



## 6.2 6dB BANDWIDTH MEASUREMENT

### 6.2.1 LIMITS

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

### 6.2.2 TEST INSTRUMENTS

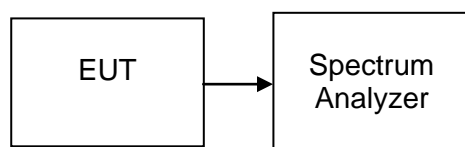
Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US44300399	02/21/2016	02/20/2017

### 6.2.3 TEST PROCEDURES (please refer to measurement standard)

#### 8.1 Option 1:

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

### 6.2.4 TEST SETUP





## 6.2.5 TEST RESULTS

*No non-compliance noted*

### Test Data

**Test mode: IEEE 802.11a mode / 5745 ~ 5825MHz**

Channel	Frequency (MHz)	Bandwidth(B) (MHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
Low	5745	16.440	16.430	>500	PASS
Mid	5785	16.440	16.460		PASS
High	5825	16.480	16.520		PASS

**Test mode: IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz**

Channel	Frequency (MHz)	Bandwidth(B) (MHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
Low	5745	17.630	17.690	>500	PASS
Mid	5785	17.630	17.660		PASS
High	5825	17.630	17.640		PASS

**Test mode: IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz**

Channel	Frequency (MHz)	Bandwidth(B) (MHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
Low	5755	36.370	36.410	>500	PASS
High	5795	36.380	36.430		PASS

**Test mode: IEEE 802.11ac 80 mode / 5775MHz**

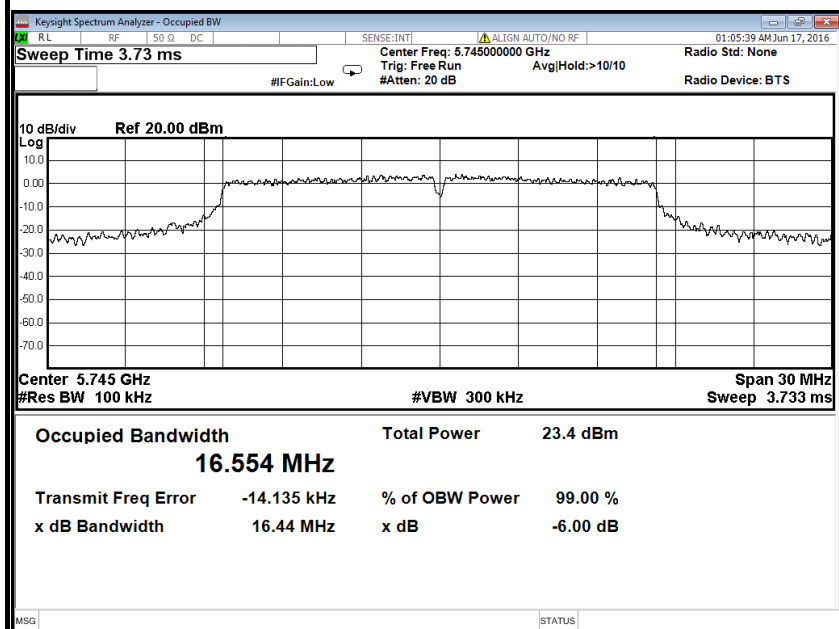
Channel	Frequency (MHz)	Bandwidth(B) (MHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
	5775	75.900	75.010	>500	PASS



IEEE 802.11a mode / 5745 ~ 5825MHz

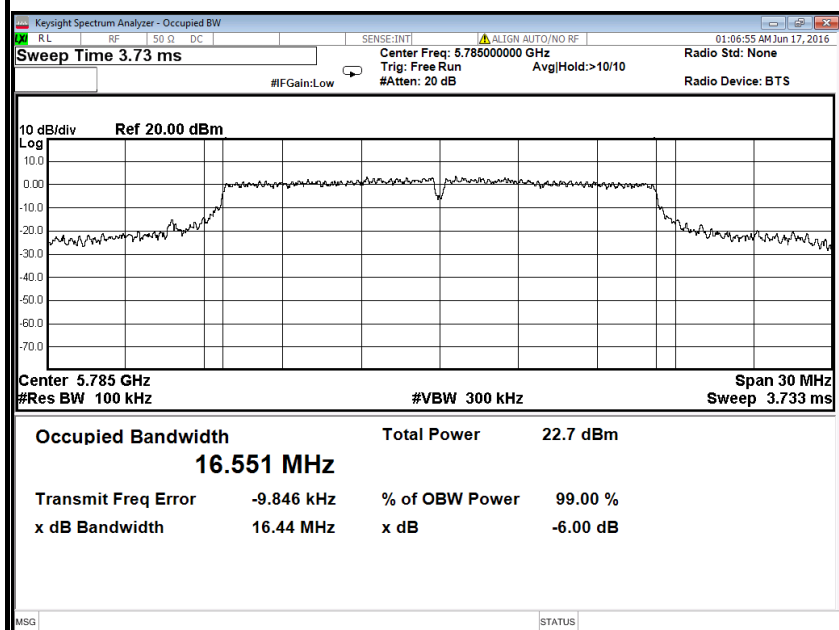
6dB Bandwidth (CH Low)

Antenna 0



6dB Bandwidth (CH Mid)

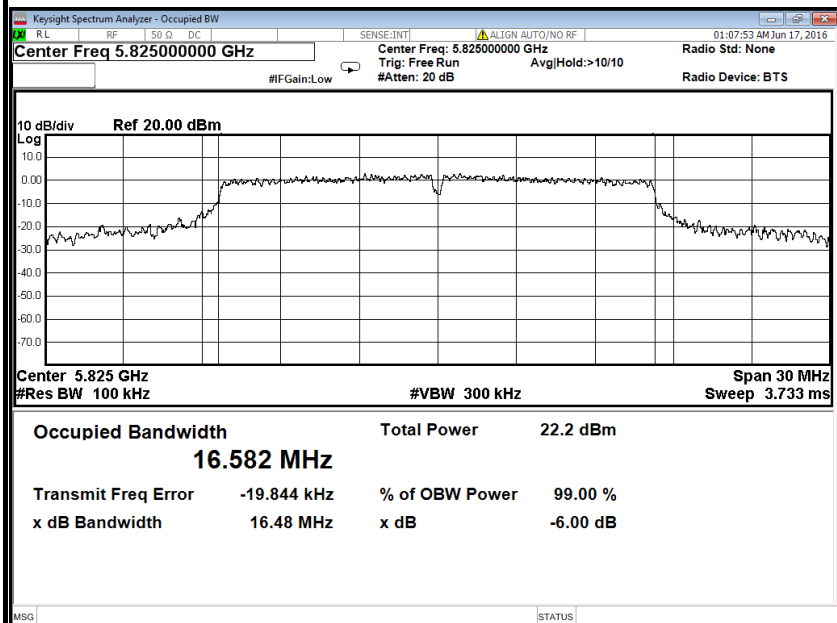
Antenna 0





### 6dB Bandwidth (CH High)

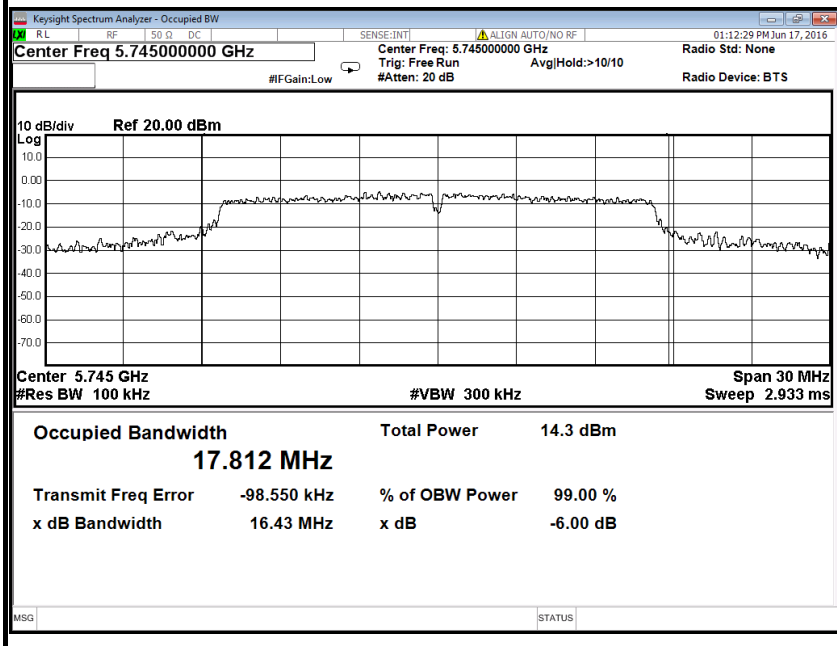
Antenna 0



### IEEE 802.11a mode / 5745 ~ 5825MHz

### 6dB Bandwidth (CH Low)

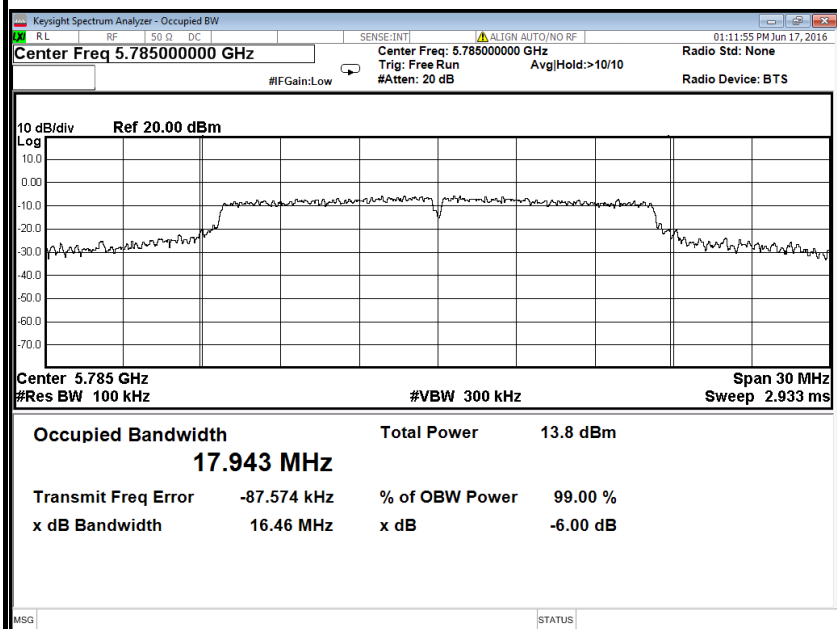
Antenna 1





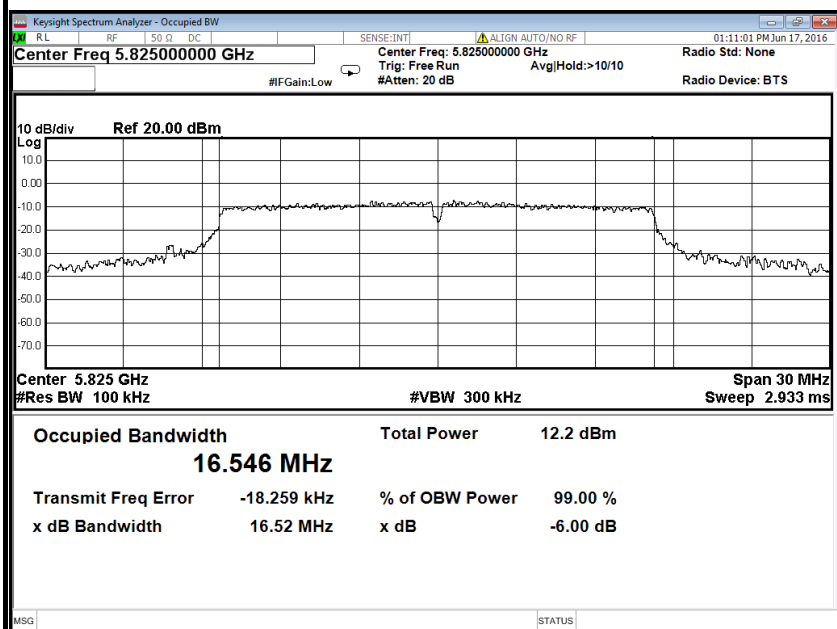
### 6dB Bandwidth (CH Mid)

