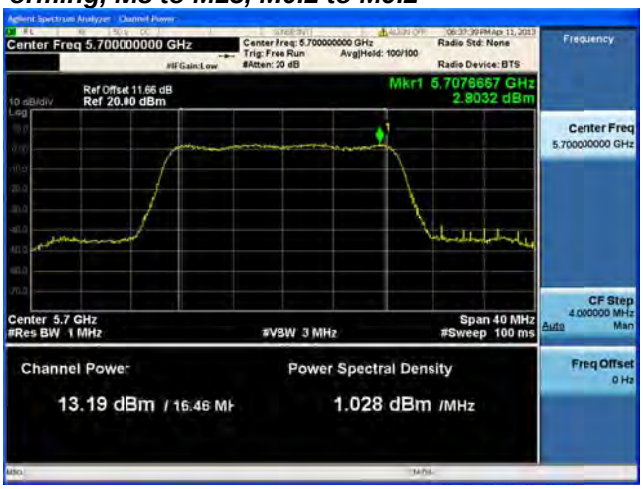
Antenna B

Antenna C

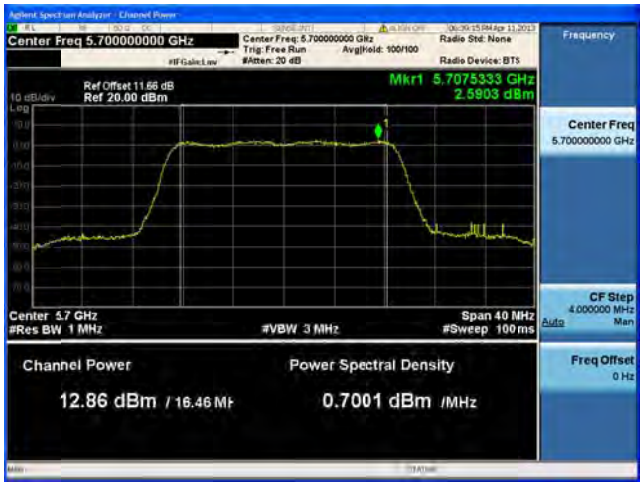
Peak Output Power / PSD, 5700 MHz, HT/VHT20 Beam Forming, M8 to M15, M0.2 to M9.2



Antenna A



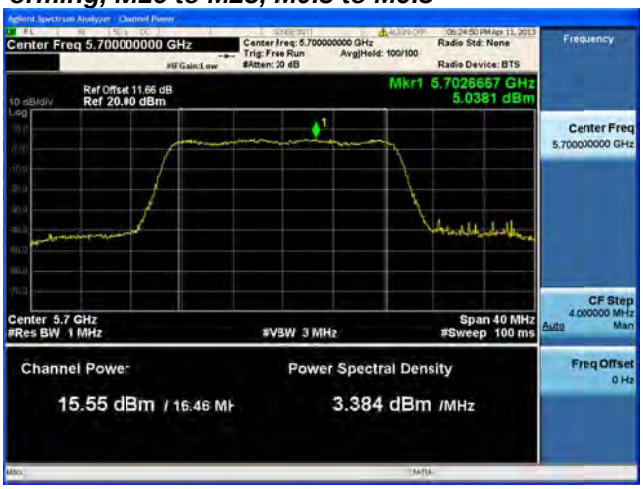
Antenna B



Antenna C

Peak Output Power / PSD, 5700 MHz, HT/VHT20 Beam Forming, M16 to M23, M0.3 to M9.3

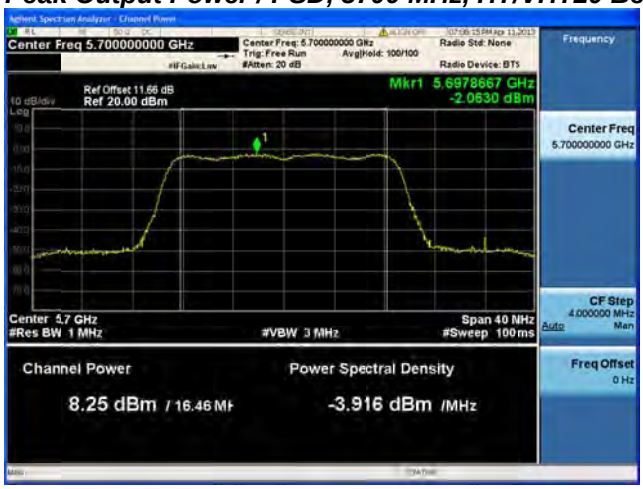
Antenna A



Antenna B

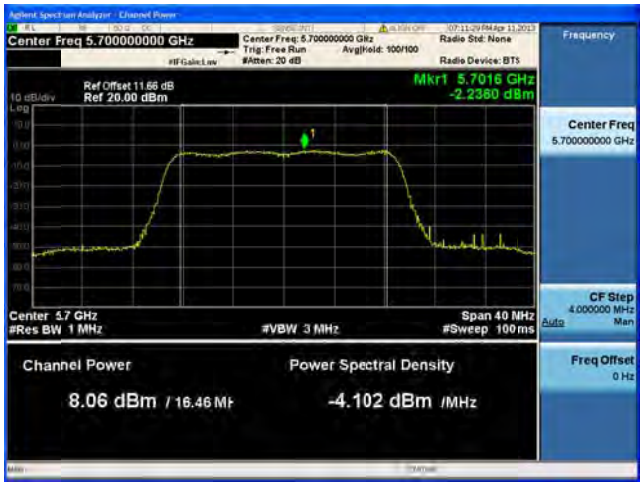
Antenna C

Peak Output Power / PSD, 5700 MHz, HT/VHT20 Beam Forming, M0 to M7, M0.1 to M9.1

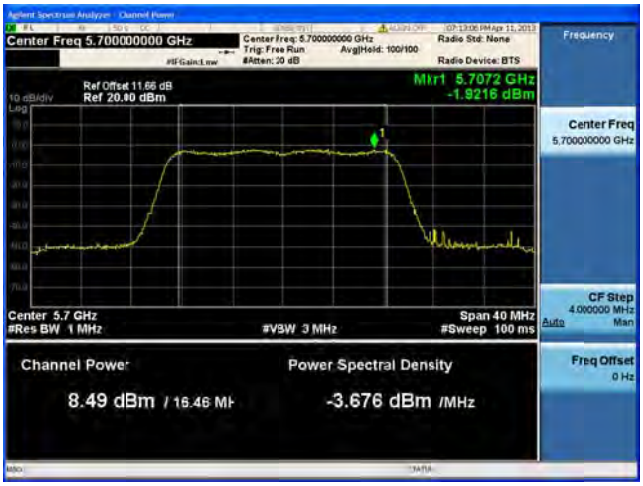


Antenna A

Antenna B



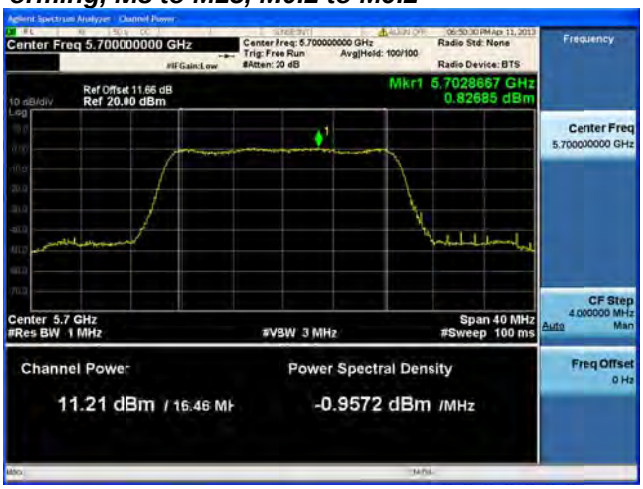
Antenna C



Antenna D

Peak Output Power / PSD, 5700 MHz, HT/VHT20 Beam Forming, M8 to M15, M0.2 to M9.2

Antenna A

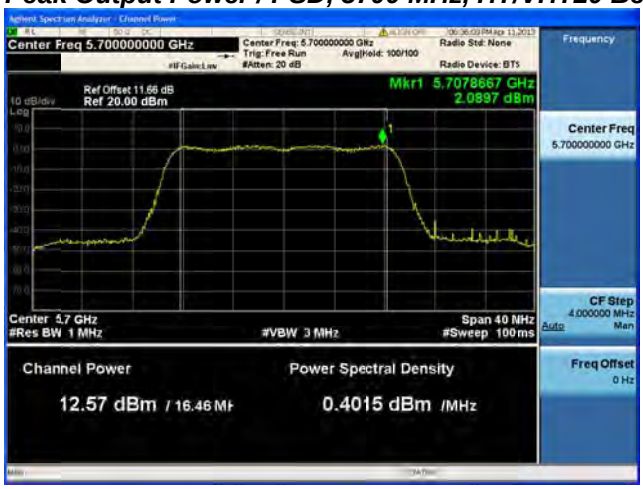


Antenna B

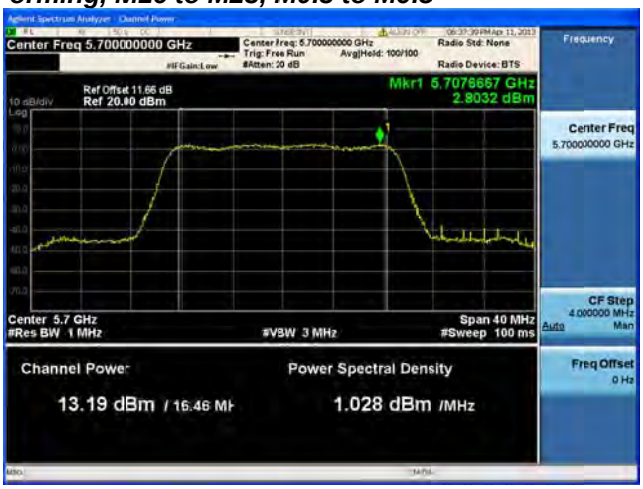
Antenna C

Antenna D

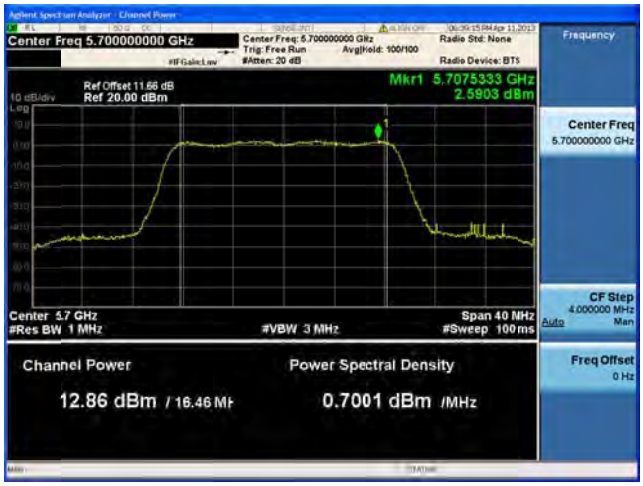
Peak Output Power / PSD, 5700 MHz, HT/VHT20 Beam Forming, M16 to M23, M0.3 to M9.3



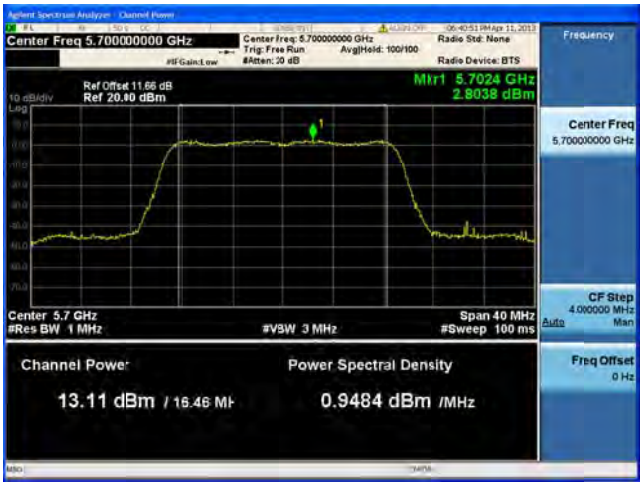
Antenna A



Antenna B



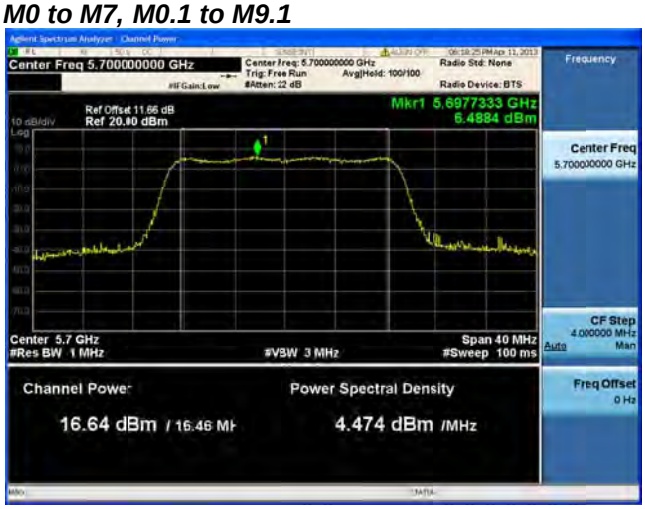
Antenna C



Antenna D

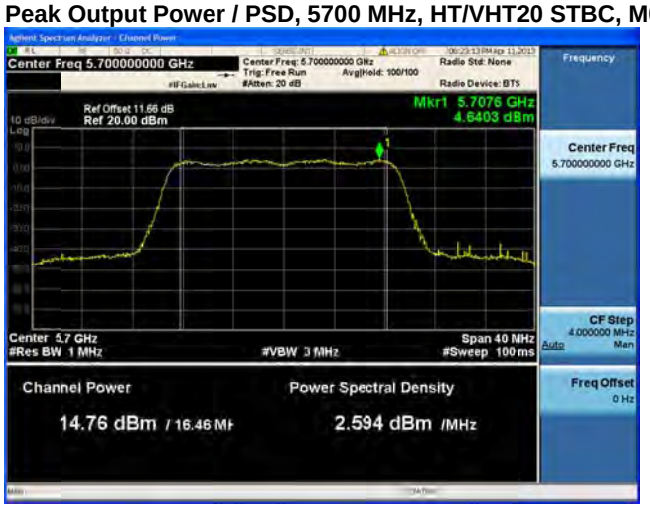
Peak Output Power / PSD, 5700 MHz, HT/VHT20 STBC, M0 to M7, M0.1 to M9.1

Antenna A

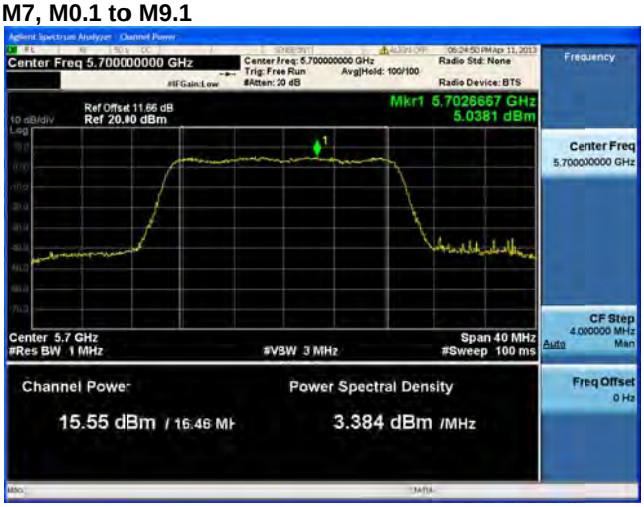


Antenna B

Peak Output Power / PSD, 5700 MHz, HT/VHT20 STBC, M0 to M7, M0.1 to M9.1



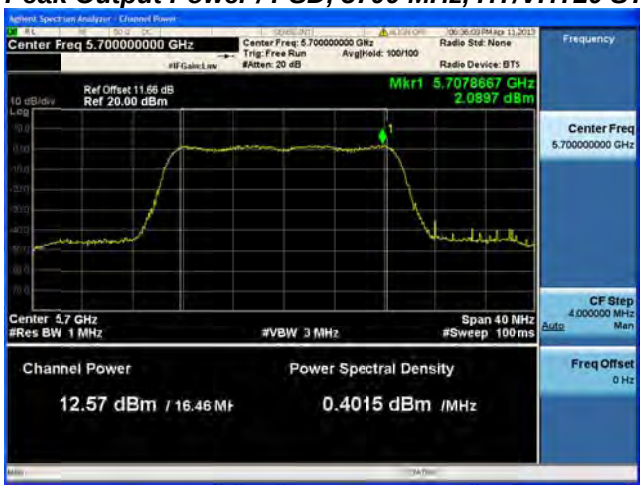
Antenna A



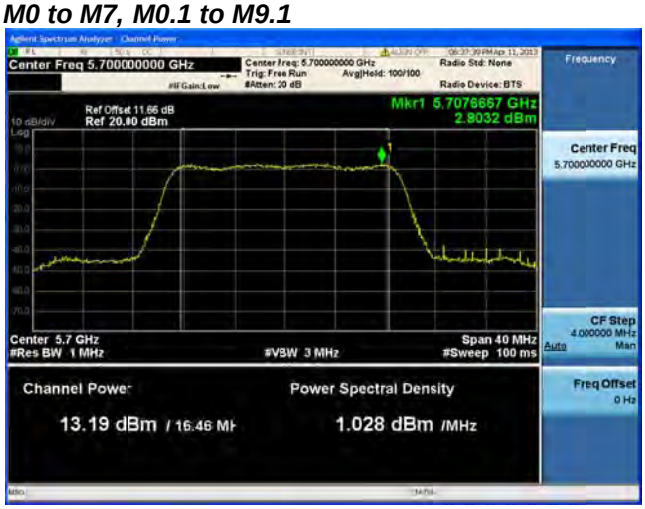
Antenna B

Antenna C

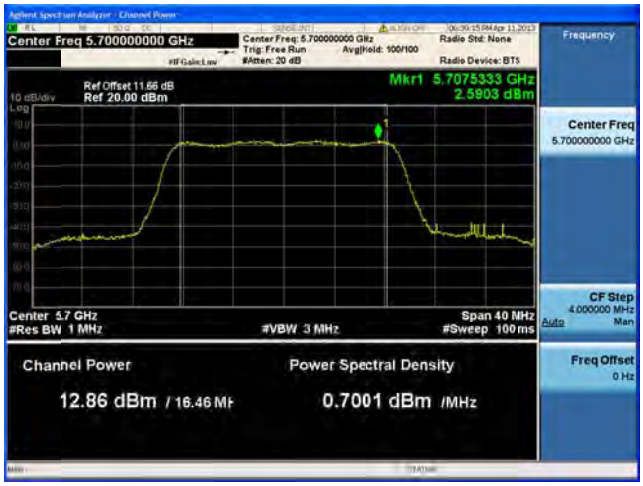
Peak Output Power / PSD, 5700 MHz, HT/VHT20 STBC, M0 to M7, M0.1 to M9.1



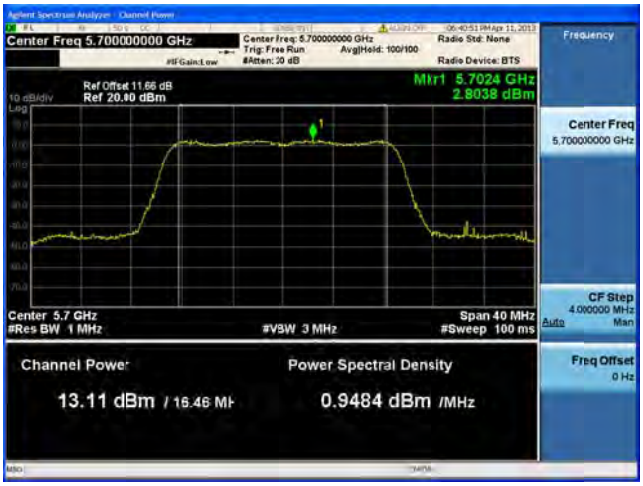
Antenna A



Antenna B



Antenna C



Antenna D

Peak Excursion

15.407: The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Set the spectrum analyzer span to view the entire emission bandwidth. The largest difference between the following two traces must be <= 13 dB for all frequencies across the emission bandwidth.

Set the spectrum analyzer span to view the entire emission bandwidth. The largest difference between the following two traces must be <= 13 dB for all frequencies across the emission bandwidth.

1st Trace: (Peak)

- Set Span to encompass the entire emission bandwidth of the signal.
- RBW = 1 MHz, VBW = 3 MHz
- Detector = Peak
- Sweep = Auto
- Trace 1 = Max-hold
- Ref Level Offset = correct for attenuator and cable loss
- Ref Level = 20dBm
- Atten = 10dBm

2nd Trace: (Average)

- Trace 2 = clear right
- Detector = Sample
- Avg/VBW type = Pwr(RMS)
- Average = 100
- Sweep = single

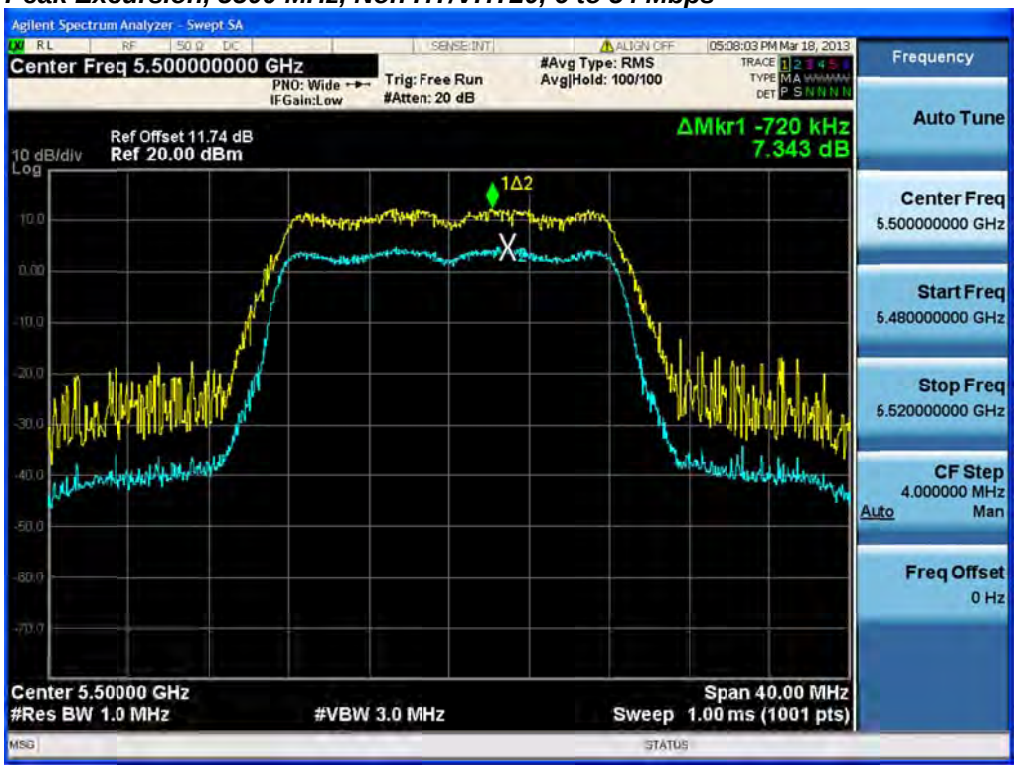
Set marker Deltas

- Trace 1 & Peak search
- Marker Delta
- Trace 2 & Peak search

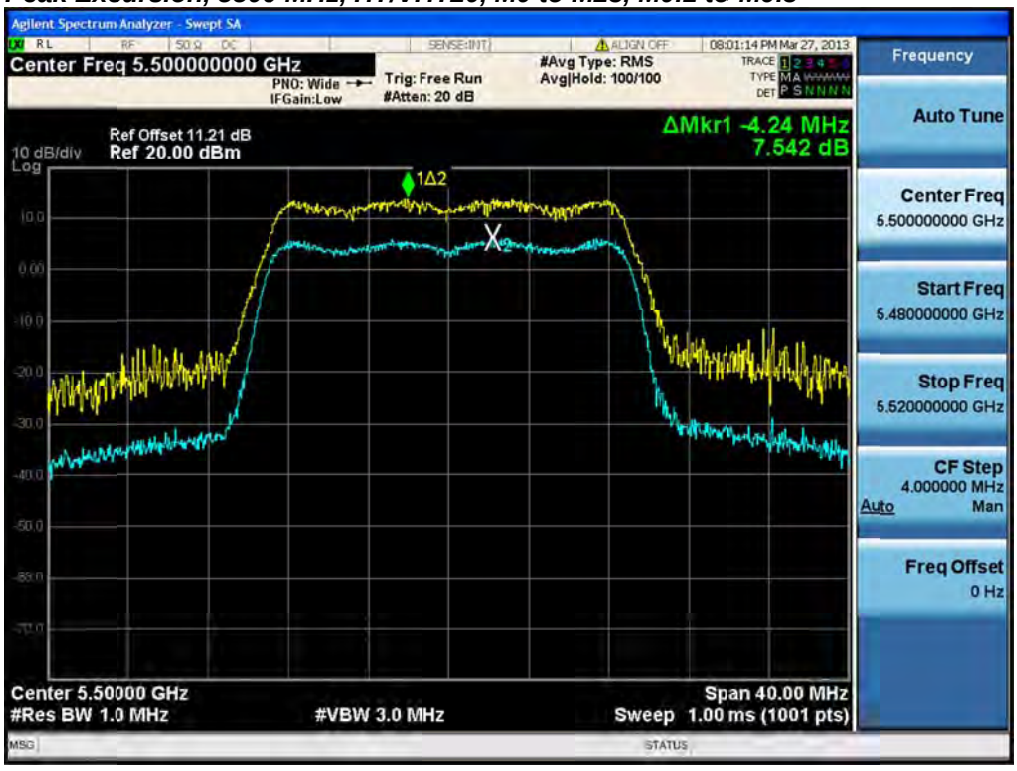
Record the difference between the Peak and Average Markers

Frequency (MHz)	Mode	Data Rate (Mbps)	Peak Excursion (dB)	Limit (dBm/MHz)	Margin (dB)
5500	Non HT/VHT20, 6 to 54 Mbps	6	7.3	13	5.7
	HT/VHT20, M0 to M23, M0.1 to M9.3	m0	7.5	13	5.5
5500/5520	Non HT/VHT40, 6 to 54 Mbps	6	7.3	13	5.7
	HT/VHT40, M0 to M23, M0.1 to M9.3	m0	7.5	13	5.5
5500/5520 5540/5560	Non HT/VHT80, 6 to 54 Mbps	6	7.3	13	5.7
	HT/VHT80, M0 to M23, M0.1 to M9.3	m0x1	7.9	13	5.1
5540/5560	Non HT/VHT40, 6 to 54 Mbps	6	7	13	6
	HT/VHT40, M0 to M23, M0.1 to M9.3	m0	7.1	13	5.9
5580	Non HT/VHT20, 6 to 54 Mbps	6	7.3	13	5.7
	HT/VHT20, M0 to M23, M0.1 to M9.3	m0	7.4	13	5.6
5660/5680	Non HT/VHT40, 6 to 54 Mbps	6	7.2	13	5.8
	HT/VHT40, M0 to M23, M0.1 to M9.3	m0	7.6	13	5.4
5700	Non HT/VHT20, 6 to 54 Mbps	6	7.2	13	5.8
	HT/VHT20, M0 to M23, M0.1 to M9.3	m0	7.5	13	5.5

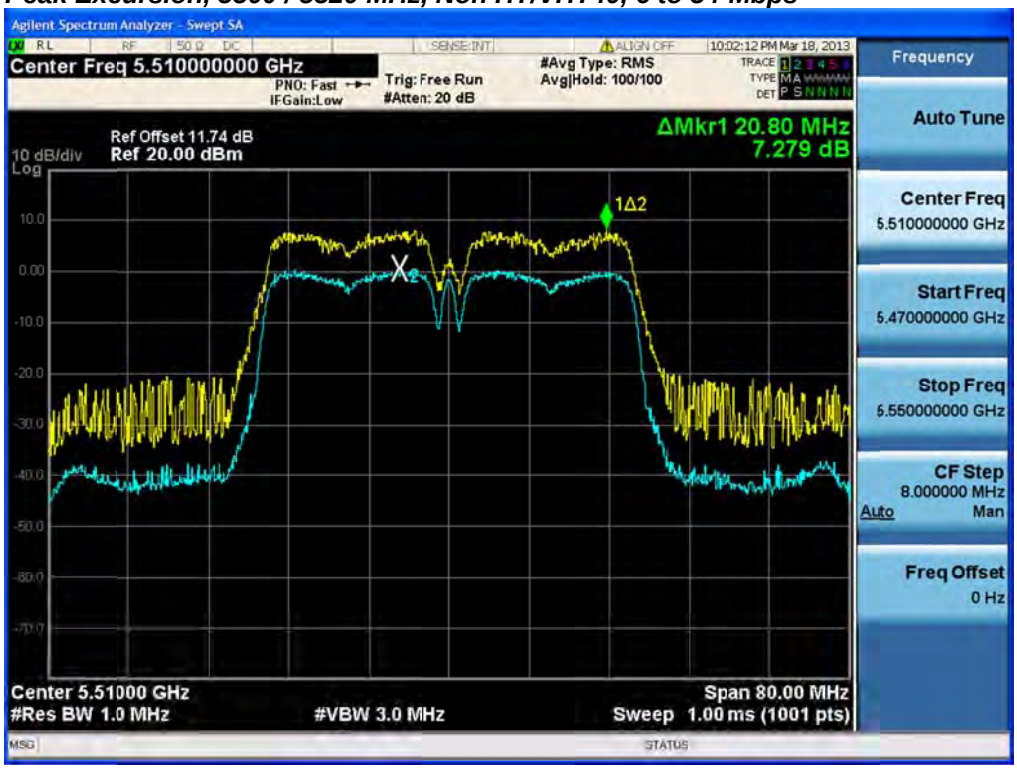
Peak Excursion, 5500 MHz, Non HT/VHT20, 6 to 54 Mbps



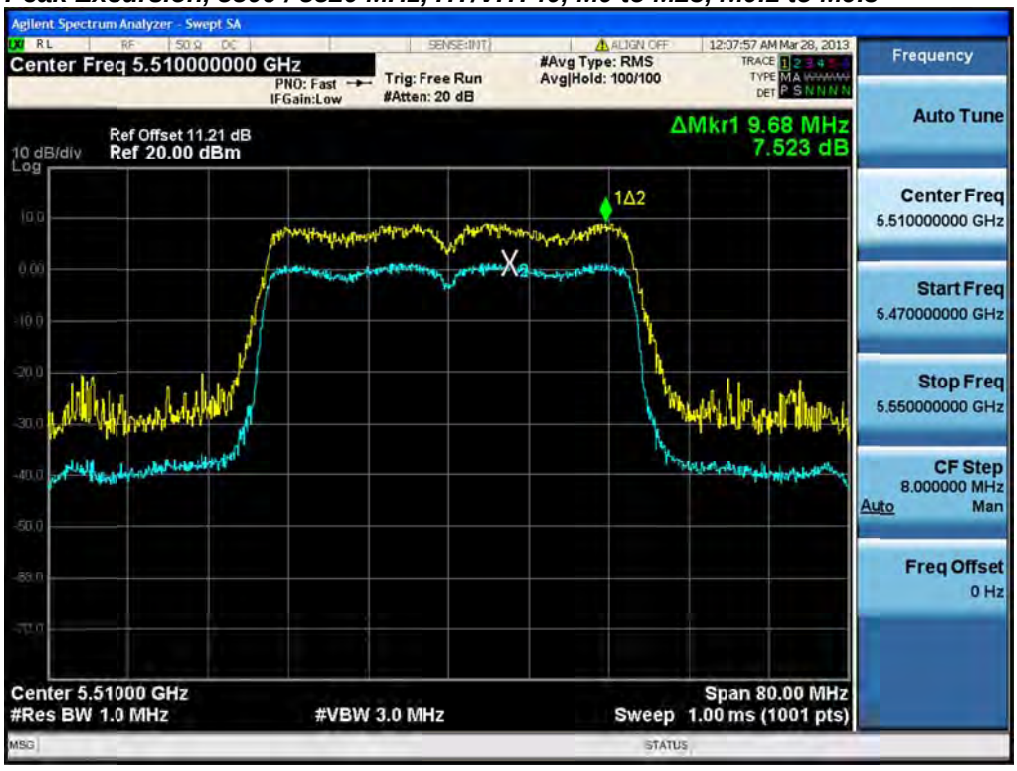
Peak Excursion, 5500 MHz, HT/VHT20, M0 to M23, M0.1 to M9.3