#### Antenna 1



### 6dB Bandwidth (CH High)

#### Antenna 1

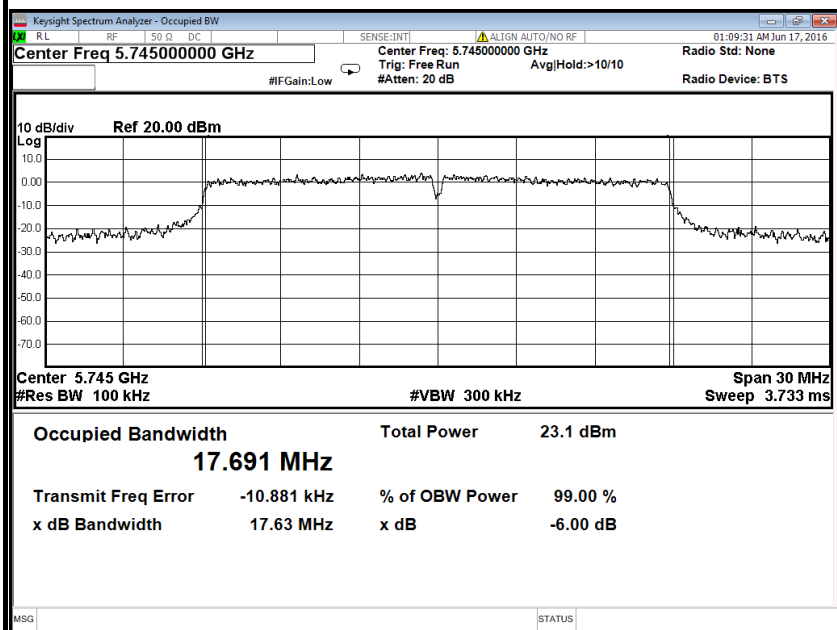




IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz

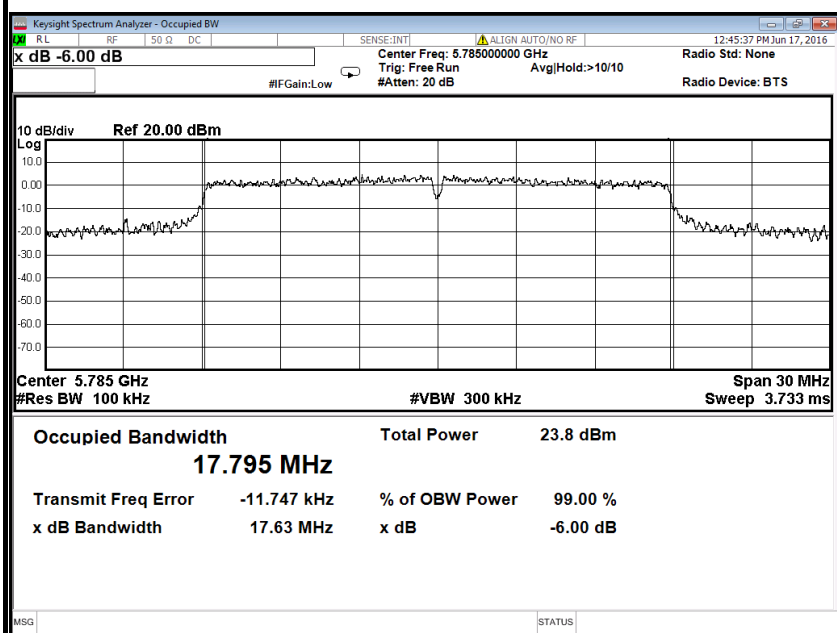
6dB Bandwidth (CH Low)

Antenna 0



6dB Bandwidth (CH Mid)

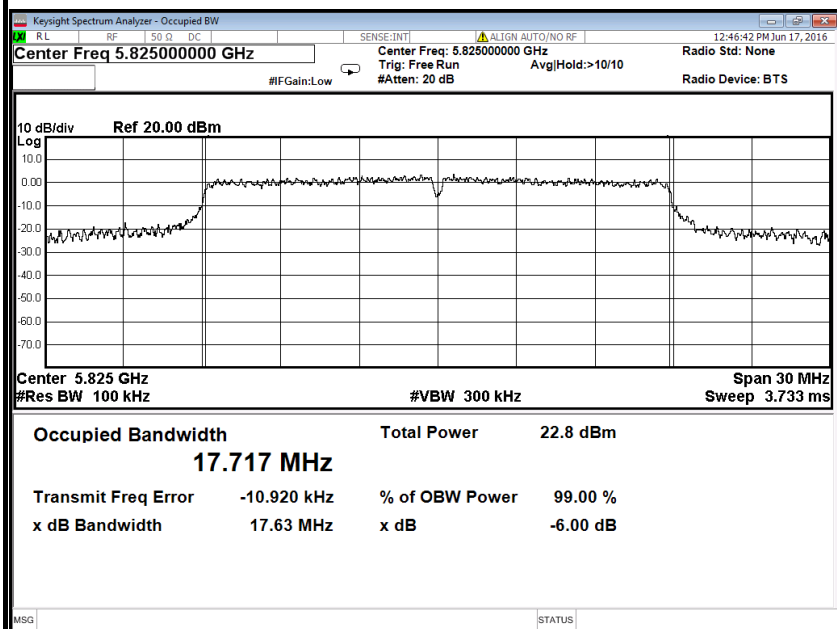
Antenna 0





### 6dB Bandwidth (CH High)

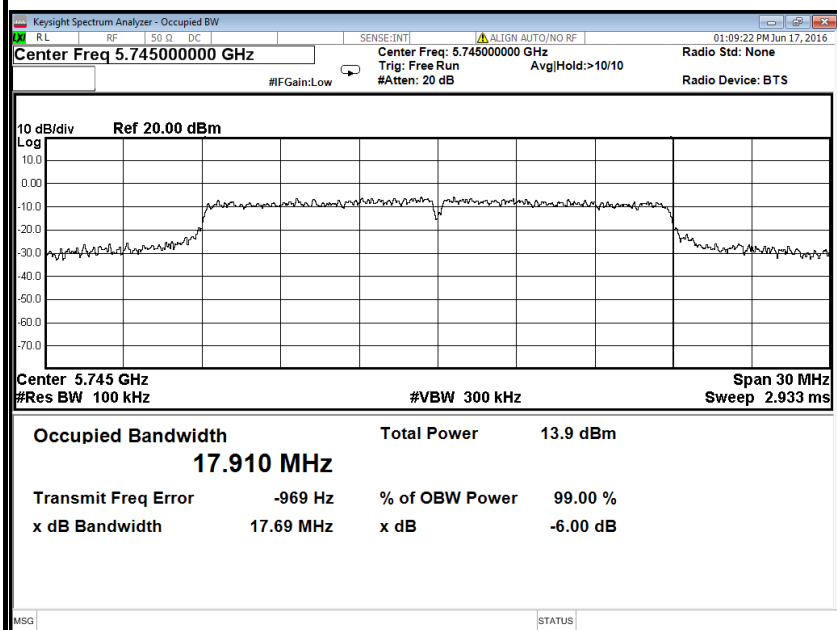
#### Antenna 0



### IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz

### 6dB Bandwidth (CH Low)

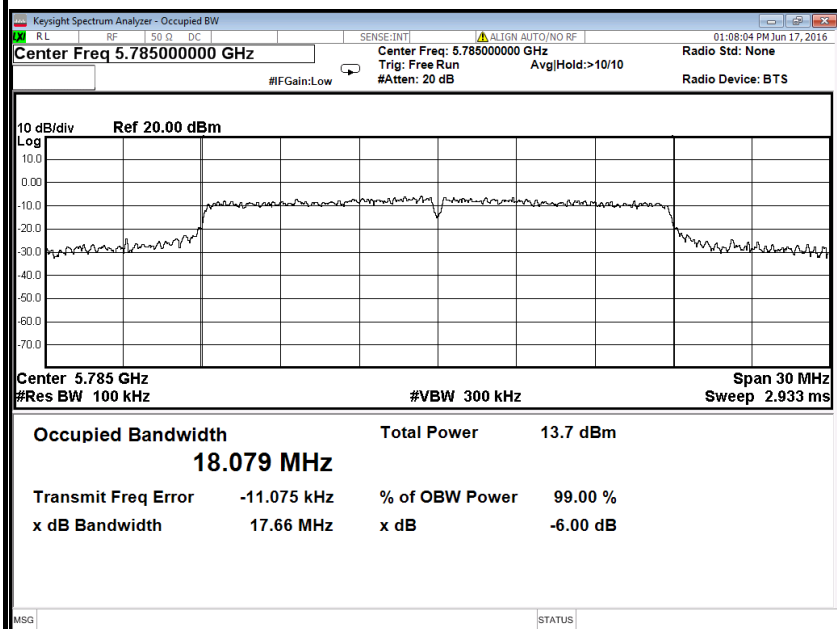
#### Antenna 1





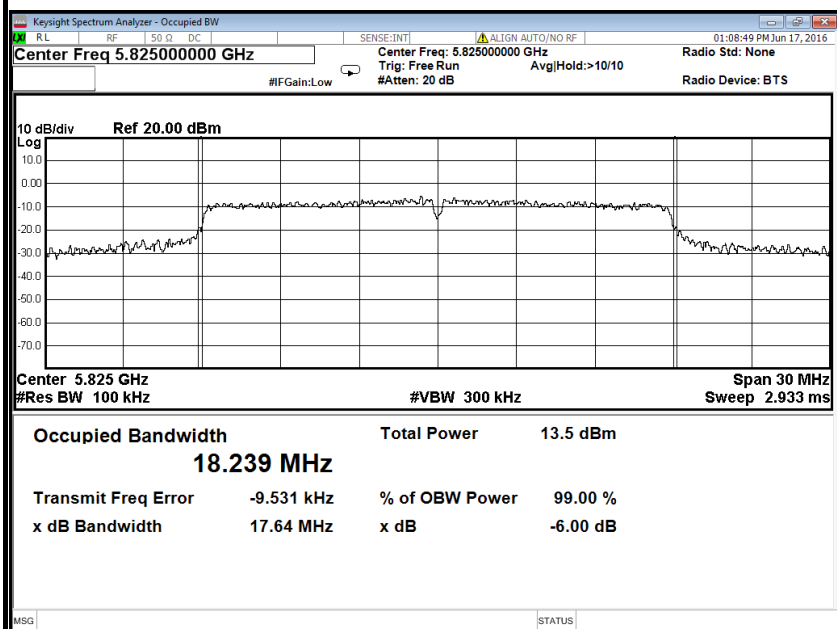
### 6dB Bandwidth (CH Mid)