Peak Excursion, 5500 / 5520 MHz, Non HT/VHT40, 6 to 54 Mbps



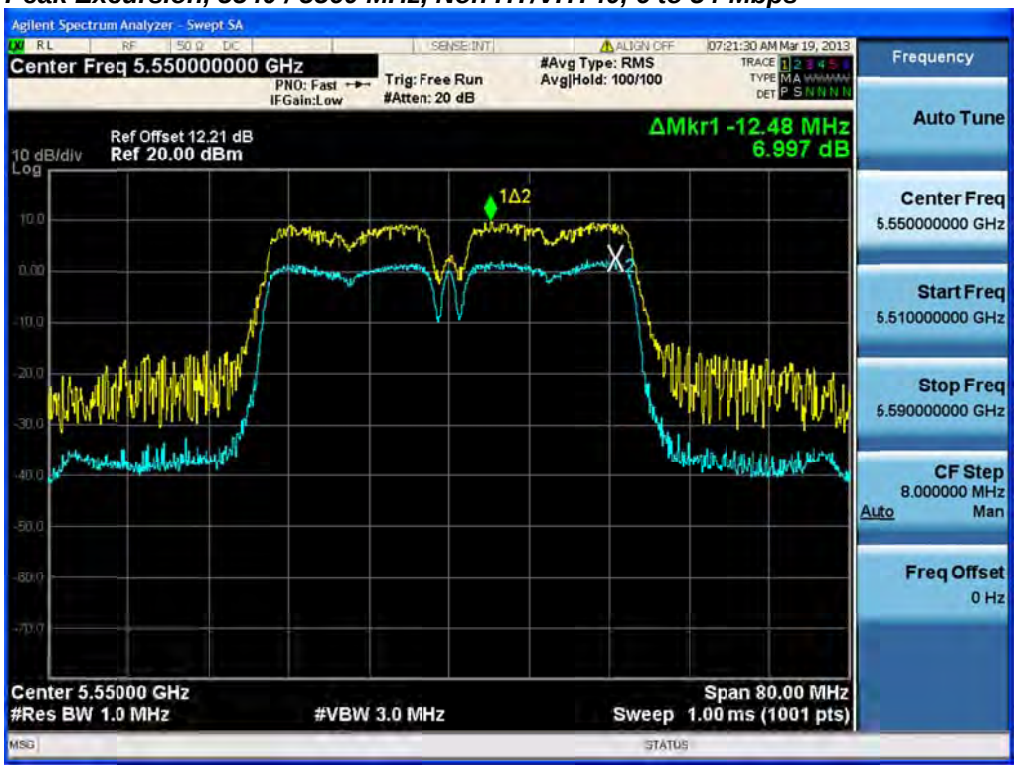
Peak Excursion, 5500 / 5520 MHz, HT/VHT40, M0 to M23, M0.1 to M9.3



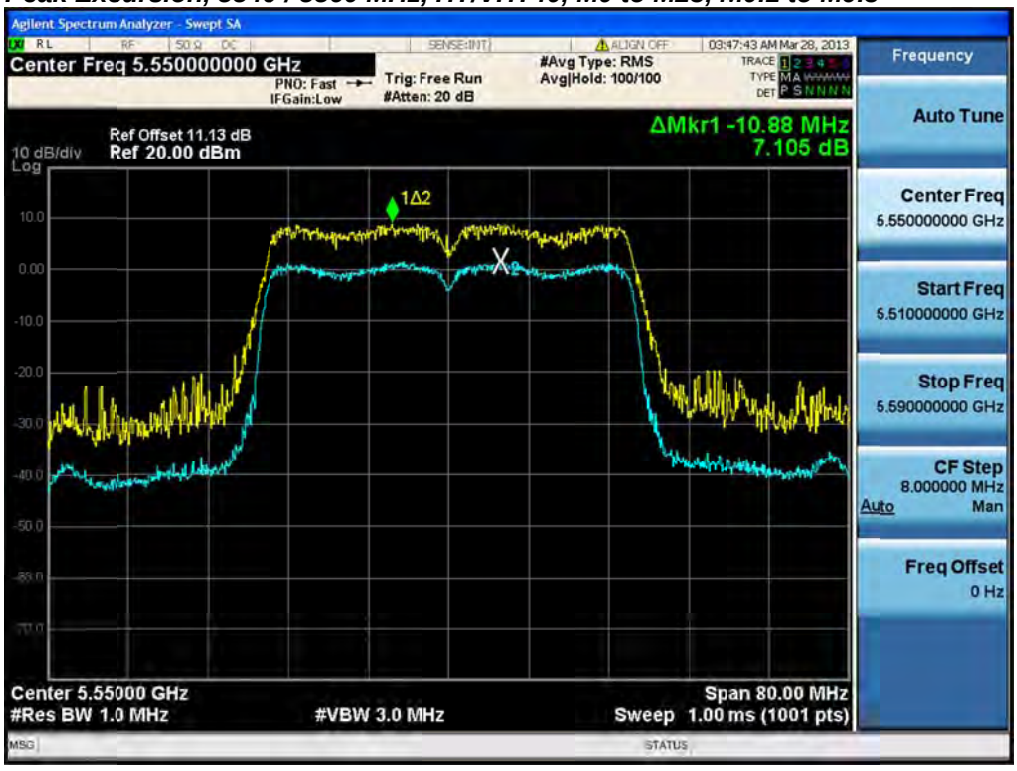
Peak Excursion, 5500 / 5520 / 5540 / 5560 MHz, Non HT/VHT80, 6 to 54 Mbps

Peak Excursion, 5500 / 5520 / 5540 / 5560 MHz, HT/VHT80, M0 to M23, M0.1 to M9.3

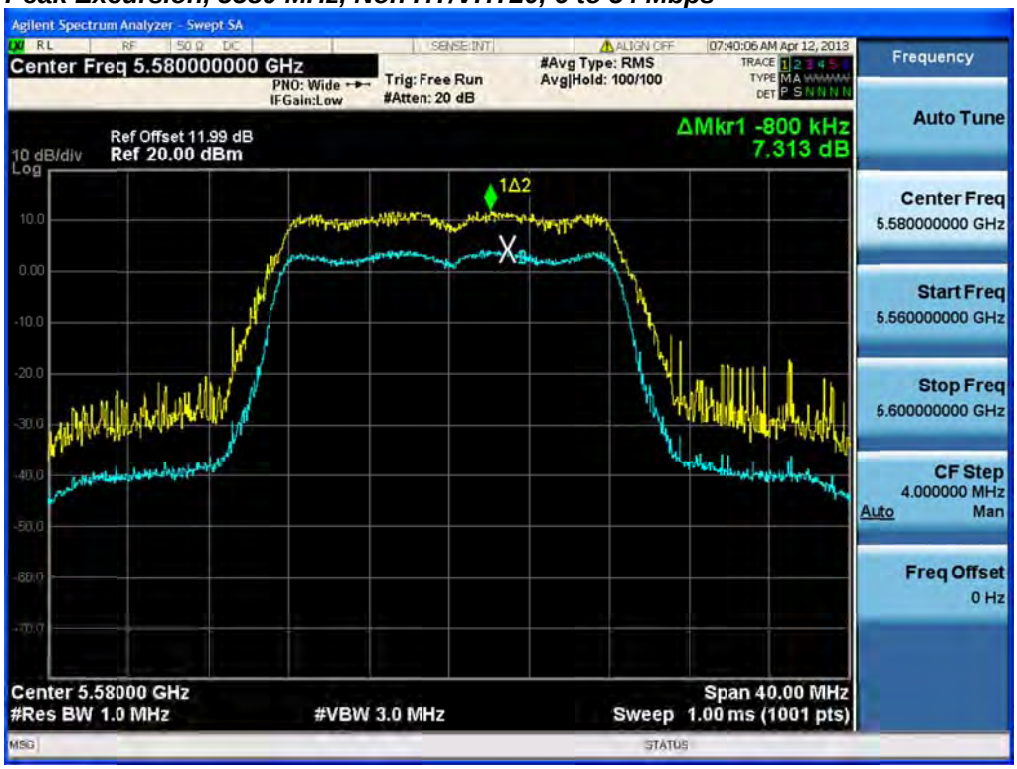
Peak Excursion, 5540 / 5560 MHz, Non HT/VHT40, 6 to 54 Mbps



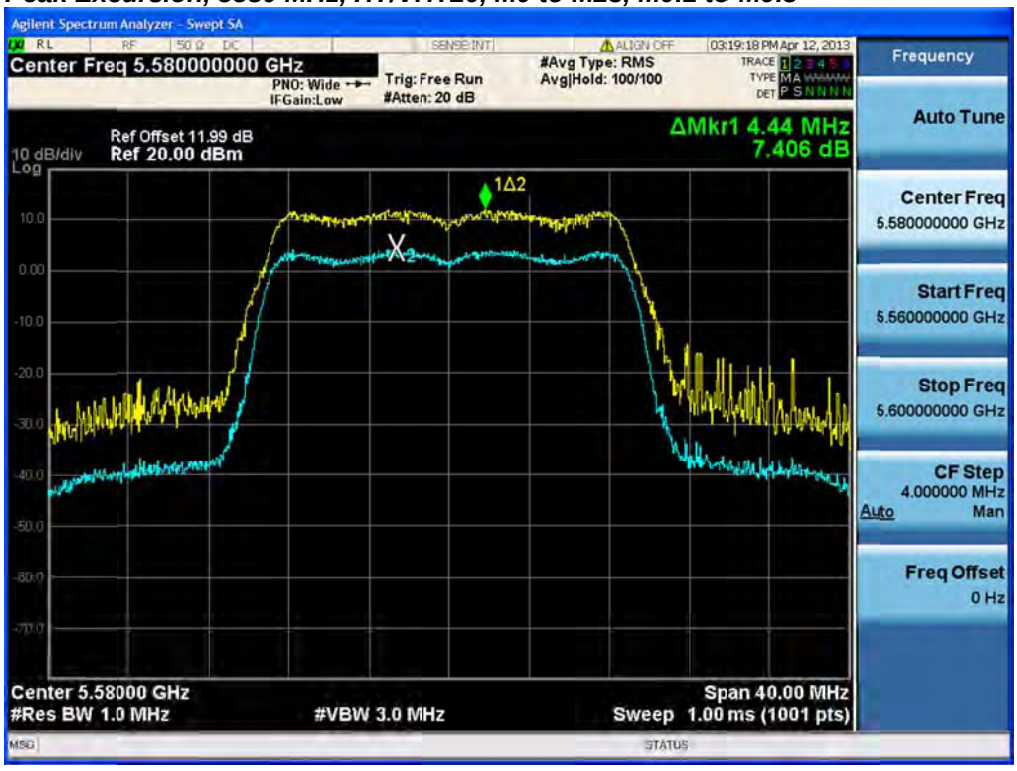
Peak Excursion, 5540 / 5560 MHz, HT/VHT40, M0 to M23, M0.1 to M9.3



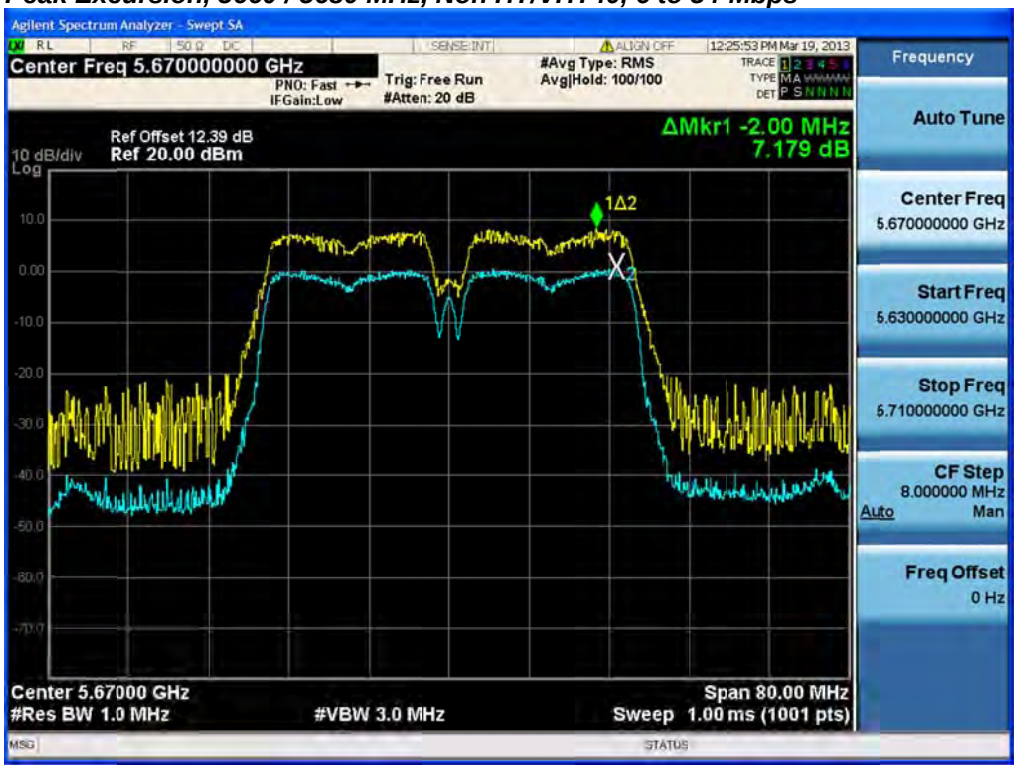
Peak Excursion, 5580 MHz, Non HT/VHT20, 6 to 54 Mbps



Peak Excursion, 5580 MHz, HT/VHT20, M0 to M23, M0.1 to M9.3



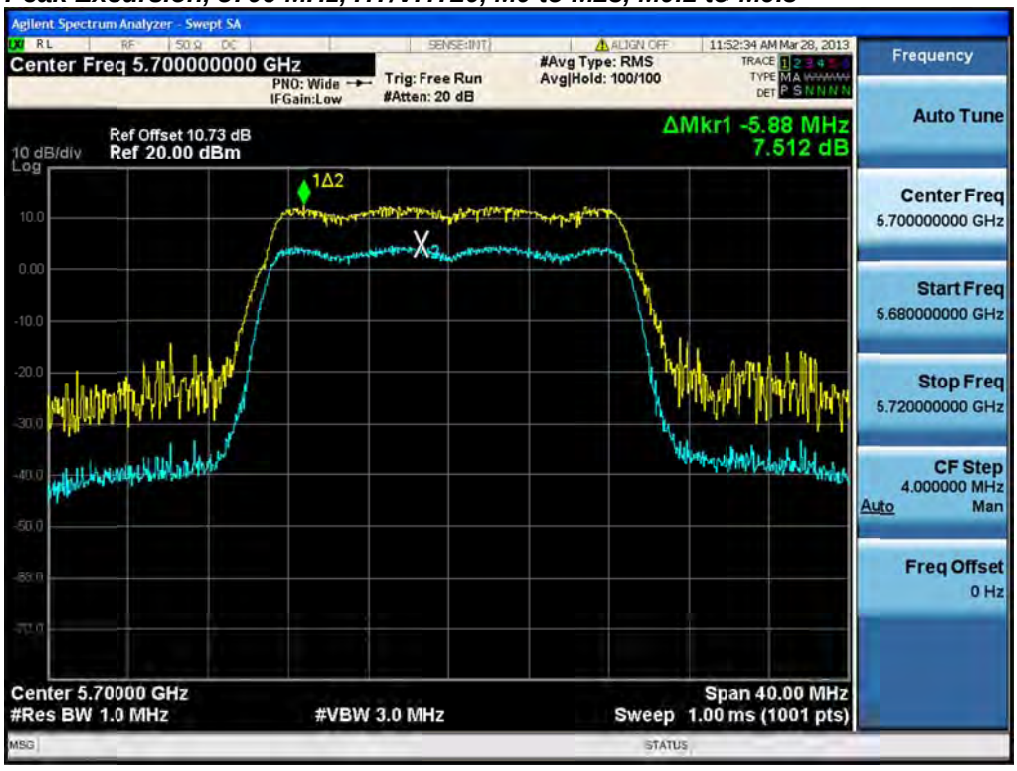
Peak Excursion, 5660 / 5680 MHz, Non HT/VHT40, 6 to 54 Mbps



Peak Excursion, 5660 / 5680 MHz, HT/VHT40, M0 to M23, M0.1 to M9.3

Peak Excursion, 5700 MHz, Non HT/VHT20, 6 to 54 Mbps

Peak Excursion, 5700 MHz, HT/VHT20, M0 to M23, M0.1 to M9.3



Conducted Spurious Emissions

15.407: For transmitters operating in the 5.25-5.35 and 5.47-5.725 GHz band: all emissions outside of the 5.25-5.35 and 5.47-5.725 GHz bands shall not exceed an EIRP of -27dBm/MHz.

Connect the antenna port(s) to the spectrum analyzer input. Place the radio in continuous transmit mode. Configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer).

Span:	30 MHz-40 GHz
Reference Level:	20 dBm
Attenuation:	10 dB
Sweep Time:	10 s
Resolution Bandwidth:	1 MHz
Video Bandwidth:	3 MHz
Detector:	Peak
Trace:	Single
Marker:	Peak

Record the marker waveform peak to spur difference

The “Measure and add 10 log(N) dB technique”, where N is the number of outputs, is used for measuring Conducted Spurious Emissions. With this technique, spectrum measurements are performed at each output of the device, and the quantity 10 log(n) is added to the worst case spectrum value before comparing to the emission limit

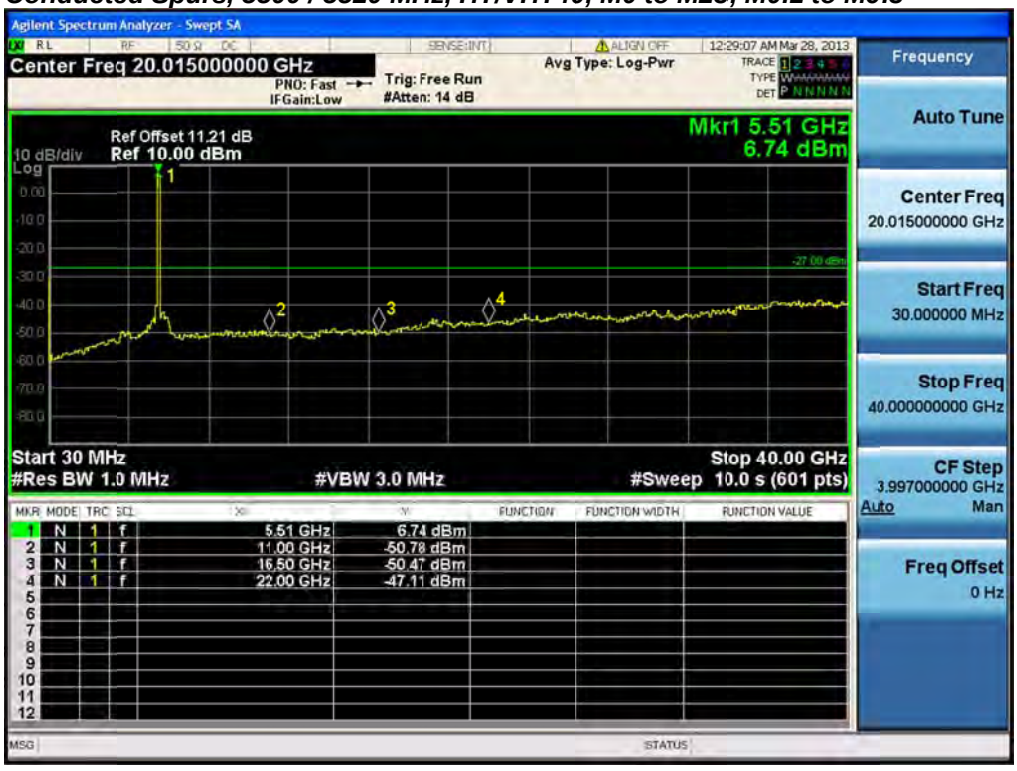
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Conducted Spur (dBm/MHz)	Total Conducted Spur (dBm/MHz)	Limit (dBm)	Margin (dB)
5500	Non HT/VHT20, 6 to 54 Mbps	2	12	-52.4	-37.4	-27	10.4
	HT/VHT20, M0 to M23, M0.1 to M9.3	3	6	-46.1	-35.3	-27	8.3
5500/5520	Non HT/VHT40, 6 to 54 Mbps	1	6	-51	-45.0	-27	18.0
	HT/VHT40, M0 to M23, M0.1 to M9.3	3	6	-47.1	-36.3	-27	9.3
5500/5520 5540/5560	Non HT/VHT80, 6 to 54 Mbps	1	6	-52.4	-46.4	-27	19.4
	HT/VHT80, M0 to M23, M0.1 to M9.3	3	6	-50	-39.2	-27	12.2
5540/5560	Non HT/VHT40, 6 to 54 Mbps	1	6	-51	-45.0	-27	18.0
	HT/VHT40, M0 to M23, M0.1 to M9.3	3	6	-47.3	-36.5	-27	9.5
5580	Non HT/VHT20, 6 to 54 Mbps	2	12	-52.1	-37.1	-27	10.1
	HT/VHT20, M0 to M23, M0.1 to M9.3	3	6	-45.8	-35.0	-27	8.0
5660/5680	Non HT/VHT40, 6 to 54 Mbps	1	6	-51.7	-45.7	-27	18.7
	HT/VHT40, M0 to M23, M0.1 to M9.3	4	6	-49.3	-37.3	-27	10.3
5700	Non HT/VHT20, 6 to 54 Mbps	2	12	-51.3	-36.3	-27	9.3
	HT/VHT20, M0 to M23, M0.1 to M9.3	3	6	-45.7	-34.9	-27	7.9

Conducted Spurs, 5500 MHz, Non HT/VHT20, 6 to 54 Mbps

Conducted Spurs, 5500 MHz, HT/VHT20, M0 to M23, M0.1 to M9.3

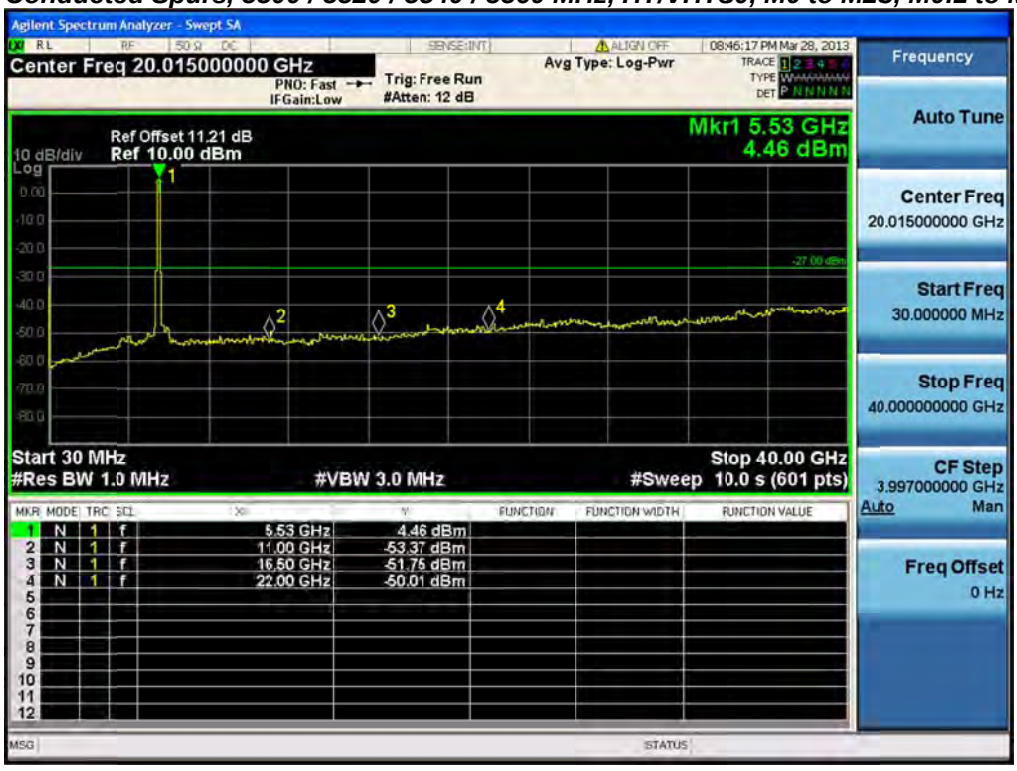
Conducted Spurs, 5500 / 5520 MHz, Non HT/VHT40, 6 to 54 Mbps

Conducted Spurs, 5500 / 5520 MHz, HT/VHT40, M0 to M23, M0.1 to M9.3



Conducted Spurs, 5500 / 5520 / 5540 / 5560 MHz, Non HT/VHT80, 6 to 54 Mbps

Conducted Spurs, 5500 / 5520 / 5540 / 5560 MHz, HT/VHT80, M0 to M23, M0.1 to M9.3



Conducted Spurs, 5540 / 5560 MHz, Non HT/VHT40, 6 to 54 Mbps

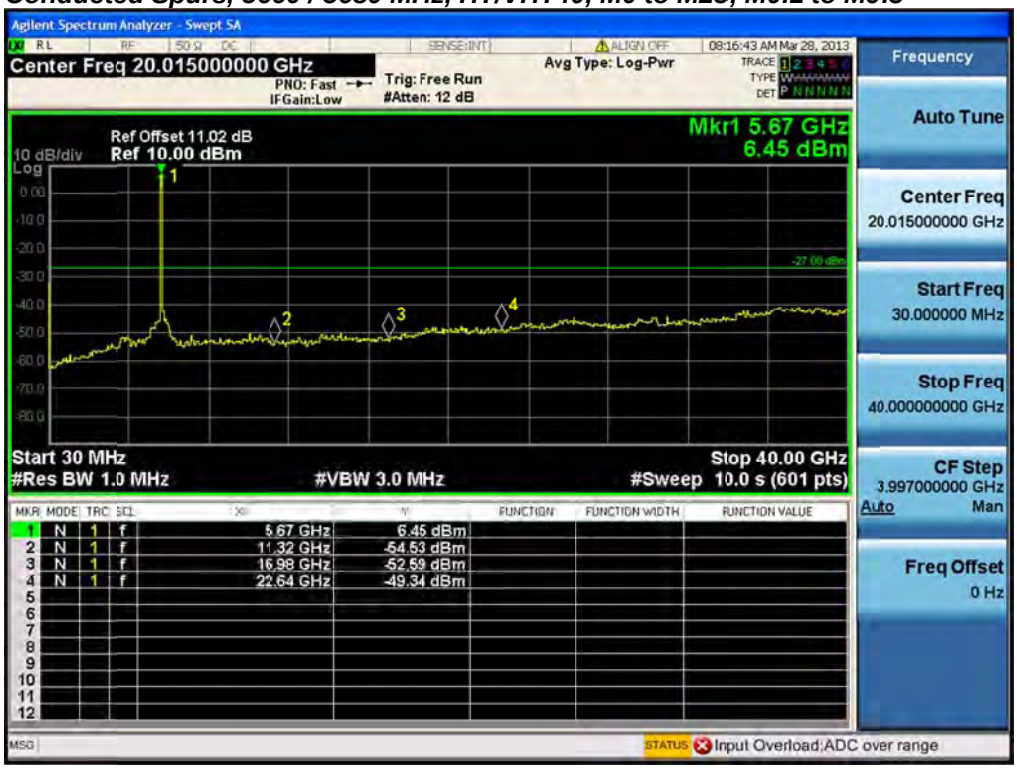
Conducted Spurs, 5540 / 5560 MHz, HT/VHT40, M0 to M23, M0.1 to M9.3

Conducted Spurs, 5580 MHz, Non HT/VHT20, 6 to 54 Mbps

Conducted Spurs, 5580 MHz, HT/VHT20, M0 to M23, M0.1 to M9.3

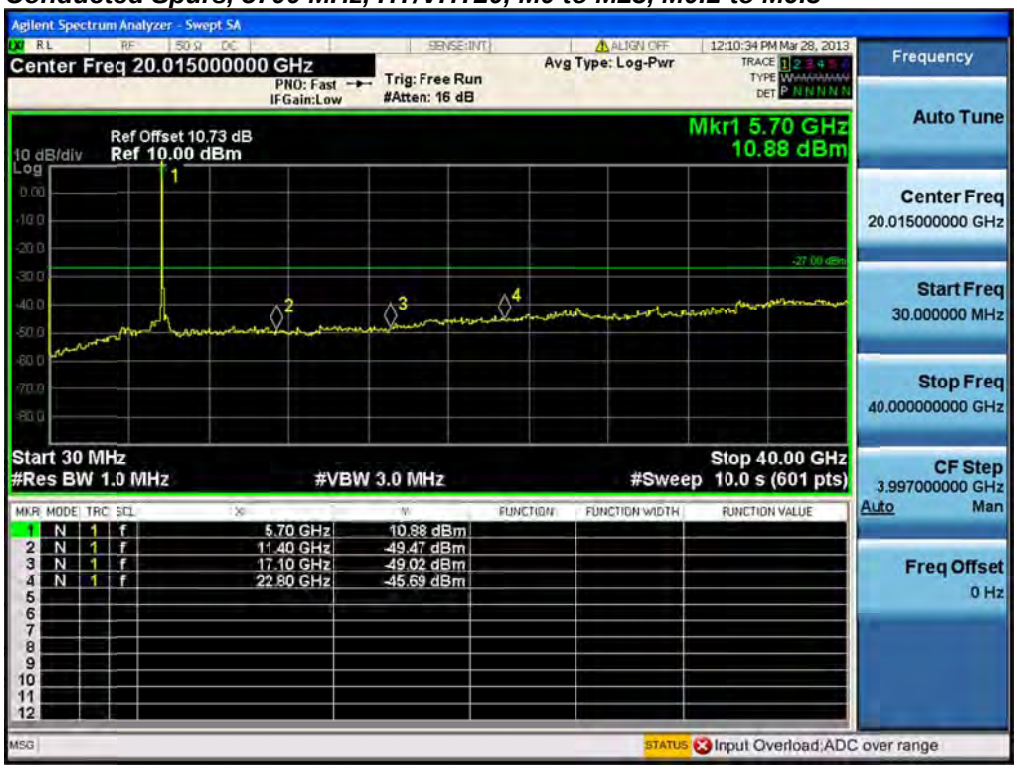
Conducted Spurs, 5660 / 5680 MHz, Non HT/VHT40, 6 to 54 Mbps

Conducted Spurs, 5660 / 5680 MHz, HT/VHT40, M0 to M23, M0.1 to M9.3



Conducted Spurs, 5700 MHz, Non HT/VHT20, 6 to 54 Mbps

Conducted Spurs, 5700 MHz, HT/VHT20, M0 to M23, M0.1 to M9.3



Conducted Bandedge

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Use the procedures in 718828 D01 DTS Meas Guidance v01 to substitute conducted measurements in place of radiated measurements.
Connect the antenna port(s) to the spectrum analyzer input. Place the radio in continuous transmit mode. Be sure to enter all losses between the transmitter output and the spectrum analyzer.