#### Antenna 1



### 6dB Bandwidth (CH High)

#### Antenna 1



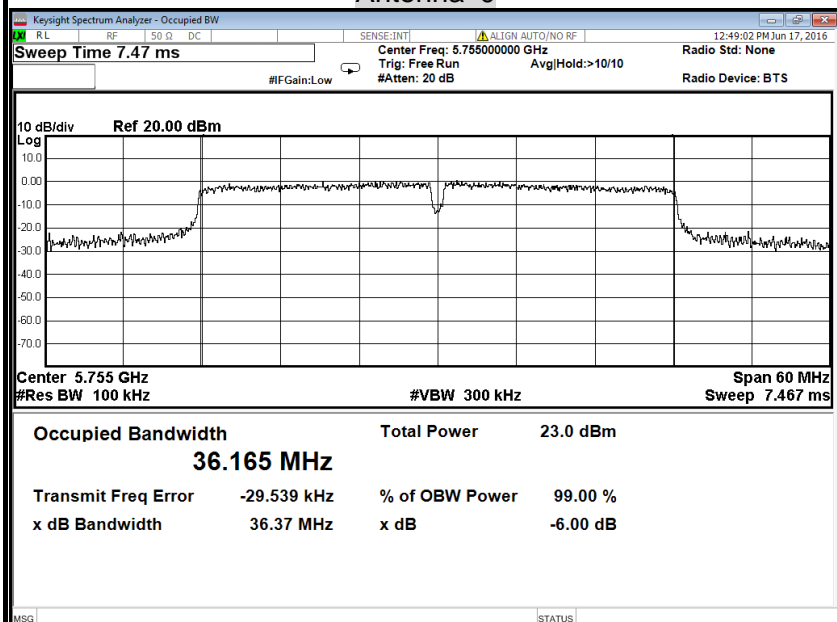




IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz

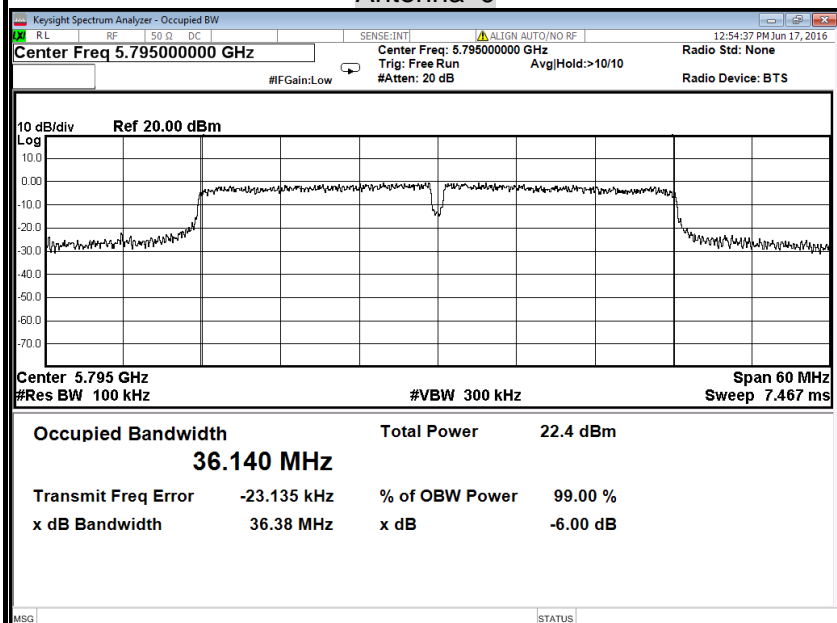
6dB Bandwidth (CH Low)

Antenna 0



6dB Bandwidth (CH High)

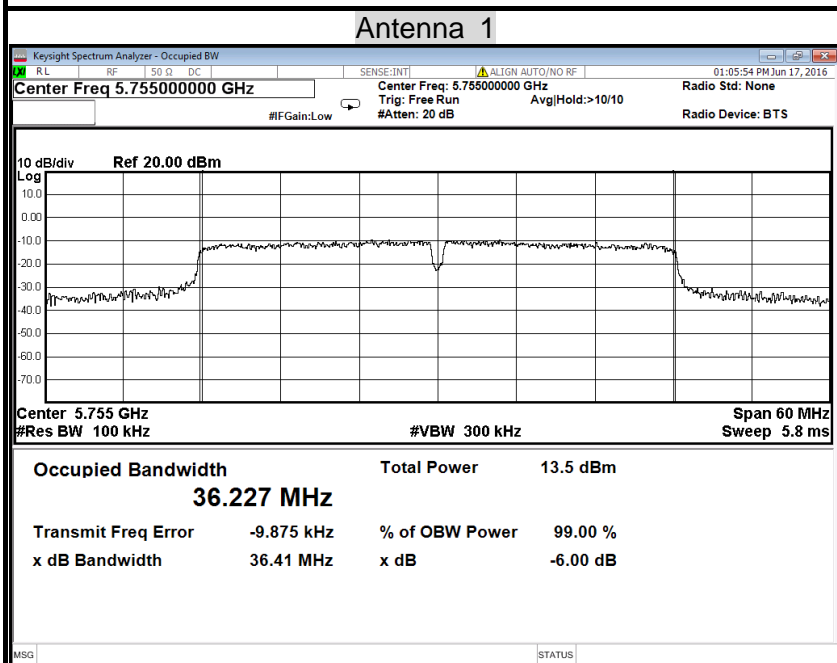
Antenna 0



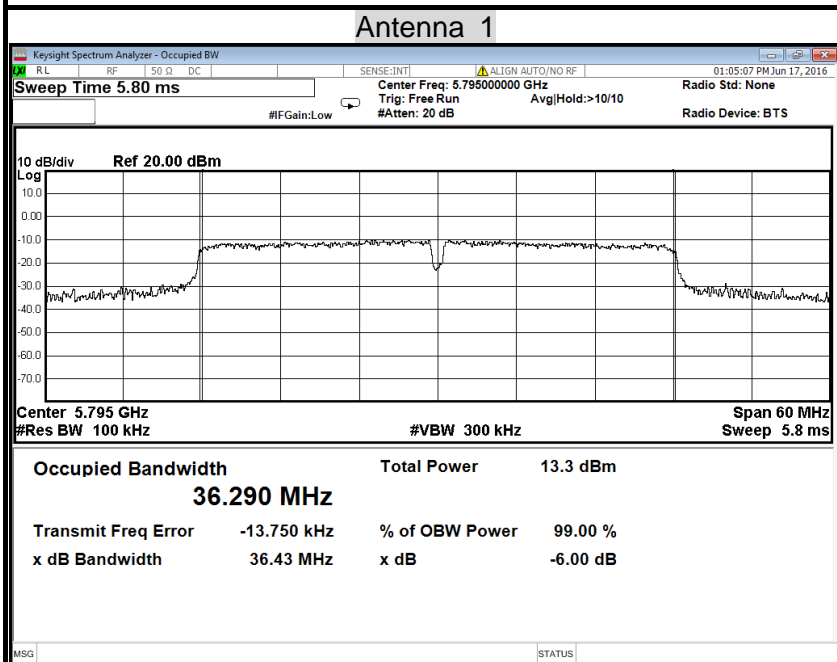


IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz

6dB Bandwidth (CH Low)



6dB Bandwidth (CH High)

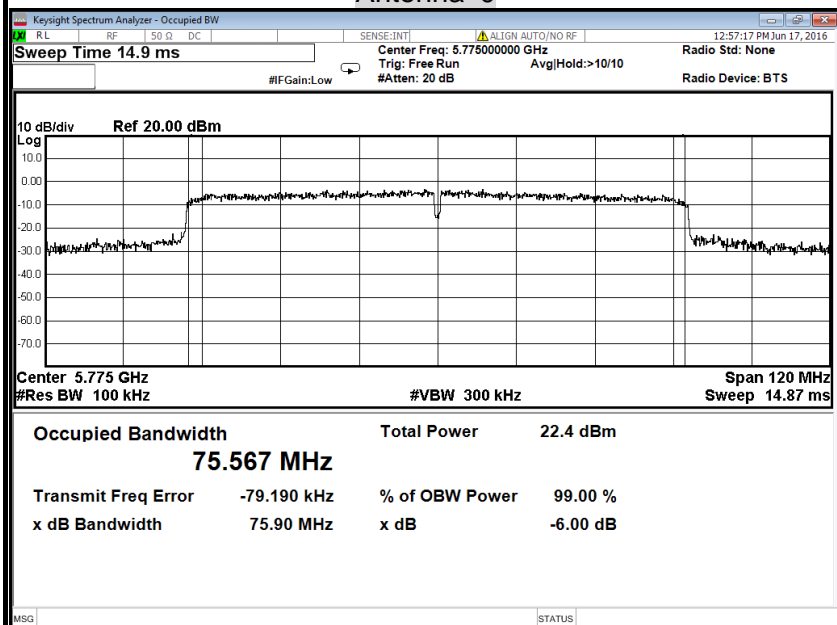




IEEE 802.11ac 80 MHz mode / 5775MHz

6dB Bandwidth

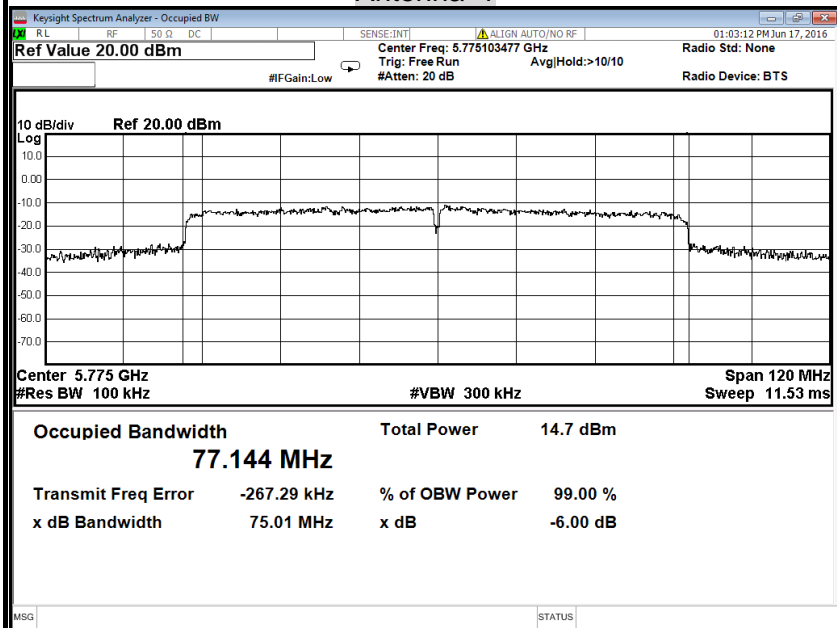
Antenna 0



IEEE 802.11ac 80 MHz mode / 5775MHz

6dB Bandwidth

Antenna 1





## 6.3 ANTENNA GAIN

### MEASUREMENT

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal WLAN devices, the OFDM mode is used.