Reference Level:	*10 dBm*
Attenuation:	*4 dB*
Sweep Time:	*Coupled*
Resolution Bandwidth:	*1MHz*
Video Bandwidth:	*1 MHz for peak, 100 Hz for average*
Detector:	*Peak*

Save 2 plots: *1) Average Plot (Vertical and Horizontal), Limit= -41.25 dBm eirp (54dBuV @3m)*
2) Peak plot (Vertical and Horizontal), Limit = -21.25 dBm eirp (74dBuV @3m)

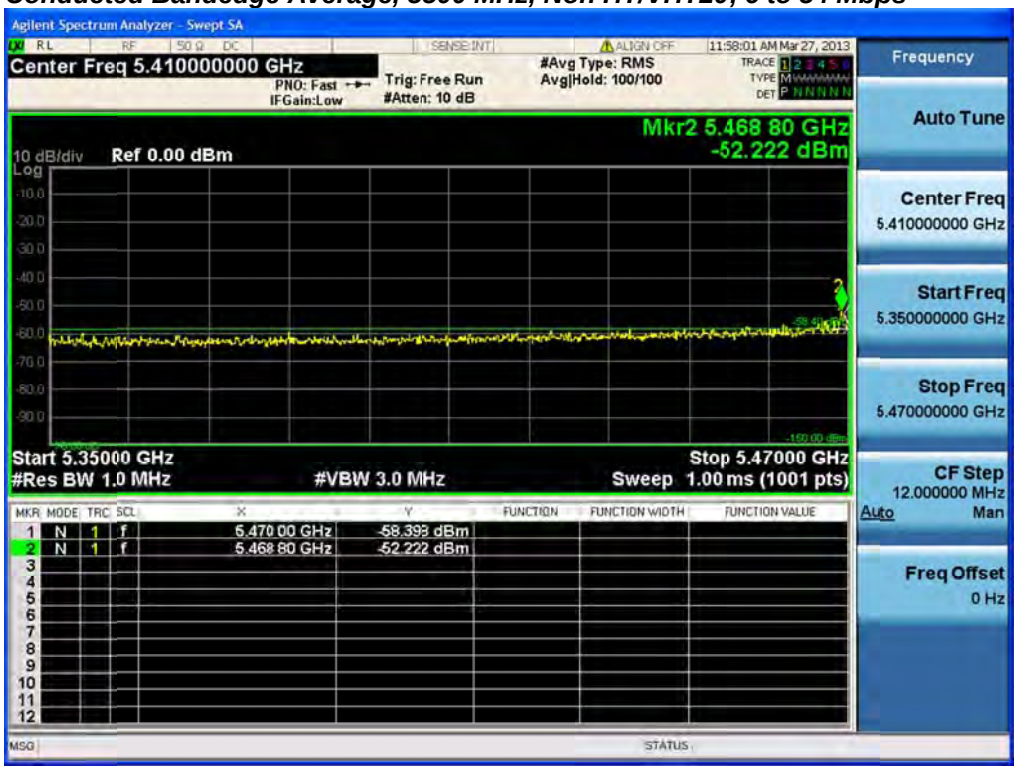
Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands.

The "measure-and-sum technique" is used for measuring in-band transmit power of a device. In the measure-and-sum approach, the conducted emission level is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in linear power units.

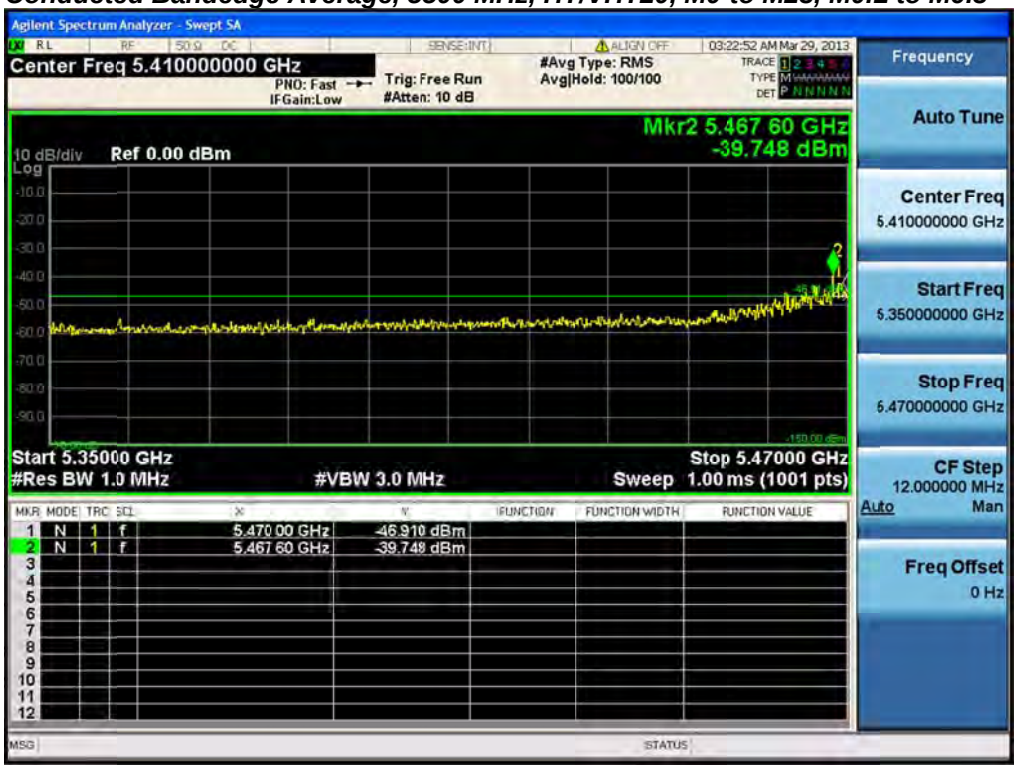
This report represents the worst case data for all supported operating modes and antennas.

Frequency (MHz)	Mode	Data Rate (Mbps)	Correlated Antenna Gain (dBi)	Conducted Bandedge Level (dBm/MHz)	Total Bandedge Level (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5500	Non HT/VHT20, 6 to 54 Mbps	2	6	-52.2	-43.2	-27	16.2
	HT/VHT20, M0 to M23, M0.1 to M9.3	2	6	-39.7	-30.7	-27	3.7
5500/5520	Non HT/VHT40, 6 to 54 Mbps	2	6	-38.2	-29.2	-27	2.2
	HT/VHT40, M0 to M23, M0.1 to M9.3	2	6	-38.5	-29.5	-27	2.5
5500/5520 5540/5560	Non HT/VHT80, 6 to 54 Mbps	2	6	-40.9	-31.9	-27	4.9
	HT/VHT80, M0 to M23, M0.1 to M9.3	2	6	-37.9	-28.9	-27	1.9
5660/5680	Non HT/VHT40, 6 to 54 Mbps	3	6	-42	-31.2	-27	4.2
	HT/VHT40, M0 to M23, M0.1 to M9.3	2	6	-46.7	-37.7	-27	10.7
5700	Non HT/VHT20, 6 to 54 Mbps	1	6	-38.5	-32.5	-27	5.5
	HT/VHT20, M0 to M23, M0.1 to M9.3	2	6	-39.7	-30.7	-27	3.7

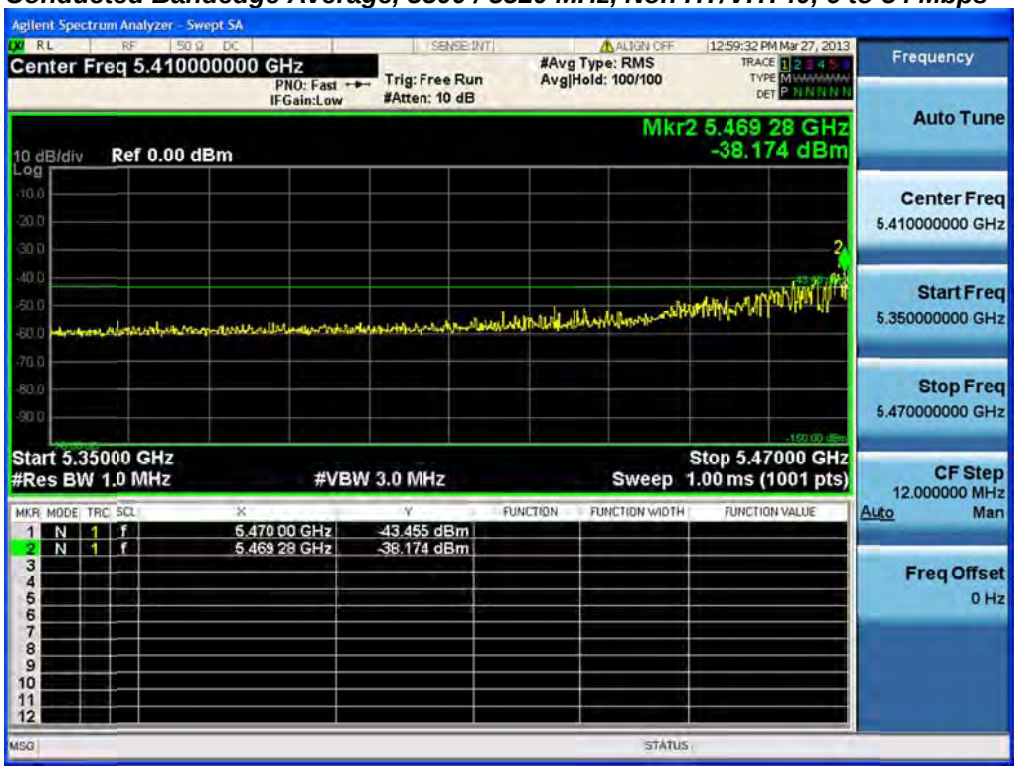
Conducted Bandedge Average, 5500 MHz, Non HT/VHT20, 6 to 54 Mbps



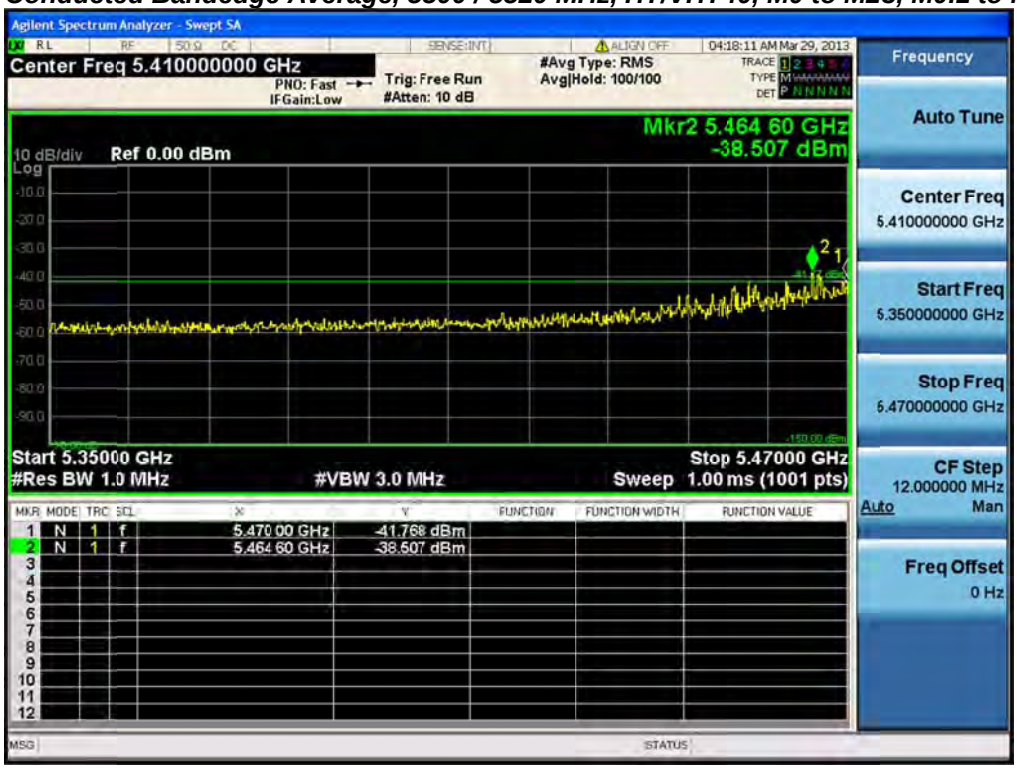
Conducted Bandedge Average, 5500 MHz, HT/VHT20, M0 to M23, M0.1 to M9.3



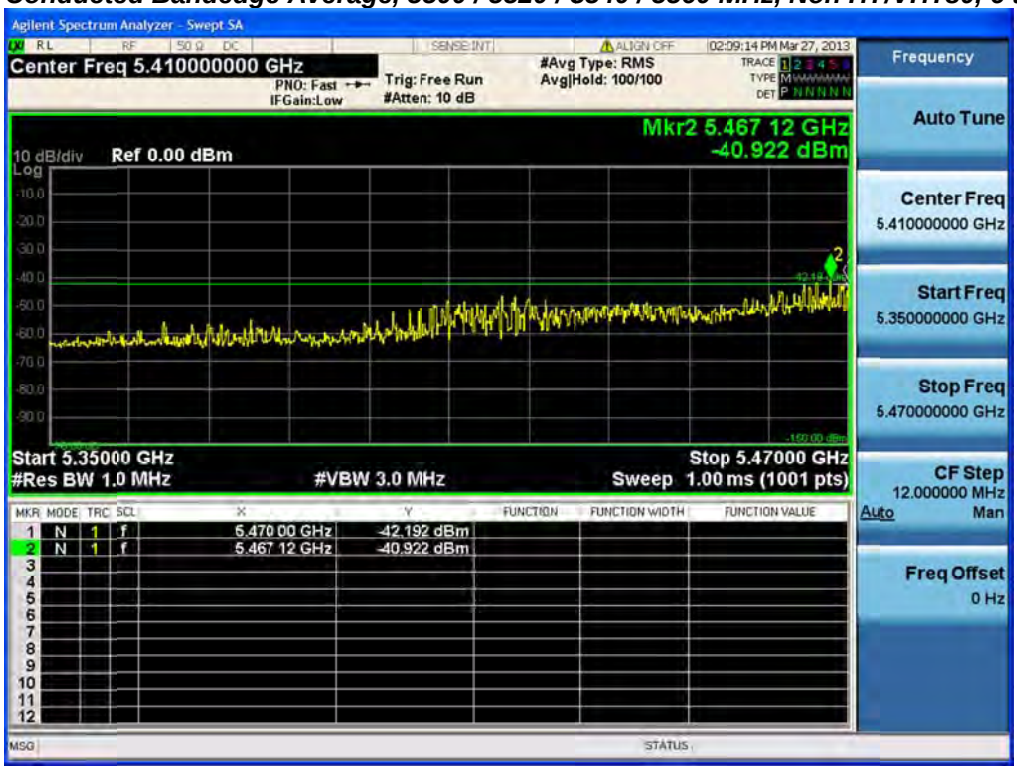
Conducted Bandedge Average, 5500 / 5520 MHz, Non HT/VHT40, 6 to 54 Mbps



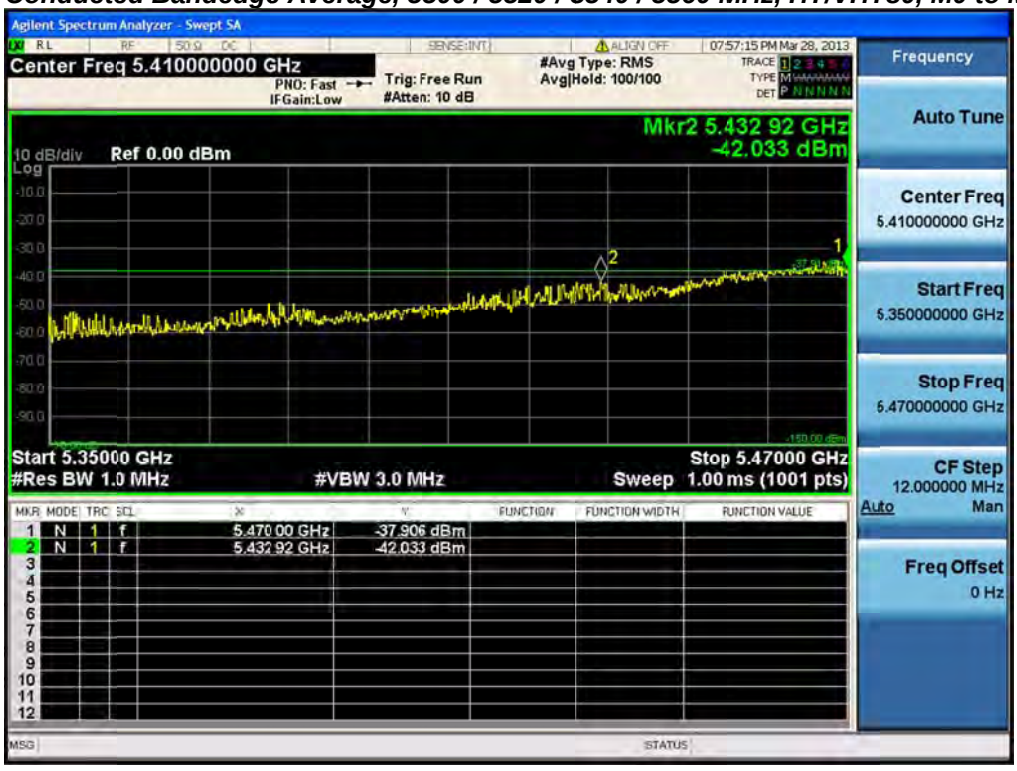
Conducted Bandedge Average, 5500 / 5520 MHz, HT/VHT40, M0 to M23, M0.1 to M9.3



Conducted Bandedge Average, 5500 / 5520 / 5540 / 5560 MHz, Non HT/VHT80, 6 to 54 Mbps

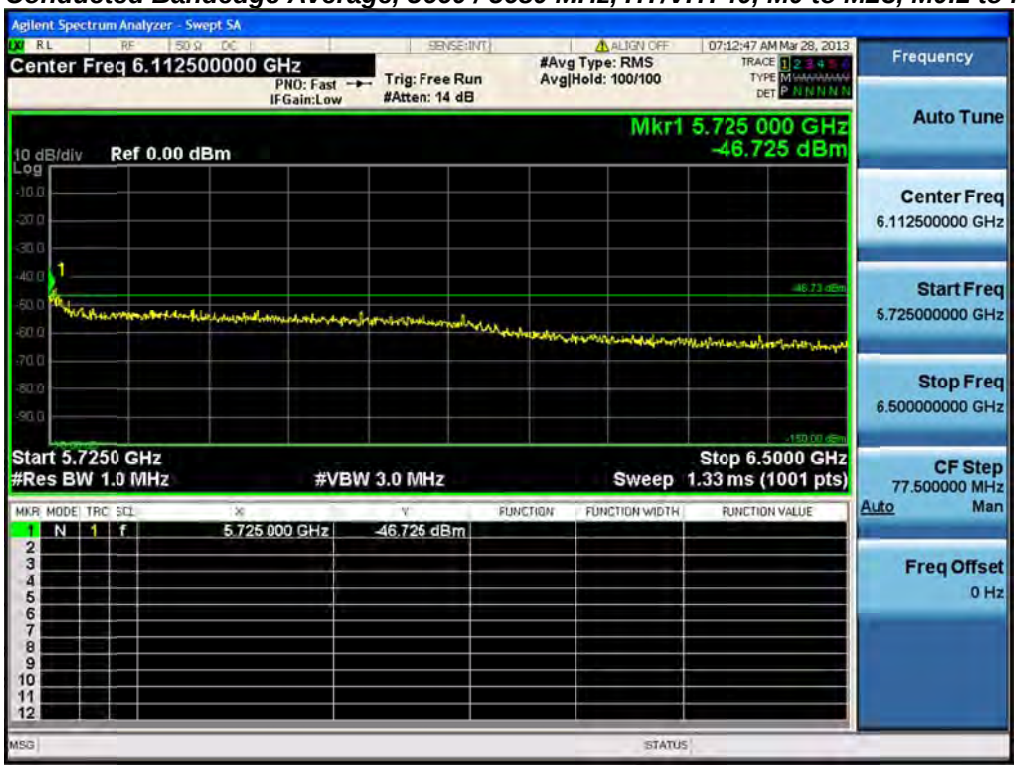


Conducted Bandedge Average, 5500 / 5520 / 5540 / 5560 MHz, HT/VHT80, M0 to M23, M0.1 to M9.3

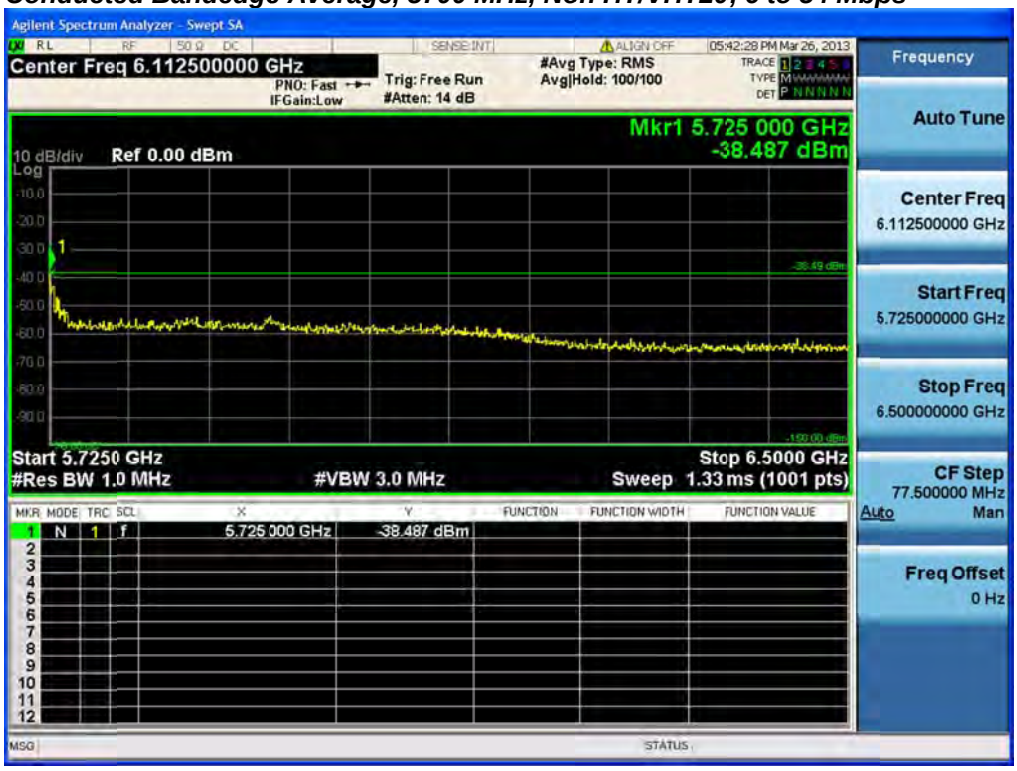


Conducted Bandedge Average, 5660 / 5680 MHz, Non HT/VHT40, 6 to 54 Mbps

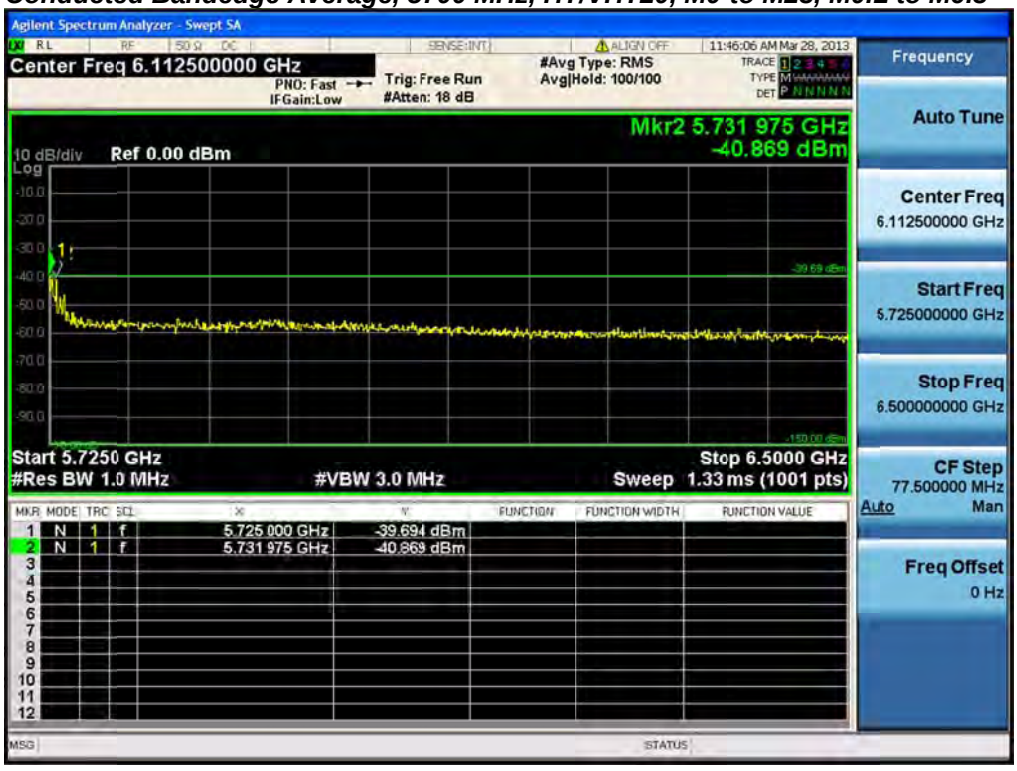
Conducted Bandedge Average, 5660 / 5680 MHz, HT/VHT40, M0 to M23, M0.1 to M9.3



Conducted Bandedge Average, 5700 MHz, Non HT/VHT20, 6 to 54 Mbps



Conducted Bandedge Average, 5700 MHz, HT/VHT20, M0 to M23, M0.1 to M9.3



20dB Bandwidth

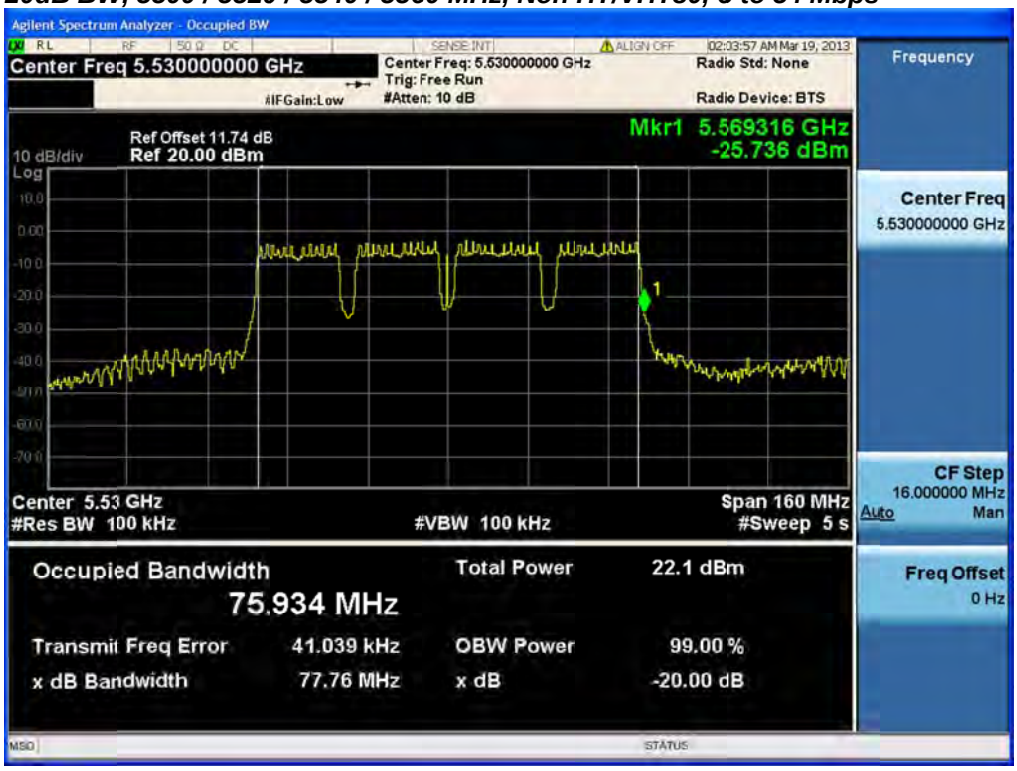
Connect the antenna port(s) to the spectrum analyzer input. Using the spectrum analyzer Channel Bandwidth mode, configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).

Center Frequency:	Frequency from table be.low
Span:	2 x Nominal Bandwidth (e.g. 40MHz for a 20MHz channel)
Reference Level:	20 dBm
Attenuation:	10 dB
Sweep Time:	5 s
Resolution Bandwidth:	1%-3% of 20 dB Bandwidth
Video Bandwidth:	≥Resolution Bandwidth
X dB Bandwidth:	20 dB
Detector:	Peak
Trace:	Single

Place the radio in continuous transmit mode. View the transmitter waveform on the spectrum analyzer, and record the pertinent measurements:

Frequency (MHz)	Mode	Data Rate (Mbps)	20dB BW (MHz)	Limit (kHz)	Margin (MHz)
5500/5520 5540/5560	Non HT/VHT80, 6 to 54 Mbps	6	5569	5600	31
	HT/VHT80, M0 to M23, M0.1 to M9.3	m0x1	5569	5600	31
5540/5560	Non HT/VHT40, 6 to 54 Mbps	6	5549	5600	51
	HT/VHT40, M0 to M23, M0.1 to M9.3	m0	5569	5600	31
5580	Non HT/VHT20, 6 to 54 Mbps	6	5582	5600	16
	HT/VHT20, M0 to M23, M0.1 to M9.3	m0	5582	5600	16
5660/5680	Non HT/VHT40, 6 to 54 Mbps	6	5651	5650	1
	HT/VHT40, M0 to M23, M0.1 to M9.3	m0	5651	5650	1

20dB BW, 5500 / 5520 / 5540 / 5560 MHz, Non HT/VHT80, 6 to 54 Mbps



20dB BW, 5500 / 5520 / 5540 / 5560 MHz, HT/VHT80, M0 to M23, M0.1 to M9.3

20dB BW, 5540 / 5560 MHz, Non HT/VHT40, 6 to 54 Mbps

20dB BW, 5540 / 5560 MHz, HT/VHT40, M0 to M23, M0.1 to M9.3

20dB BW, 5580 MHz, Non HT/VHT20, 6 to 54 Mbps

20dB BW, 5580 MHz, HT/VHT20, M0 to M23, M0.1 to M9.3

20dB BW, 5660 / 5680 MHz, Non HT/VHT40, 6 to 54 Mbps

20dB BW, 5660 / 5680 MHz, HT/VHT40, M0 to M23, M0.1 to M9.3

Conducted Test Setup Photo

Appendix B: Emission Test Results

Testing Laboratory: Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134, USA

Radiated Spurious Emissions

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Using Vasona, configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode.

Span:	1GHz – 18 GHz
Reference Level:	80 dBuV
Attenuation:	10 dB
Sweep Time:	Coupled
Resolution Bandwidth:	1MHz
Video Bandwidth:	1 MHz for peak, 10 Hz for average
Detector:	Peak

Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

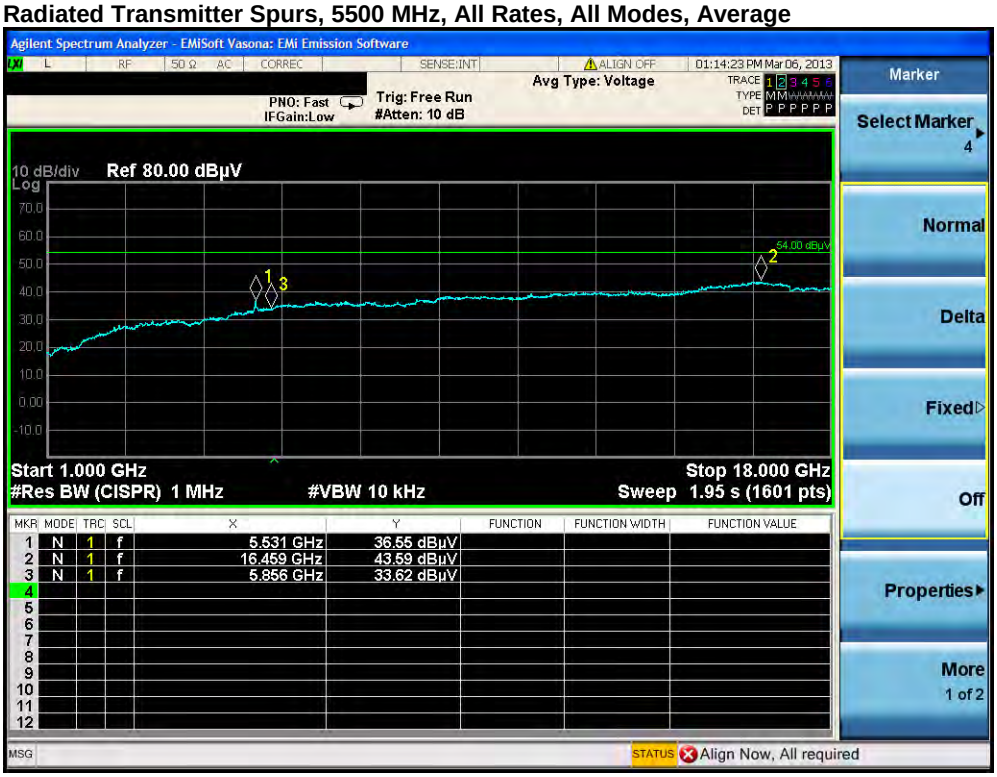
Save 2 plots: 1) Average Plot (Vertical and Horizontal), Limit= 54dBuV @3m
2) Peak plot (Vertical and Horizontal), Limit = 74dBuV @3m

Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands.