### MEASUREMENT PARAMETERS

Measurement parameter	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	3 MHz
Video bandwidth	3 MHz
Trace-Mode	Max hold

### LIMITS

FCC	IC
Antenna Gain	
6 dBi	



## **TEST RESULTS**

### **IEEE 802.11a mode (Antenna 0)**

<b>T<sub>nom</sub></b>	<b>V<sub>nom</sub></b>	<b>Lowest channel 5180MHz</b>	<b>Highest channel 5320MHz</b>
Conducted power [dBm] Measured with OFDM modulation		3.33	0.75
Radiated power [dBm] Measured with OFDM modulation		3.28	2.41
Gain [dBi] Calculated		-0.05	1.66
Measurement uncertainty		$\pm 1.5$ dB (cond.) / $\pm 3$ dB (rad.)	

### **IEEE 802.11a mode (Antenna 1)**

<b>T<sub>nom</sub></b>	<b>V<sub>nom</sub></b>	<b>Lowest channel 5180MHz</b>	<b>Highest channel 5320MHz</b>
Conducted power [dBm] Measured with OFDM modulation		5.28	2.99
Radiated power [dBm] Measured with OFDM modulation		3.28	2.44
Gain [dBi] Calculated		-2.00	-0.55
Measurement uncertainty		$\pm 1.5$ dB (cond.) / $\pm 3$ dB (rad.)	



## 6.4 OUTPUT POWER

### 6.4.1 LIMIT

**According to §15.407(a)& FCC R&O FCC 14 - 30,**

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple colocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

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

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

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall



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

*Note to paragraph (a)(3): The Commission strongly recommends that parties employing U-NII devices to provide critical communications services should determine if there are any nearby Government radar systems that could affect their operation.*

**Specified Limit of the Output Power****Test mode: IEEE 802.11a mode / 5260 ~ 5320MHz**

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)		10*Log(B) (dB)		11 + 10*Log(B) (dBm)		Maximum Conducted Output Power Limit (dBm)	
		Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1
Low	5260	19.98	19.86	13.01	12.98	24.01	23.98	24.00	23.98
Mid	5300	19.68	19.88	12.94	12.98	23.94	23.98	23.94	23.98
High	5320	19.97	19.76	13.00	12.96	24.00	23.96	24.00	23.96

**Test mode: IEEE 802.11a mode / 5500 ~ 5700MHz**

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)		10*Log(B) (dB)		11 + 10*Log(B) (dBm)		Maximum Conducted Output Power Limit (dBm)	
		Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1
Low	5500	19.83	19.90	12.97	12.99	23.97	23.99	23.97	23.99
Mid	5580	19.84	19.87	12.97	12.98	23.97	23.98	23.97	23.98
High	5700	19.78	19.81	12.96	12.97	23.96	23.97	23.96	23.97

**Test mode: IEEE 802.11n HT 20 MHz mode / 5260 ~ 5320MHz**

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)		10*Log(B) (dB)		11 + 10*Log(B) (dBm)		Maximum Conducted Output Power Limit (dBm)	
		Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1
Low	5260	19.98	20.29	13.01	13.07	24.01	24.07	24.00	24.00
Mid	5300	19.66	20.30	12.94	13.07	23.94	24.07	23.94	24.00
High	5320	19.90	20.32	12.99	13.08	23.99	24.08	23.99	24.00

**Test mode: IEEE 802.11n HT 20 MHz mode / 5500 ~ 5700MHz**

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)		10*Log(B) (dB)		11 + 10*Log(B) (dBm)		Maximum Conducted Output Power Limit (dBm)	
		Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1
Low	5500	19.79	20.34	12.96	13.08	23.96	24.08	23.96	24.00
Mid	5580	19.88	20.39	12.98	13.09	23.98	24.09	23.98	24.00
High	5700	19.84	20.35	12.98	13.08	23.98	24.08	23.98	24.00



**IEEE 802.11n HT 40 MHz mode / 5270 ~ 5310MHz**

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)		10*Log(B) (dB)		11 + 10*Log(B) (dBm)		Maximum Conducted Output Power Limit (dBm)	
		Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1
Low	5270	39.58	39.56	15.97	15.97	26.97	26.97	24.00	24.00
High	5310	39.50	39.54	15.97	15.97	26.97	26.97	24.00	24.00

**IEEE 802.11n HT 40 MHz mode / 5510 ~ 5670MHz**

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)		10*Log(B) (dB)		11 + 10*Log(B) (dBm)		Maximum Conducted Output Power Limit (dBm)	
		Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1
Low	5510	39.66	39.52	15.98	15.97	26.98	26.97	24.00	24.00
Mid	5550	39.61	39.57	15.98	15.97	26.98	26.97	24.00	24.00
High	5670	39.54	39.53	15.97	15.97	26.97	26.97	24.00	24.00

**IEEE 802.11ac 80 mode / 5290MHz**

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)		10*Log(B) (dB)		11 + 10*Log(B) (dBm)		Maximum Conducted Output Power Limit (dBm)	
		Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1
	5290	80.04	80.00	16.00	19.03	30.03	30.03	24.00	24.00

**IEEE 802.11ac 80 mode / 5530MHz**

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)		10*Log(B) (dB)		11 + 10*Log(B) (dBm)		Maximum Conducted Output Power Limit (dBm)	
		Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1	Antenna 0	Antenna 1
	5530	79.81	79.92	16.00	19.03	30.02	30.03	24.00	24.00



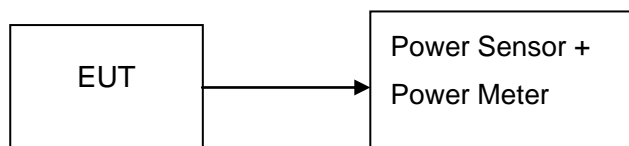
#### 6.4.2 MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Power Meter	Anritsu	ML2495A	1204003	02/21/2016	02/20/2017
Power Sensor	Anritsu	MA2411B	1126150	02/21/2016	02/20/2017

**Remark:** Each piece of equipment is scheduled for calibration once a year.

#### 6.4.3 TEST CONFIGURATIONS

The EUT was connected to a spectrum analyzer through a 50 $\Omega$  RF cable.



#### 6.4.4 TEST PROCEDURE

Set span to encompass the entire emission bandwidth (EBW) of the signal.

Set RBW = 1 MHz / Set VBW = 3 MHz.

Use sample detector mode if bin width (i.e., span/number of points in spectrum display) < 0.5 RBW. Otherwise use peak detector mode. Use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to "free run". Trace average 100 traces in power averaging mode. Compute power by integrating the spectrum across the 26 dB EBW of the signal. The integration can be performed using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be summed can be obtained by averaging, in linear power terms, power levels in each frequency bin across the 1 MHz.

#### 6.4.5 TEST RESULTS

*No non-compliance noted*

**6.4.6 TEST DATA****IEEE 802.11a mode / 5180 ~ 5240MHz**

Channel	Frequency (MHz)	Output Power (dBm)		Output Power (W)		Limit (dBm)	Result
		Antenna 0	Antenna 1	Antenna 0	Antenna 1		
Low	5180	16.34	18.27	0.04305	0.06714	24.00	PASS
Mid	5200	16.26	18.17	0.04227	0.06561		PASS
High	5240	16.12	18.05	0.04093	0.06383		PASS

**IEEE 802.11a mode / 5260~ 5320MHz**

Channel	Frequency (MHz)	Output Power (dBm)		Output Power (W)		Limit (dBm)	Result
		Antenna 0	Antenna 1	Antenna 0	Antenna 1		
Low	5260	13.74	17.84	0.02366	0.06081	23.94	PASS
Mid	5300	16.29	19.13	0.04256	0.08185		PASS
High	5320	13.75	15.95	0.02371	0.03936		PASS

**IEEE 802.11a mode / 5500 ~ 5700MHz**

Channel	Frequency (MHz)	Output Power (dBm)		Output Power (W)		Limit (dBm)	Result
		Antenna 0	Antenna 1	Antenna 0	Antenna 1		
Low	5500	17.68	16.54	0.05861	0.04508	23.96	PASS
Mid	5580	15.45	16.57	0.03508	0.04539		PASS
High	5700	15.52	16.18	0.03565	0.04150		PASS

**IEEE 802.11a mode / 5745 ~ 5825MHz**

Channel	Frequency (MHz)	Output Power (dBm)		Output Power (W)		Limit (dBm)	Result
		Antenna 0	Antenna 1	Antenna 0	Antenna 1		
Low	5745	18.02	16.98	0.06339	0.04989	30.00	PASS
Mid	5785	18.08	19.14	0.06427	0.08204		PASS
High	5825	14.67	16.22	0.02931	0.04188		PASS

**IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz**

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Limit (dBm)	Result
		Antenna 0	Antenna 1	Total			
Low	5180	16.50	18.07	20.37	0.10879	24.00	PASS
Mid	5200	16.16	17.93	20.14	0.10339		PASS
High	5240	15.64	17.97	19.97	0.09931		PASS

**IEEE 802.11n HT 20 MHz mode / 5260~ 5320MHz**

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Limit (dBm)	Result
		Antenna 0	Antenna 1	Total			
Low	5260	15.62	18.61	20.38	0.10909	23.94	PASS
Mid	5300	15.93	14.98	18.49	0.07065		PASS
High	5320	16.15	18.95	20.78	0.11973		PASS

**IEEE 802.11n HT 20 MHz mode / 5500 ~ 5700MHz**

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Limit (dBm)	Result
		Antenna 0	Antenna 1	Total			
Low	5500	18.64	20.06	22.42	0.17451	23.96	PASS
Mid	5580	15.97	17.31	19.70	0.09336		PASS
High	5700	14.66	14.69	17.69	0.05869		PASS

**IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz**

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Limit (dBm)	Result
		Antenna 0	Antenna 1	Total			
Low	5745	15.44	14.91	18.19	0.06597	30.00	PASS
Mid	5785	17.34	18.45	20.94	0.12418		PASS
High	5825	14.28	15.15	17.75	0.05953		PASS

**IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz**

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Limit (dBm)	Result
		Antenna 0	Antenna 1	Total			
Low	5190	14.39	15.10	17.77	0.05984	24.00	PASS
High	5230	16.18	18.92	20.77	0.11948		PASS

**IEEE 802.11n HT 40 MHz mode / 5270 ~ 5310MHz**

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Limit (dBm)	Result
		Antenna 0	Antenna 1	Total			
Low	5270	16.76	15.41	19.15	0.08218	24.00	PASS
High	5310	16.43	15.19	18.86	0.07699		PASS

**IEEE 802.11n HT 40 MHz mode / 5510 ~ 5670MHz**

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Limit (dBm)	Result
		Antenna 0	Antenna 1	Total			
Low	5510	16.38	15.24	18.86	0.07687	24.00	PASS
Mid	5550	18.89	19.93	22.45	0.17585		PASS
High	5670	17.01	16.85	19.94	0.09865		PASS

**IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz**

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Limit (dBm)	Result
		Antenna 0	Antenna 1	Total			
Low	5755	17.70	15.56	19.77	0.09486	30.00	PASS
High	5795	15.62	15.56	18.60	0.07245		PASS

**IEEE 802.11ac 80 mode / 5210MHz**

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Limit (dBm)	Result
		Antenna 0	Antenna 1	Total			
	5210	13.77	14.09	16.94	0.04947	24.00	PASS