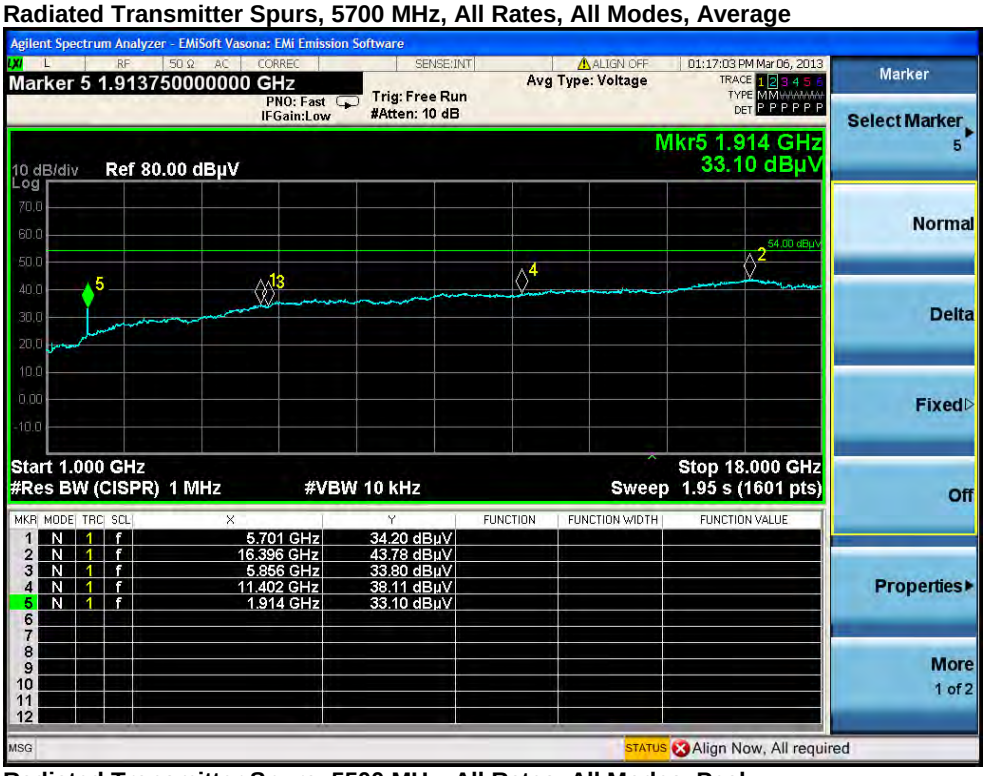
This report represents the worst case data for all supported operating modes and antennas. There are no measurable emissions above 18 GHz.

Frequency (MHz)	Mode	Data Rate (Mbps)	Spurious Emission Level (dBuV/m)	Limit (dBuV/m)
5500	Non HT-20, 6 to 54 Mbps	6	**<54**	**54**
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	**<54**	**54**
	HT-20, M0 to M23	m0	**<54**	**54**
	HT-20 STBC, M0 to M7	m0	**<54**	**54**
	HT-20 Beam Forming, M0 to M23	m0	**<54**	**54**
5700	Non HT-20, 6 to 54 Mbps	6	**<54**	**54**
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	**<54**	**54**
	HT-20, M0 to M23	m0	**<54**	**54**
	HT-20 STBC, M0 to M7	m0	**<54**	**54**
	HT-20 Beam Forming, M0 to M23	m0	**<54**	**54**
5500/5520	Non HT-40 Duplicate, 6-54 Mbps		**<54**	**54**
	HT-40, M0 to M23	6	**<54**	**54**
	HT-40 STBC, M0 to M7	m0	**<54**	**54**
	HT-40 Beam Forming, M0 to M23	m0	**<54**	**54**
5660/5680	Non HT-40 Duplicate, 6-54 Mbps	6	**<54**	**54**
	HT-40, M0 to M23	m0	**<54**	**54**
	HT-40 STBC, M0 to M7	m0	**<54**	**54**
	HT-40 Beam Forming, M0 to M23	m0	**<54**	**54**

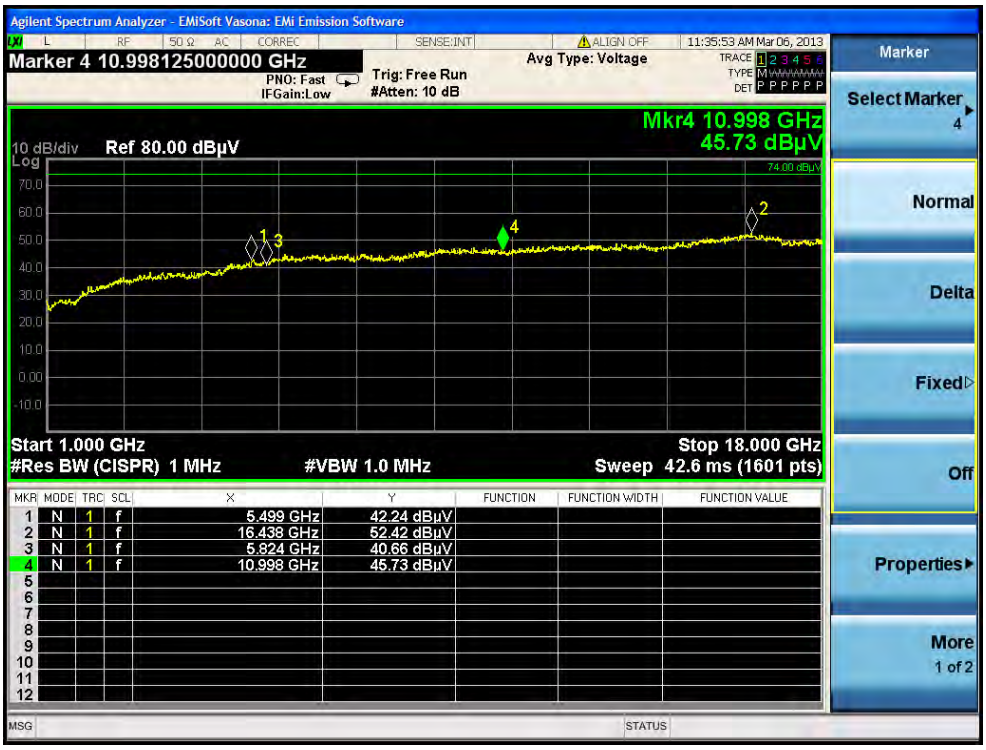
Radiated Transmitter Spurs, 5500 MHz, All Rates, All Modes, Average



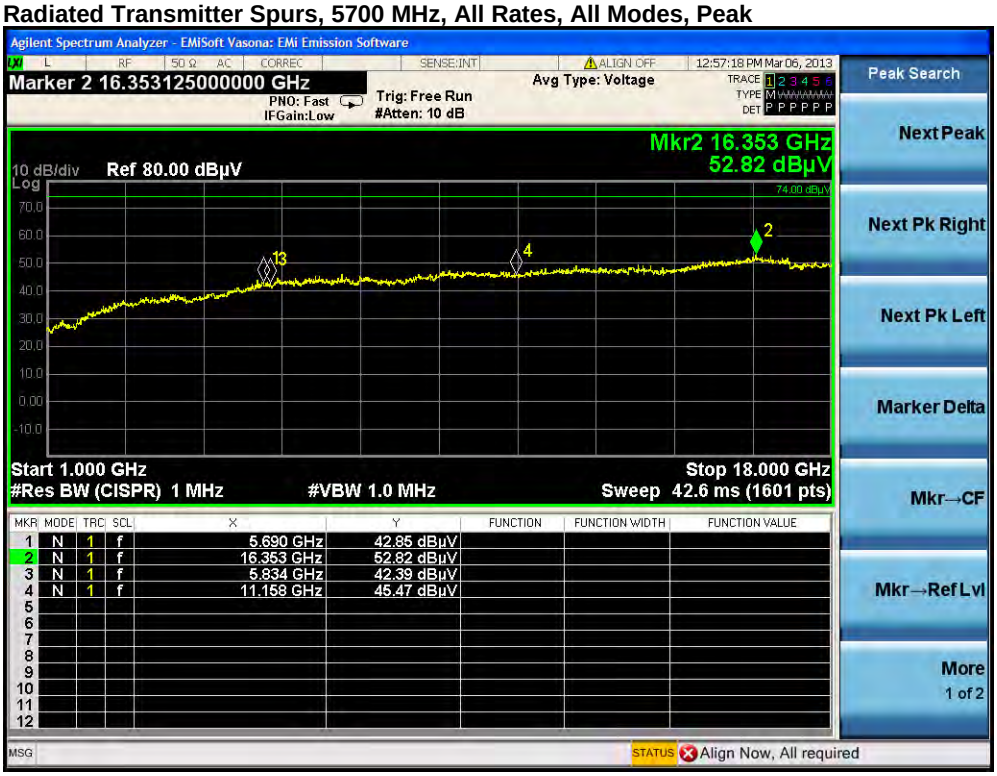
Radiated Transmitter Spurs, 5700 MHz, All Rates, All Modes, Average



Radiated Transmitter Spurs, 5500 MHz, All Rates, All Modes, Peak

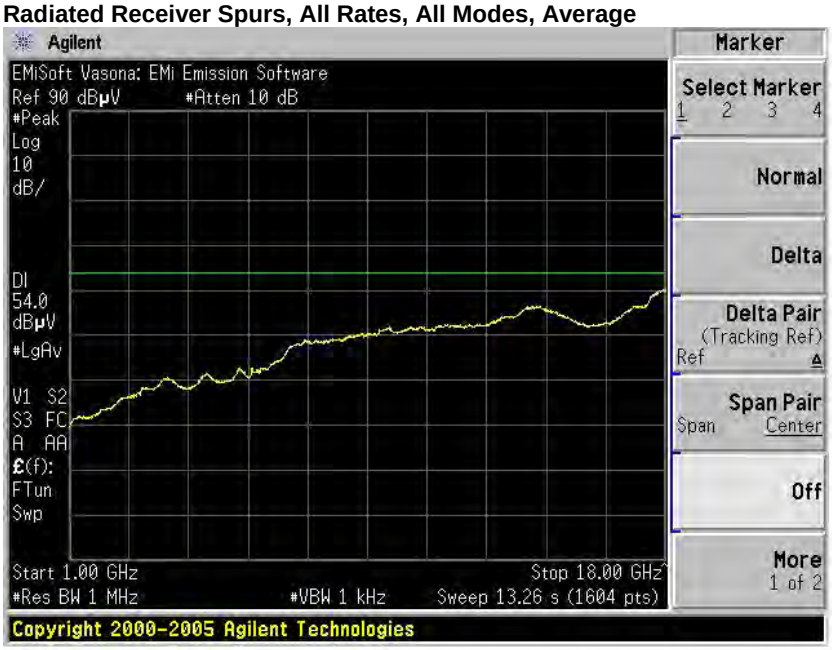


Radiated Transmitter Spurs, 5700 MHz, All Rates, All Modes, Peak

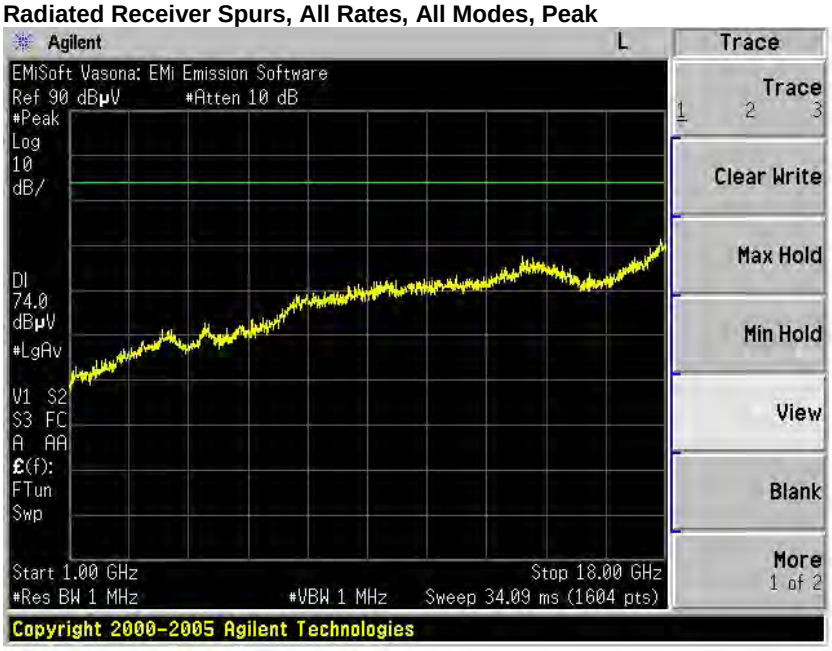


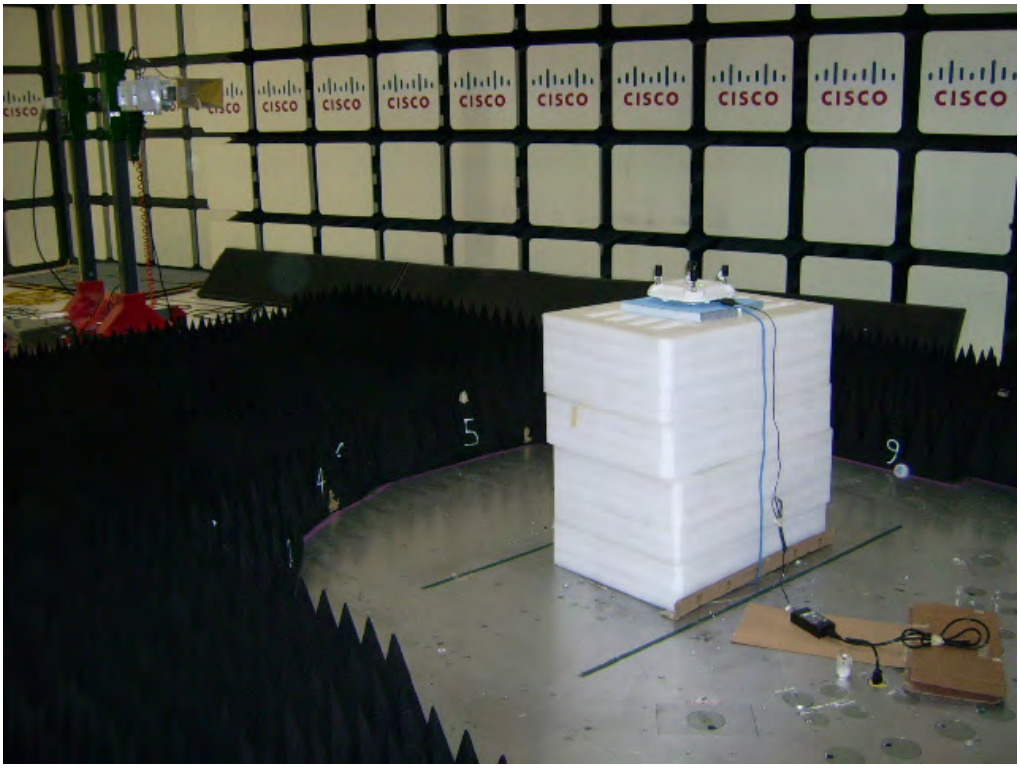
Receiver Radiated Spurious Emissions

Radiated Receiver Spurs, All Rates, All Modes, Average



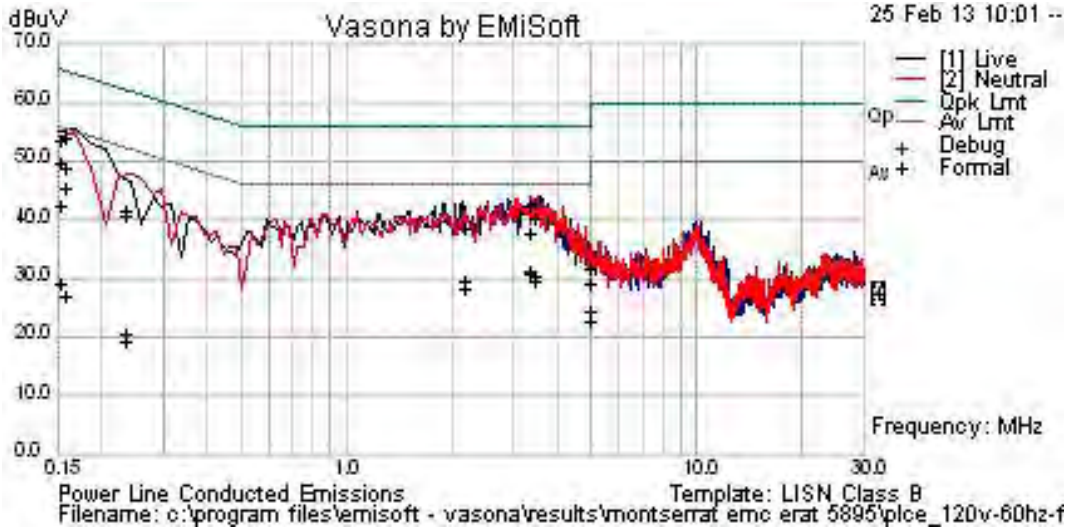
Radiated Receiver Spurs, All Rates, All Modes, Peak