**IEEE 802.11ac 80 mode / 5290MHz**

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Limit (dBm)	Result
		Antenna 0	Antenna 1	Total			
	5290	14.10	14.81	17.48	0.05597	24.00	PASS

**IEEE 802.11ac 80 mode / 5530MHz**

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Limit (dBm)	Result
		Antenna 0	Antenna 1	Total			
	5530	15.61	15.41	18.52	0.07115	24.00	PASS

**IEEE 802.11ac 80 mode / 5775MHz**

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Limit (dBm)	Result
		Antenna 0	Antenna 1	Total			
	5775	15.10	16.31	18.76	0.07512	30.00	PASS



## 6.5 BAND EDGES MEASUREMENT

### 6.5.1 LIMIT

According to §15.407(b)

- (1) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.
- (2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

### 6.5.2 MEASUREMENT EQUIPMENT USED

SRadiated Emission Test Site 966 (2)					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
PSA Series Spectrum Analyzer	Agilent	E4446A	US44300399	02/21/2016	02/20/2017
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2016	02/20/2017
Amplifier	EMEC	EM330	060661	03/18/2016	03/17/2017
High Noise Amplifier	Agilent	8449B	3008A01838	02/21/2016	02/20/2017
Loop Antenna	COM-POWER	AL-130	121044	09/25/2015	09/24/2016
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/21/2016	02/20/2017
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/28/2016	02/27/2017
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/28/2016	02/27/2017
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2016	02/20/2017
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

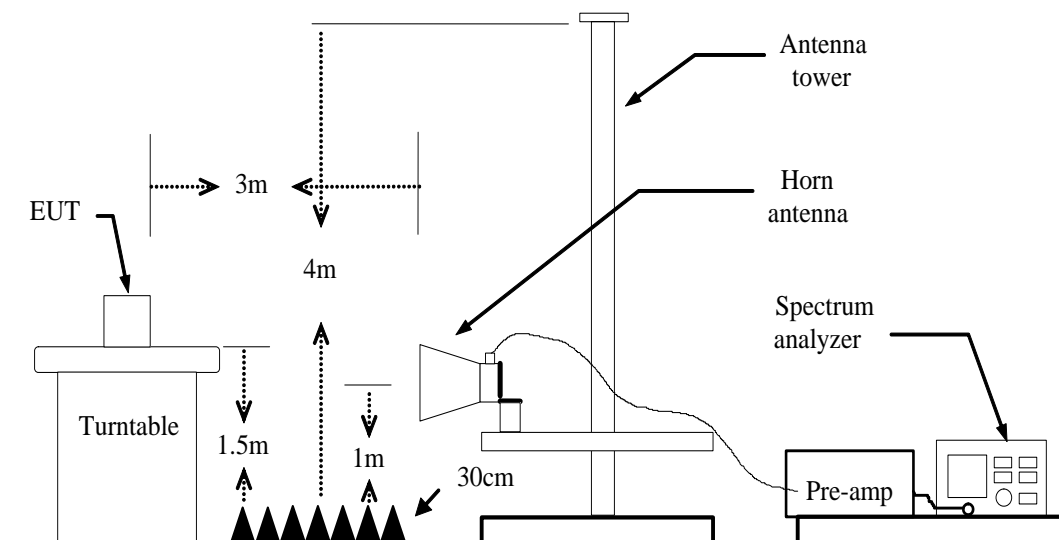
**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The FCC Site Registration number is 101879.

3. N.C.R = No Calibration Required.



### 6.5.3 TEST CONFIGURATION



### 6.5.4 TEST PROCEDURE

1. The EUT is placed on a turntable, which is 1.5m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
  - (a) PEAK: RBW=1 / VBW=3MHz / Sweep=AUTO
  - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO / Detector=Peak
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.





### 6.5.5 TEST RESULT

#### IEEE 802.11a mode / 5500 ~ 5700MHz

##### **Antenna 0:**

1. Operating Frequency: 5500-5700MHz
2. CH Low: 5500MHz, CH High: 5700MHz
3. 26dB bandwidth: CH Low: 19.832MHz, CH High: 19.781MHz
4. Frequency Range: 5490.0840MHz, 5709.8905MHz

##### **Antenna 1:**

1. Operating Frequency: 5500-5700MHz
2. CH Low: 5500MHz, CH High: 5700MHz
3. 26dB bandwidth: CH Low: 19.899MHz, CH High: 19.805MHz
4. Frequency Range: 5490.0505MHz, 5709.9025MHz

#### IEEE 802.11a mode / 5745 ~ 5825MHz

##### **Antenna 0:**

1. Operating Frequency: 5745-5825MHz
2. CH Low: 5745MHz, CH High: 5825MHz
3. 26dB bandwidth: CH Low: 19.830MHz, CH High: 19.884MHz
4. Frequency Range: 5735.0850MHz, 5834.9420MHz

##### **Antenna 1:**

1. Operating Frequency: 5745-5825MHz
2. CH Low: 5745MHz, CH High: 5825MHz
3. 26dB bandwidth: CH Low: 20.034MHz, CH High: 19.805MHz
4. Frequency Range: 5734.9830MHz, 5834.9025MHz



**IEEE 802.11n HT 20 MHz mode / 5500 ~ 5700MHz**

**Antenna 0:**

1. Operating Frequency: 5500-5700MHz
2. CH Low: 5500MHz, CH High: 5700MHz
3. 26dB bandwidth: CH Low: 19.792MHz, CH High: 19.842MHz
4. Frequency Range: 5490.1040MHz, 5709.9210MHz

**Antenna 1:**

1. Operating Frequency: 5500-5700MHz
2. CH Low: 5500MHz, CH High: 5700MHz
3. 26dB bandwidth: CH Low: 20.335MHz, CH High: 20.345MHz
4. Frequency Range: 5489.8325MHz, 5710.1725MHz

**IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz**

**Antenna 0:**

1. Operating Frequency: 5745-5825MHz
2. CH Low: 5745MHz, CH High: 5825MHz
3. 26dB bandwidth: CH Low: 19.806MHz, CH High: 19.801MHz
4. Frequency Range: 5735.0970MHz, 5834.9005MHz

**Antenna 1:**

1. Operating Frequency: 5745-5825MHz
2. CH Low: 5745MHz, CH High: 5825MHz
3. 26dB bandwidth: CH Low: 20.309MHz, CH High: 20.394MHz
4. Frequency Range: 5734.8455MHz, 5835.1970MHz



**IEEE 802.11n HT 40 MHz mode / 5510 ~ 5670MHz**

**Antenna 0:**

1. Operating Frequency: 5510-5670MHz
2. CH Low: 5510MHz, CH High: 5670MHz
3. 26dB bandwidth: CH Low: 39.664MHz, CH High: 39.543MHz
4. Frequency Range: 5490.1680MHz, 5689.7715MHz

**Antenna 1:**

1. Operating Frequency: 5510-5670MHz
2. CH Low: 5510MHz, CH High: 5670MHz
3. 26dB bandwidth: CH Low: 39.519MHz, CH High: 39.525MHz
4. Frequency Range: 5490.2405MHz, 5689.7625MHz

**IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz**

**Antenna 0:**

1. Operating Frequency: 5755-5795MHz
2. CH Low: 5755MHz, CH High: 5795MHz
3. 26dB bandwidth: CH Low: 39.582MHz, CH High: 39.739MHz
4. Frequency Range: 5735.2090MHz, 5814.8695MHz

**Antenna 1:**

1. Operating Frequency: 5755-5795MHz
2. CH Low: 5755MHz, CH High: 5795MHz
3. 26dB bandwidth: CH Low: 39.561MHz, CH High: 39.502MHz
4. Frequency Range: 5735.2195MHz, 5814.7510MHz



**IEEE 802.11ac 80 mode / 5530MHz**

**Antenna 0:**

1. Operating Frequency: 5530MHz
2. CH: 5530MHz
3. 26dB bandwidth: CH: 79.807MHz
4. Frequency Range: 5490.0965MHz, 5569.9035MHz

**Antenna 1:**

1. Operating Frequency: 5530MHz
2. CH: 5530MHz
3. 26dB bandwidth: CH: 79.921MHz
4. Frequency Range: 5490.0395MHz, 5569.9605MHz

**IEEE 802.11ac 80 mode / 5775MHz**

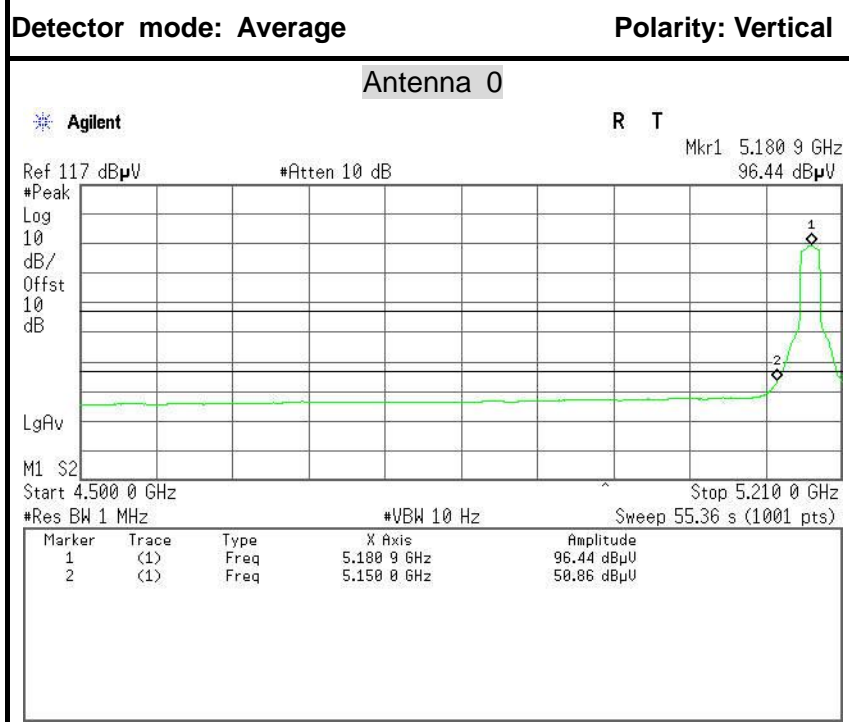
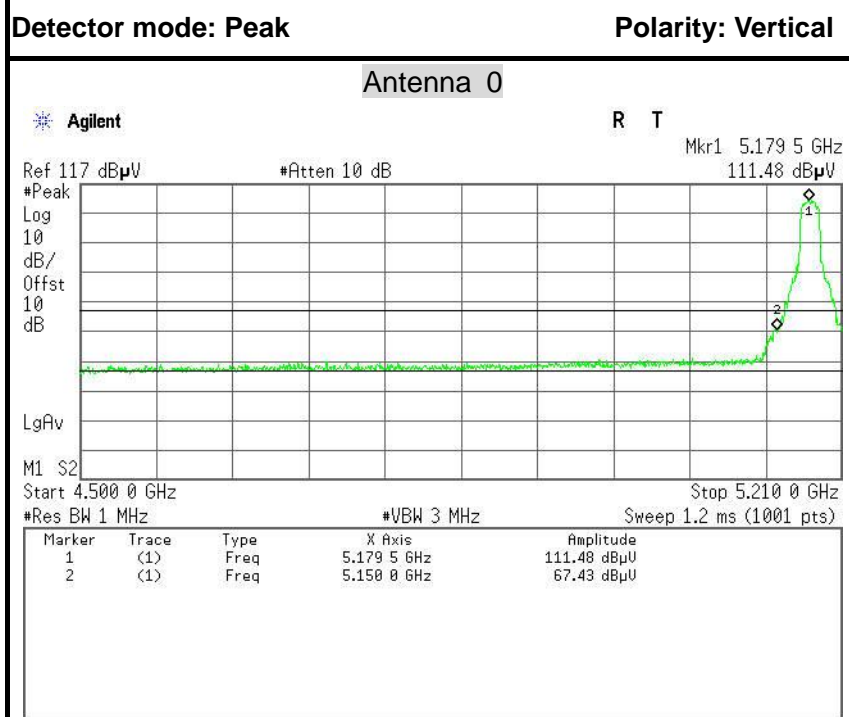
**Antenna 0:**