Radiated Test Setup Photo

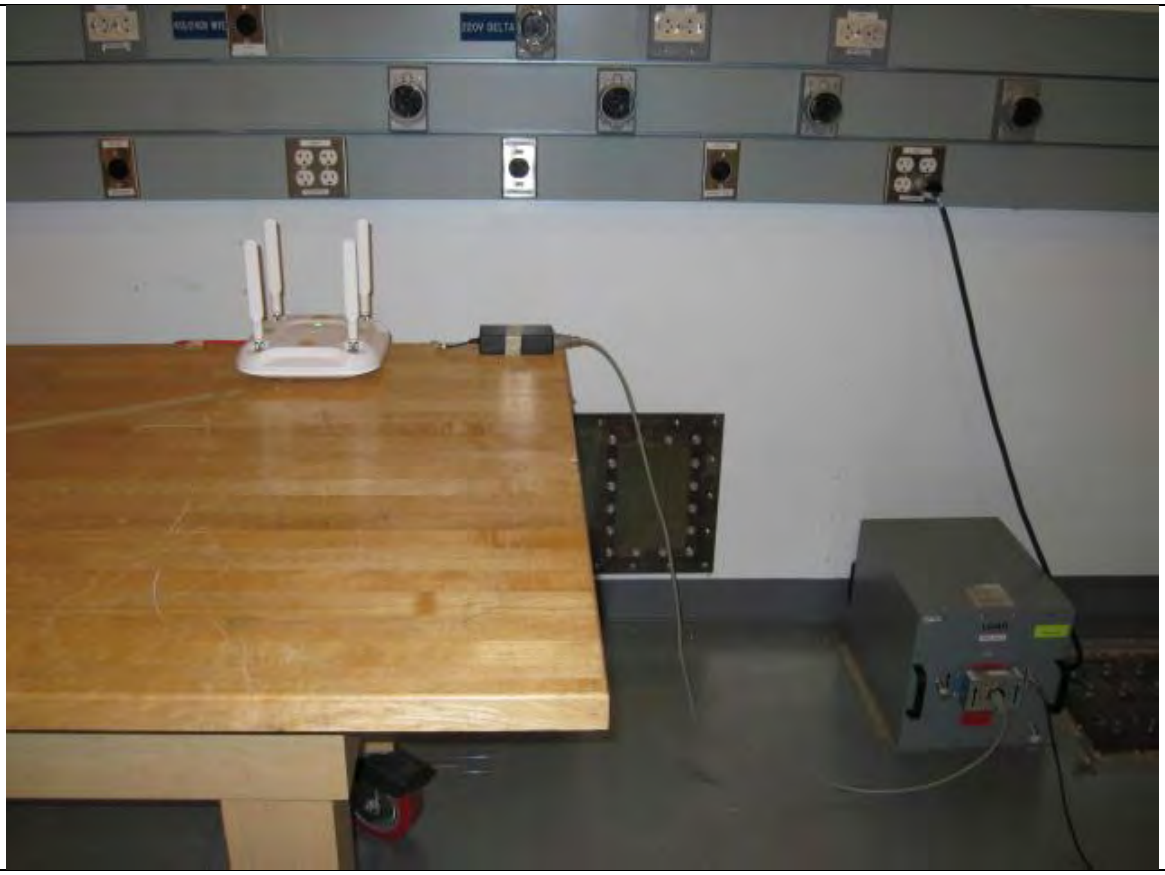
Conducted Emissions



Test Results Table

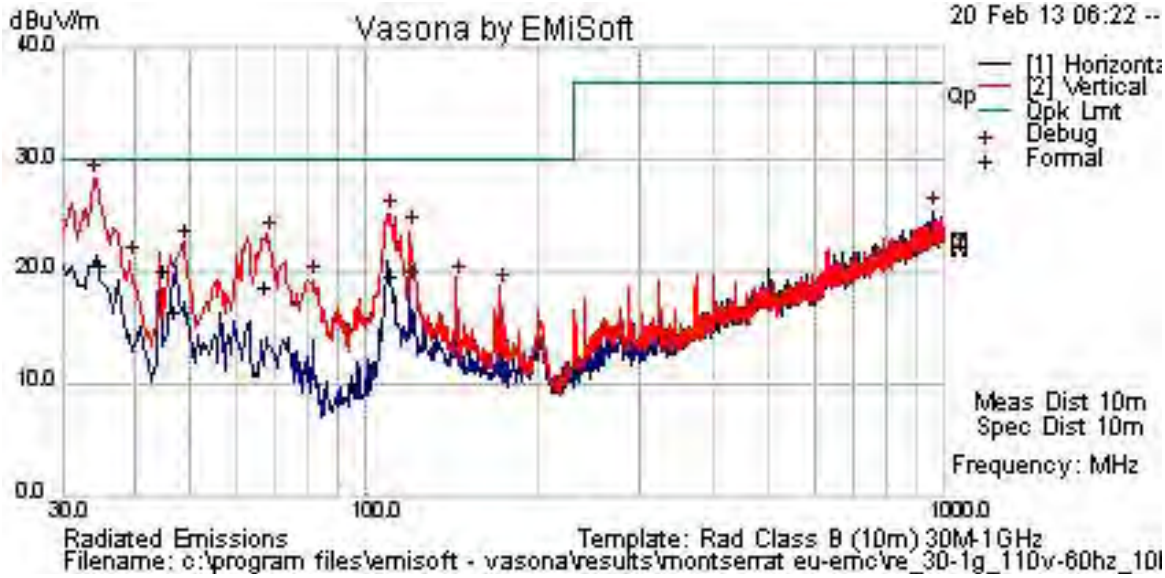
Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.15736	24	21.3	0.1	45.4	Av	N	55.6	-10.2	Pass	
0.15736	32.8	21.3	0.1	54.2	Qp	N	65.6	-11.4	Pass	
0.15288	32	21.4	0.1	53.5	Qp	N	65.8	-12.4	Pass	
3.424	22.7	20	0	42.8	Qp	N	56	-13.2	Pass	
0.15288	21	21.4	0.1	42.4	Av	L	55.8	-13.4	Pass	
3.351	22.5	20	0.1	42.6	Qp	N	56	-13.4	Pass	
3.351	11.1	20	0.1	31.2	Av	N	46	-14.8	Pass	
3.351	10.9	20	0.1	30.9	Av	L	46	-15.1	Pass	
3.424	20.3	20	0	40.3	Qp	L	56	-15.7	Pass	
3.424	10.2	20	0	30.3	Av	N	46	-15.7	Pass	
0.15288	28.1	21.4	0.1	49.6	Qp	L	65.8	-16.3	Pass	
3.424	9.4	20	0	29.5	Av	L	46	-16.5	Pass	
2.158	9.4	20	0	29.5	Av	N	46	-16.5	Pass	
0.15736	27.5	21.3	0.1	48.9	Qp	L	65.6	-16.7	Pass	
2.158	18.6	20	0	38.7	Qp	N	56	-17.3	Pass	
2.158	18.6	20	0	38.6	Qp	L	56	-17.4	Pass	
2.158	8.5	20	0	28.5	Av	L	46	-17.5	Pass	
3.351	17.6	20	0.1	37.6	Qp	L	56	-18.4	Pass	
0.23346	20.6	20.9	0	41.5	Qp	L	62.3	-20.8	Pass	
0.23346	19.8	20.9	0	40.7	Qp	N	62.3	-21.6	Pass	
4.916	4.3	20	0	24.4	Av	N	46	-21.6	Pass	
4.916	2.5	20	0	22.6	Av	L	46	-23.4	Pass	
4.916	11.8	20	0	31.9	Qp	N	56	-24.1	Pass	

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.15288	7.8	21.4	0.1	29.2	Av	N	55.8	-26.6	Pass	
4.916	9	20	0	29.1	Qp	L	56	-26.9	Pass	
0.15736	5.7	21.3	0.1	27.1	Av	L	55.6	-28.5	Pass	
0.23346	-0.1	20.9	0	20.8	Av	N	52.3	-31.6	Pass	
0.23346	-1.5	20.9	0	19.4	Av	L	52.3	-32.9	Pass	



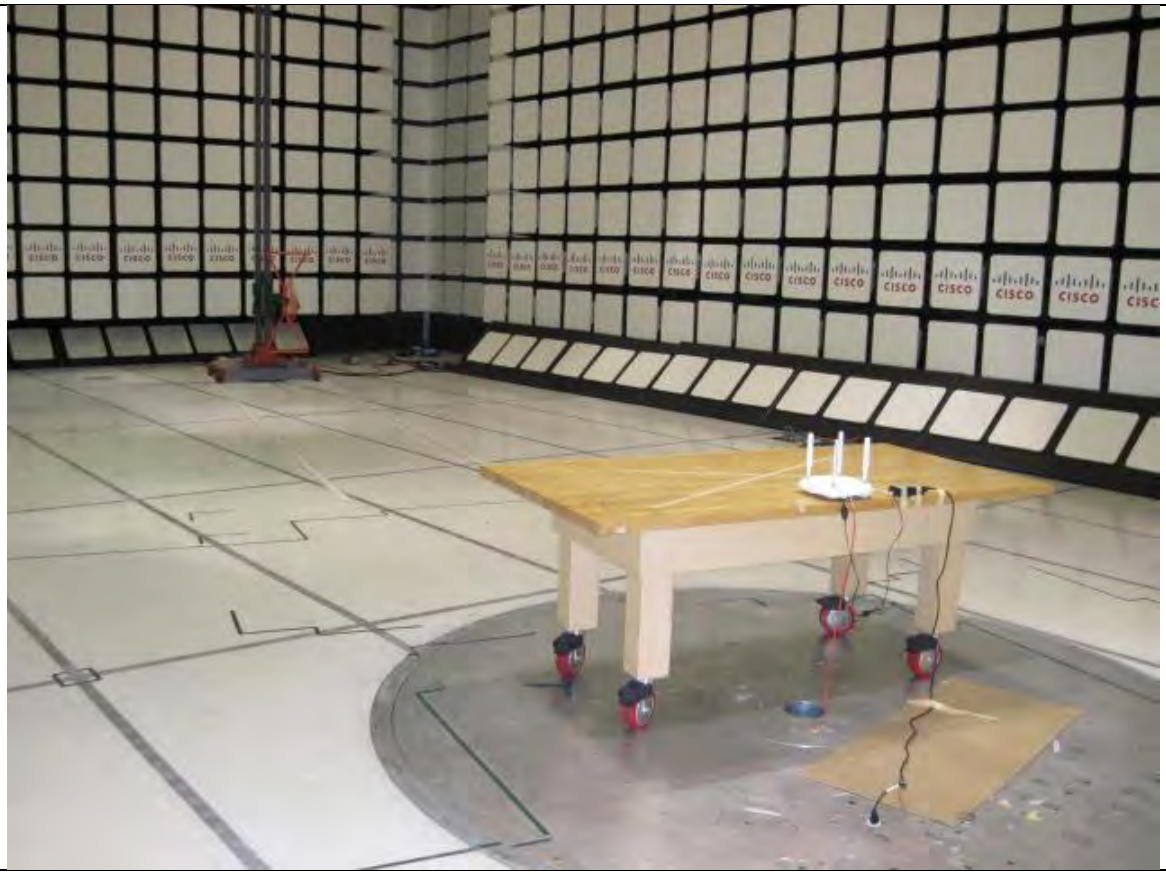
Title: Power Line Conducted Emissions Test Setup

Radiated emissions



Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
34.65	30.1	0.6	-10.1	20.6	Qp	V	124	218	30	-9.4	Pass	
44.239	36.6	0.7	-17.2	20.2	Qp	V	198	221	30	-9.8	Pass	
120.013	32.5	1.2	-13.6	20.2	Qp	V	135	87	30	-9.8	Pass	
110.373	33.2	1.2	-14.7	19.7	Qp	V	131	175	30	-10.3	Pass	
66.612	37.4	1	-19.7	18.6	Qp	V	102	271	30	-11.4	Pass	
46.154	33.9	0.7	-18.3	16.3	Qp	V	254	195	30	-13.7	Pass	



Title: Radiated Emissions 10m Test Distance

Maximum Permissible Exposure (MPE) Calculations

15.407: U-NII devices are subject to the radio frequency radiation exposure requirements specified in Sec. 1.1307(b), Sec. 2.1091 and Sec. 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a ``general population/uncontrolled'' environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

Given

E=√(30*P*G)/d and S=E^2/3770

where

E=Field Strength in Volts/meter
P=Power in Watts
G=Numeric Antenna Gain
d=Distance in meters
S=Power Density in mW/cm^2

Combine equations and rearrange the terms to express the distance as a function of the remaining variables:

d=√((30*P*G)/(3770*S))

Changing to units of power in mW and distance in cm, using:

P(mW)=P(W)/1000 d(cm)=100*d(m)

yields

d=100*√((30*(P/1000)*G)/(3770*S))
d=0.282*√(P*G/S)

where

d=Distance in cm
P=Power in mW
G=Numerica Antenna Gain
S=Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P(mW)=10^(P(dBm)/10) G(numeric)=10^(G(dBi)/10)

yields

d=0.282*10^((P+G)/20)/√S Equation (1)

and

s=((0.282*10^((P+G)/20))/d)^2 Equation (2)

where

d=MPE distance in cm
P=Power in dBm
G=Antenna Gain in dBi
S=Power Density in mW/cm^2

Equation (1) and the measured peak power are used to calculate the MPE distance. Note that for mobile or fixed location transmitters such as an access point, the minimum separation distance is 20 cm even if the calculations indicate that the MPE distance may be less.

S=1mW/cm^2 maximum. The highest supported antenna gain is 6 dBi (9dBi with beamforming). Using the peak power levels recorded in the test report along with Equation 1 above, the MPE distances are calculated as follows.

Frequency (MHz)	Power Density (mW/cm^2)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)	Limit (cm)	Margin (cm)
5260	1	24	6	**8.92**	20	11.08
5320	1	24	6	**8.92**	20	11.08

MPE Calculations

To maintain compliance, installations will assure a separation distance of at least 20cm.

Using Equation 2, the MPE levels (s) at 20 cm are calculated as follows:

Frequency (MHz)	MPE Distance (cm)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Margin (mW/cm^2)
5260	20	24	6	**0.20**	1	0.80
5320	20	24	6	**0.20**	1	0.80

Appendix C: Test Equipment/Software Used to perform the test

Equip #	Manufacturer	Model	Description	Last Cal	Next Due
CIS004882	EMC Test Systems	3115	Double Ridged Guide Horn Antenna	04-Jun-12	04-Jun-13
CIS004927	Miteq	NSP1000-S1	Broadband Preamplifier	01-Feb-13	01-Feb-14
CIS007704	Fischer	FCC-LISN-50/250-50-2-01	LISN	11-May-12	11-May-13
CIS021117	Micro-Coax	UFB311A-0-2484-520520	RF Coaxial Cable, to 18GHz, 248.4 in	24-Aug-12	24-Aug-13
CIS030564	Micro-Coax	UFB311A-1-0950-504504	RF Coaxial Cable, to 18GHz, 95 in	24-Aug-12	24-Aug-13
CIS030652	Sunol Sciences	JB1	Combination Antenna, 30MHz-2GHz	04-Sep-12	04-Sep-13
CIS044940	Rohde & Schwarz	ESU40	EMI Test Receiver	08-May-12	08-May-13
CIS018313	HP	8447D	RF Preamplifier	08-Jan-13	08-Jan-14
CIS043116	Huber + Suhner	Sucoflex 104PE	N & SMA RF cable	14-Dec-12	14-Dec-13
CIS049381	Agilent	N9030A	Spectrum Analyzer	28-Aug-12	28-Aug-13