1. Operating Frequency: 5775MHz
2. CH: 5775MHz
3. 26dB bandwidth: CH: 79.992MHz
4. Frequency Range: 5735.0040MHz, 5814.9960MHz

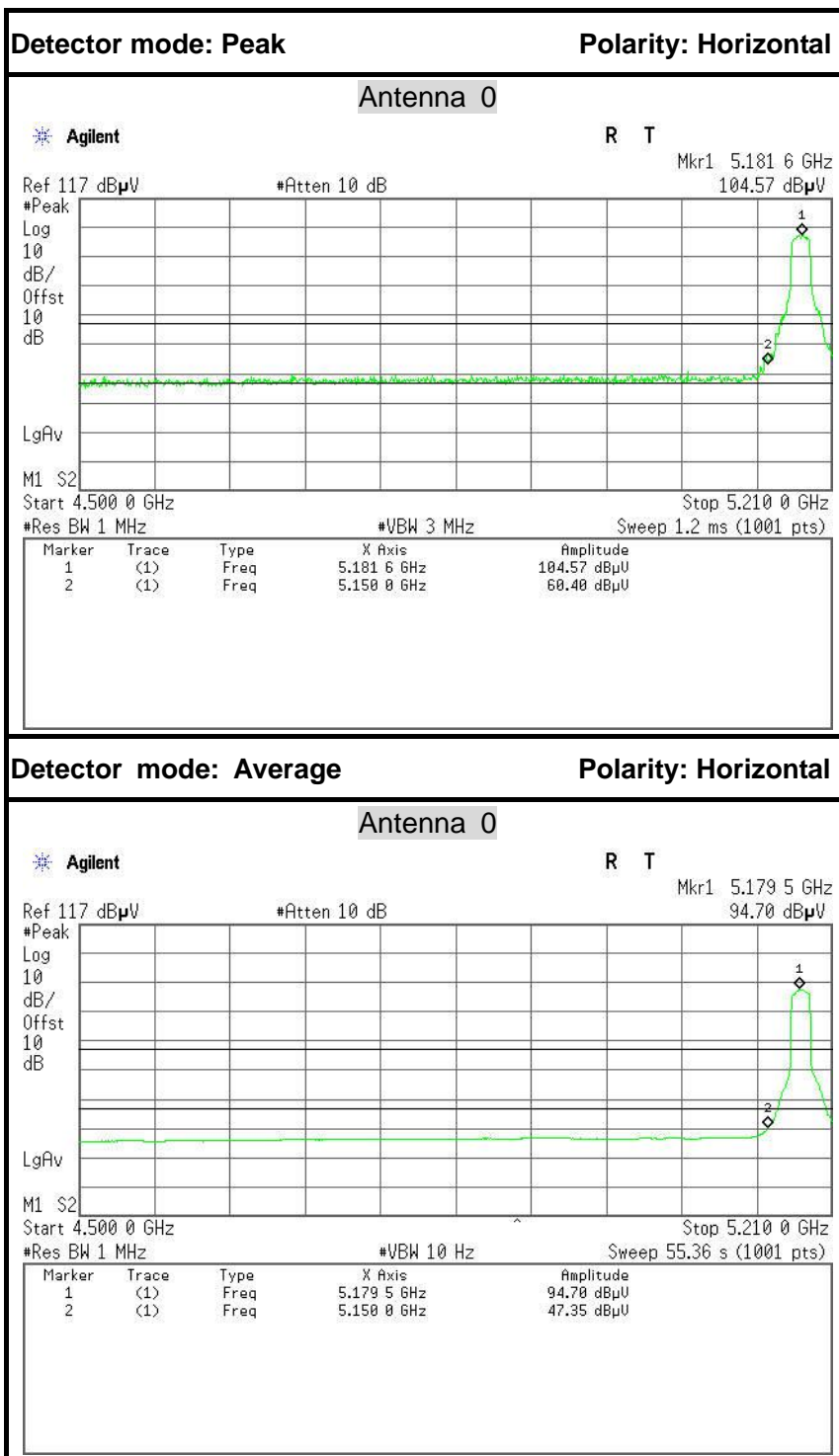
**Antenna 1:**

1. Operating Frequency: 5775MHz
2. CH: 5775MHz
3. 26dB bandwidth: CH: 79.976MHz
4. Frequency Range: 5735.0120MHz, 5814.9880MHz

Because the mentioned conditions, the test is not applicable.

**Test Plot****IEEE 802.11a mode / 5180MHz**

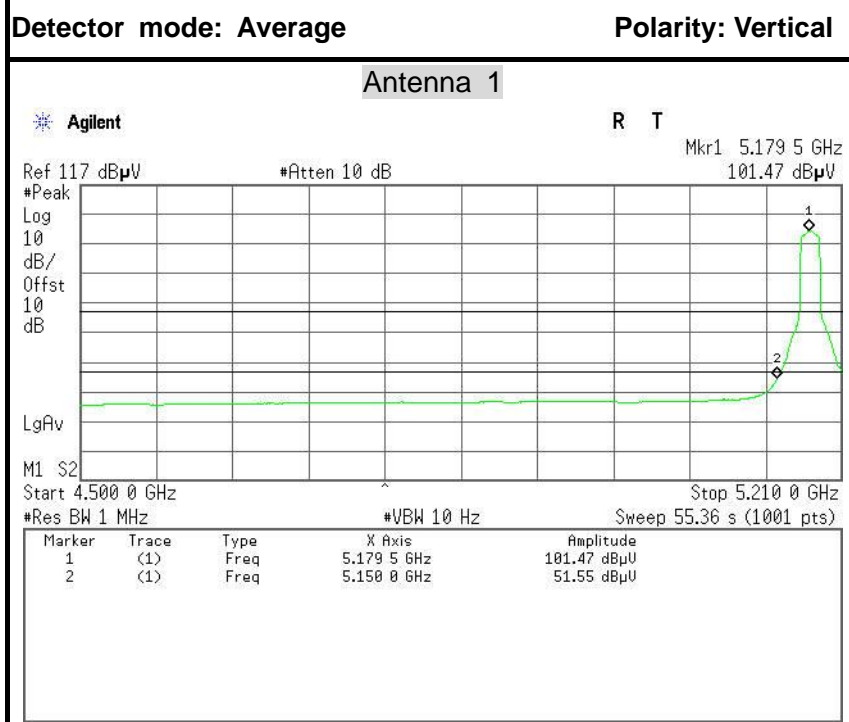
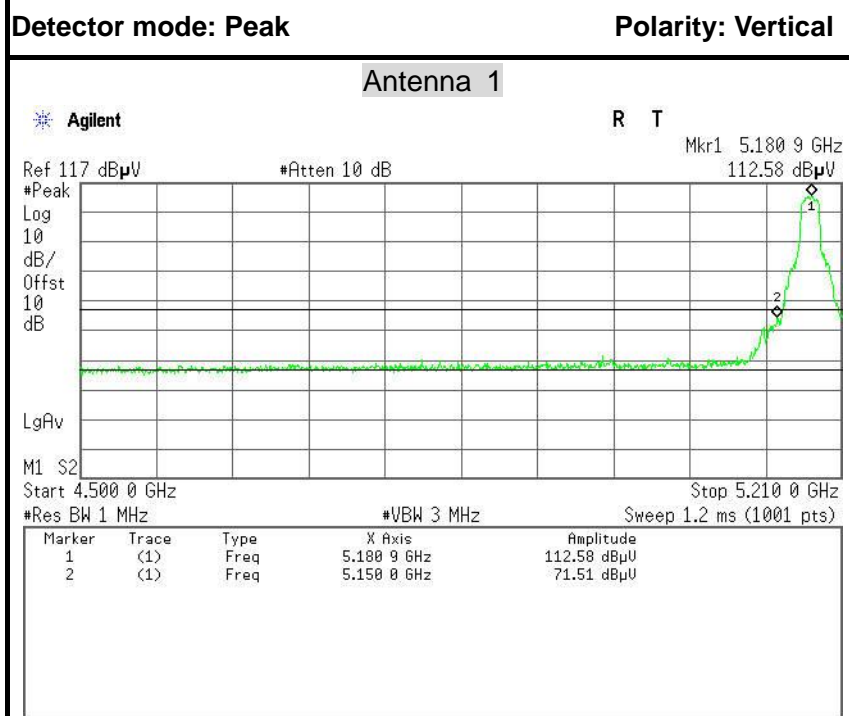
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	63.03	5.60	57.43	74.00	-16.57	Peak	Vertical
2	5150.0000	56.46	5.60	50.86	54.00	-3.14	Average	Vertical



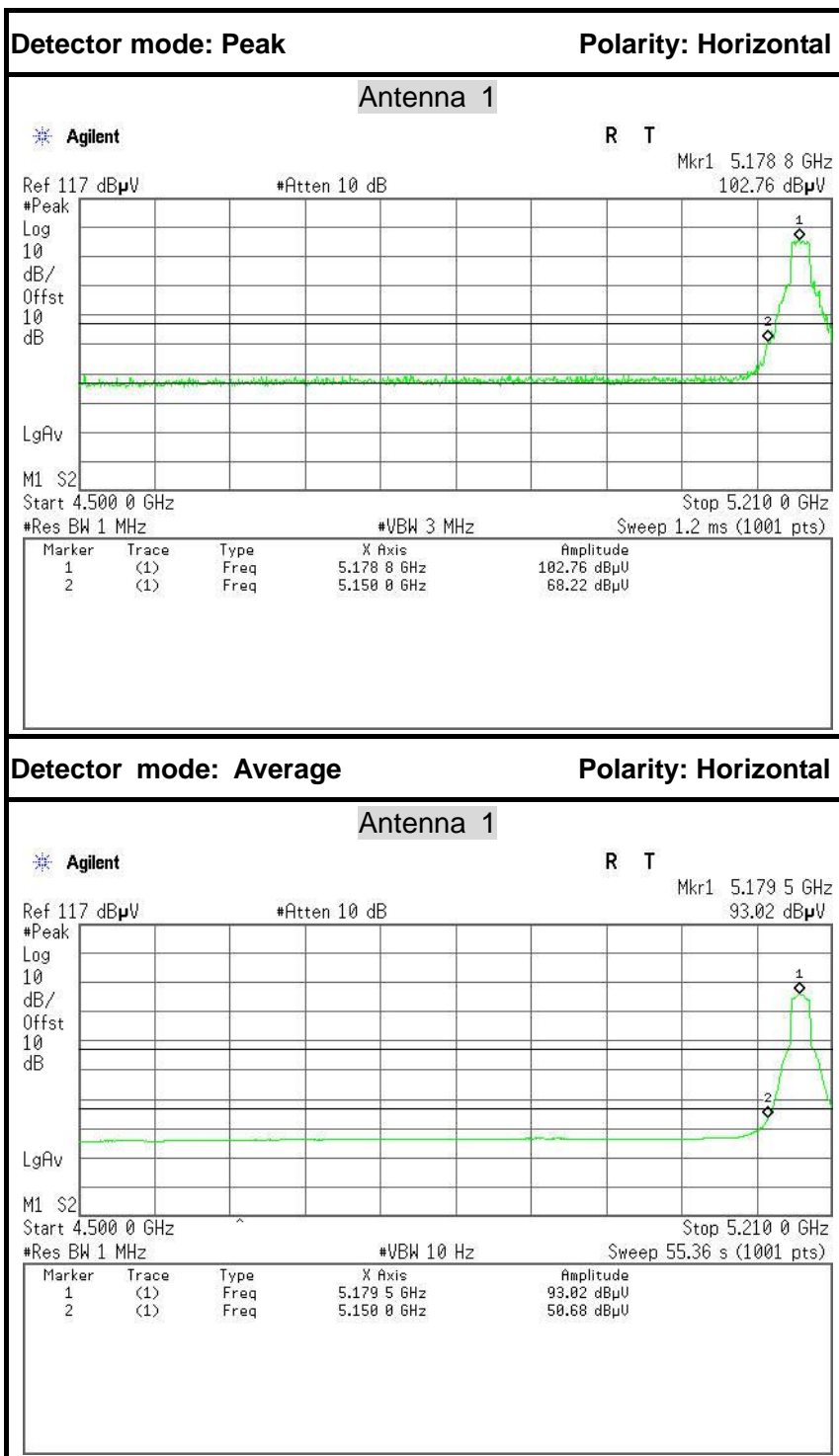
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	66.00	5.60	60.40	74.00	-13.60	Peak	Horizontal
2	5150.0000	52.95	5.60	47.35	54.00	-6.65	Average	Horizontal



## IEEE 802.11a mode / 5180MHz



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	77.11	5.60	71.51	74.00	-2.49	Peak	Vertical
2	5150.0000	57.15	5.60	51.55	54.00	-2.45	Average	Vertical

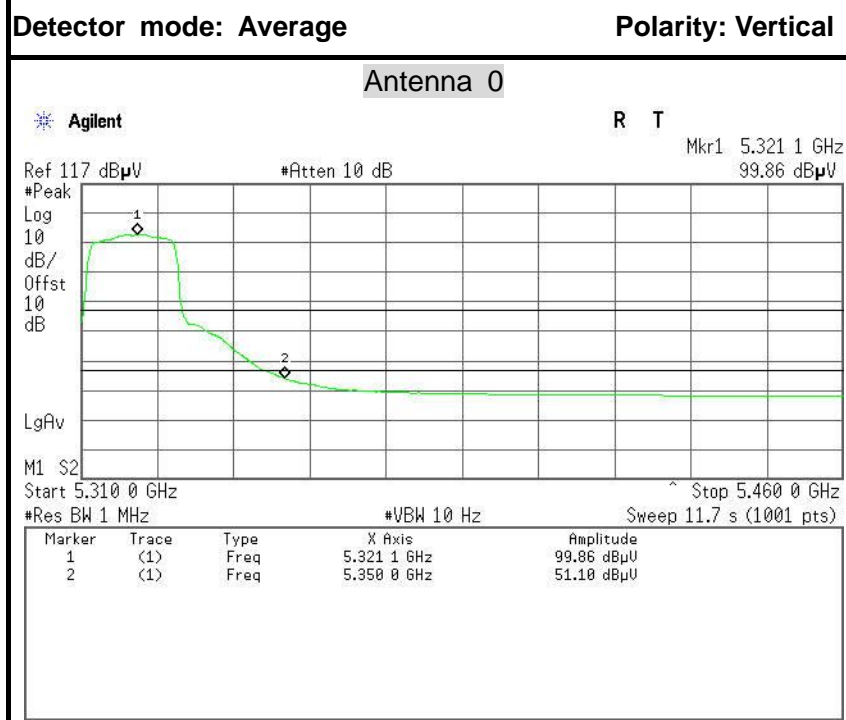
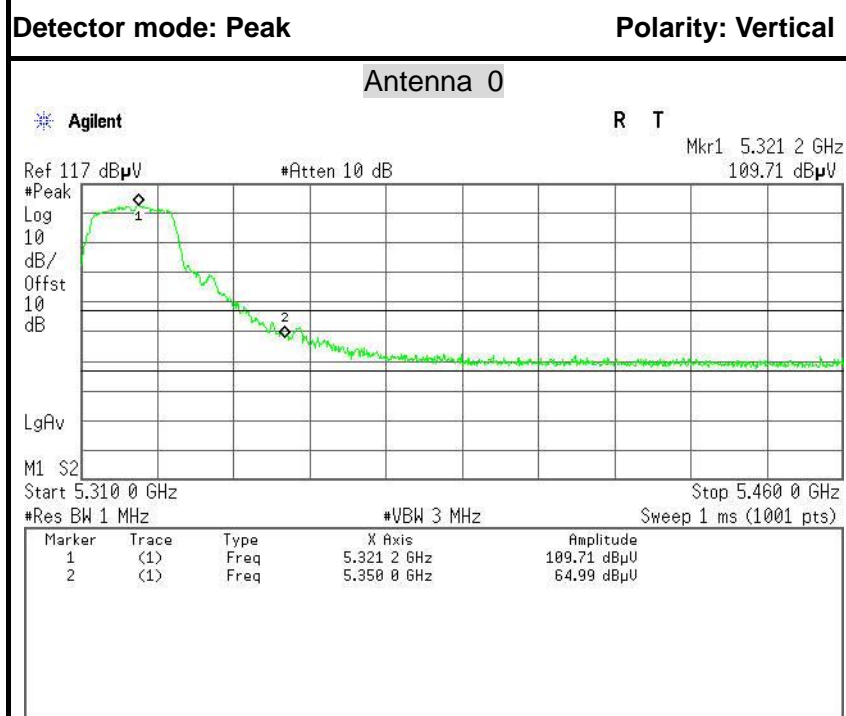


No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	73.82	5.60	68.22	74.00	-5.78	Peak	Horizontal
2	5150.0000	56.28	5.60	50.68	54.00	-3.32	Average	Horizontal

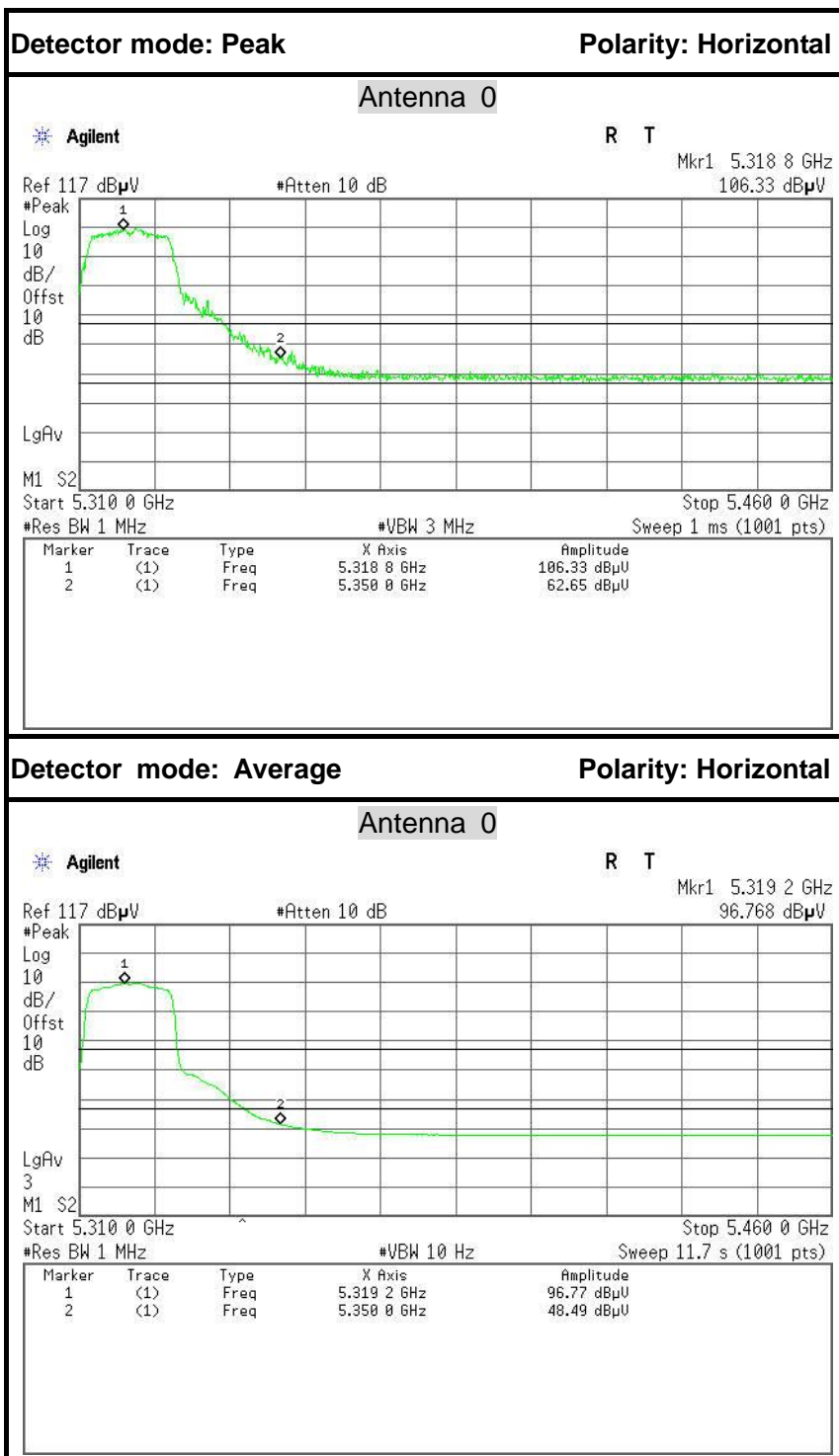




## IEEE 802.11a mode / 5320MHz



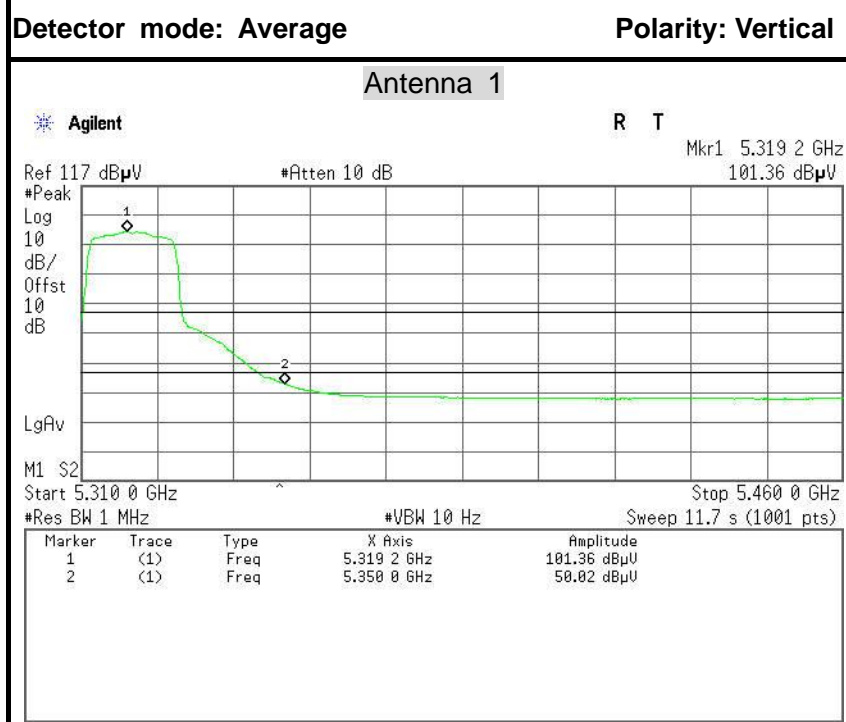
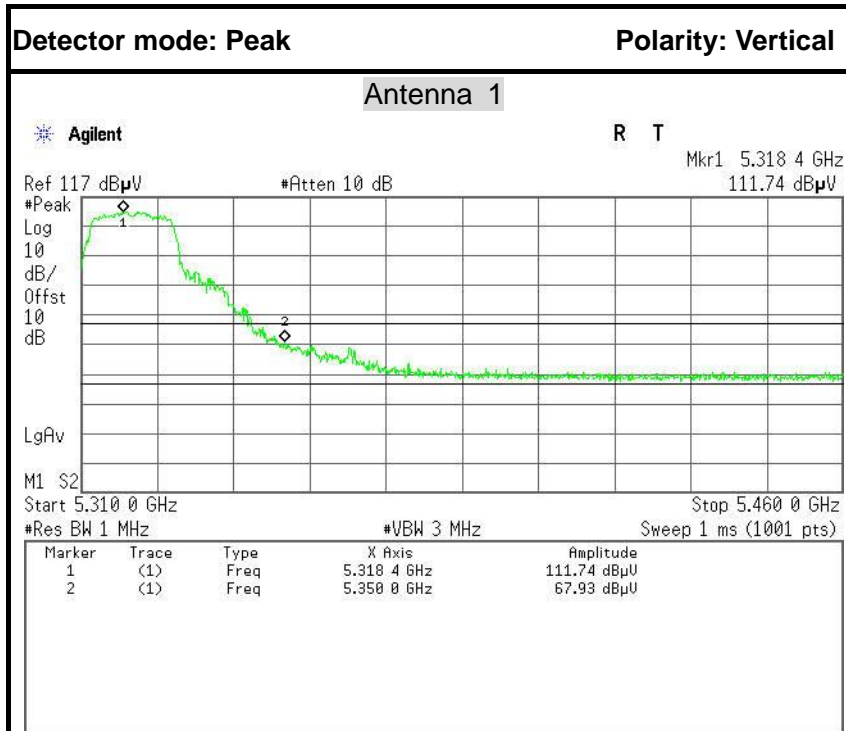
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	70.59	5.60	64.99	74.00	-9.01	Peak	Vertical
2	5350.0000	56.70	5.60	51.10	54.00	-2.90	Average	Vertical



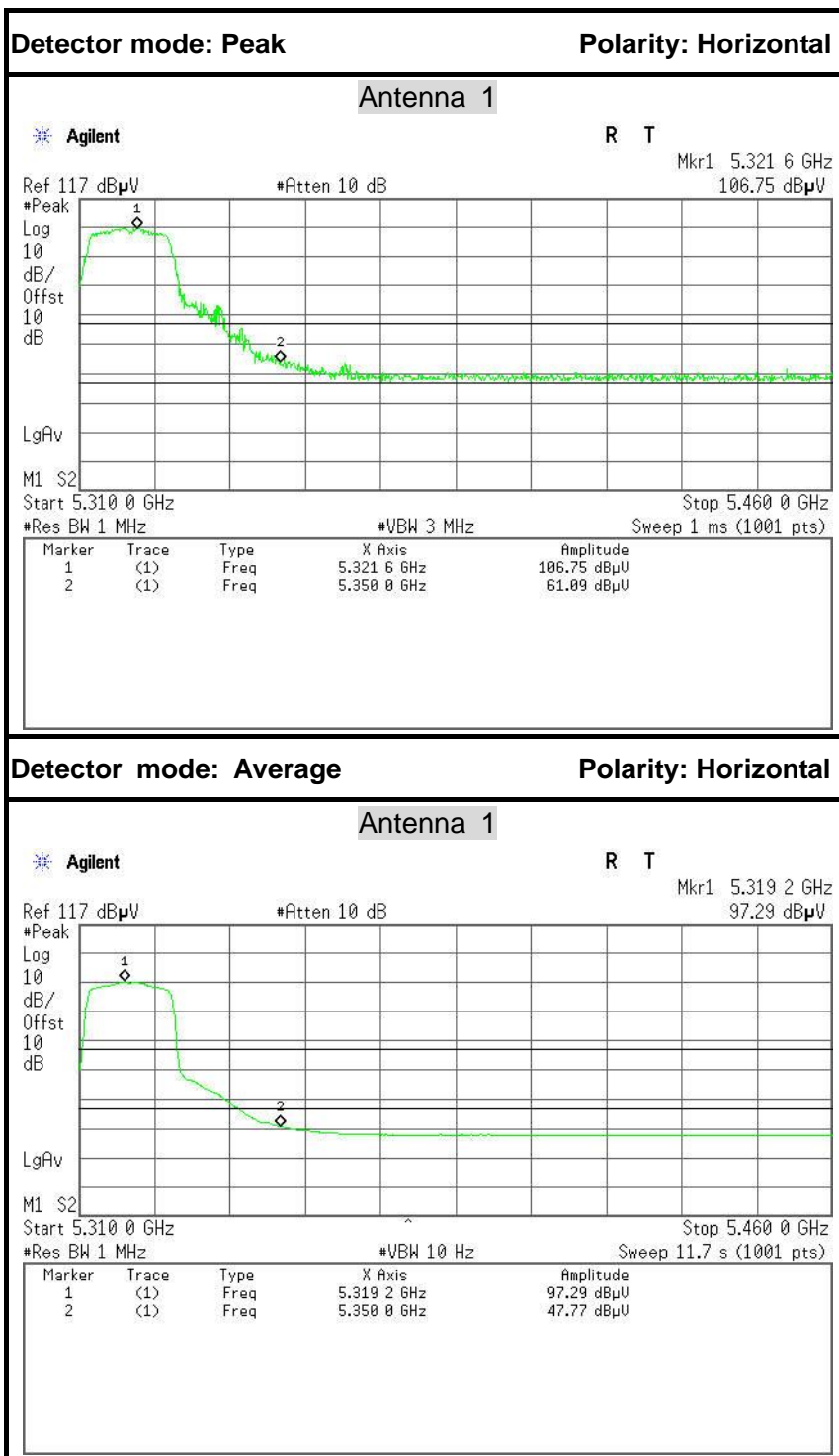
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	68.25	5.60	62.65	74.00	-11.35	Peak	Horizontal
2	5350.0000	54.09	5.60	48.49	54.00	-5.51	Average	Horizontal



IEEE 802.11a mode / 5320MHz



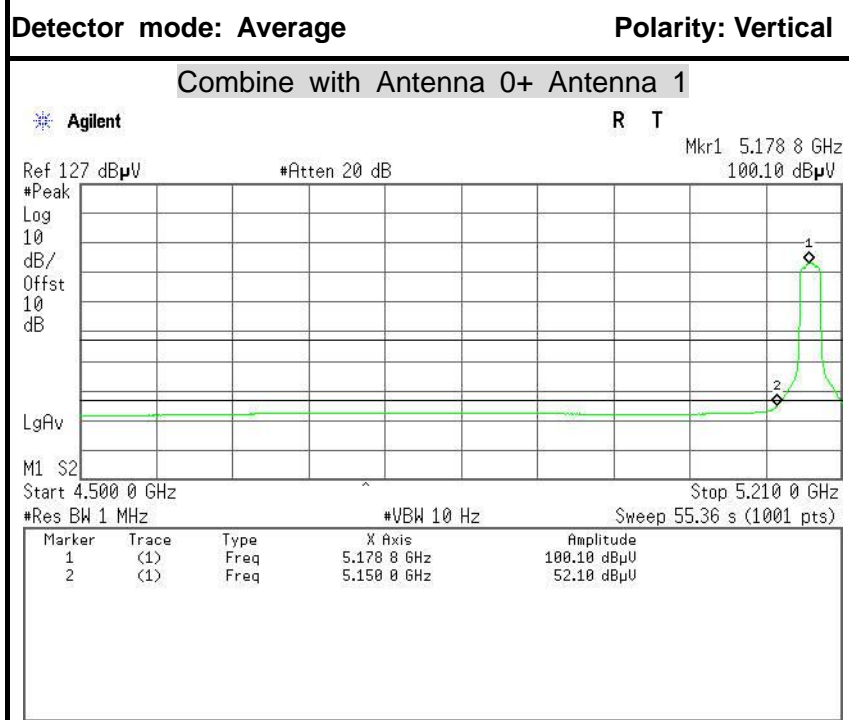
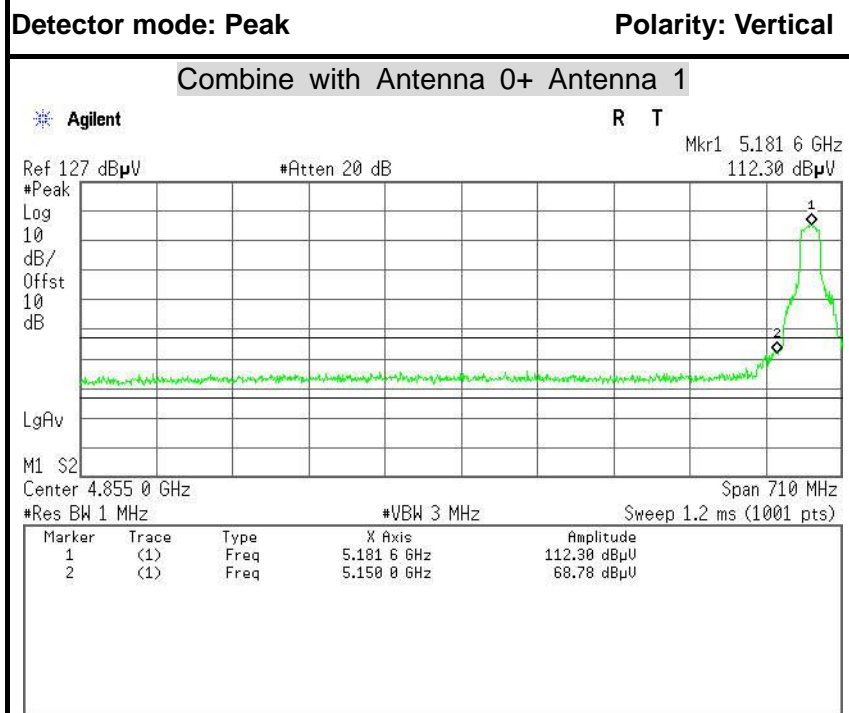
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	73.53	5.60	67.93	74.00	-6.07	Peak	Vertical
2	5350.0000	55.62	5.60	50.02	54.00	-3.98	Average	Vertical



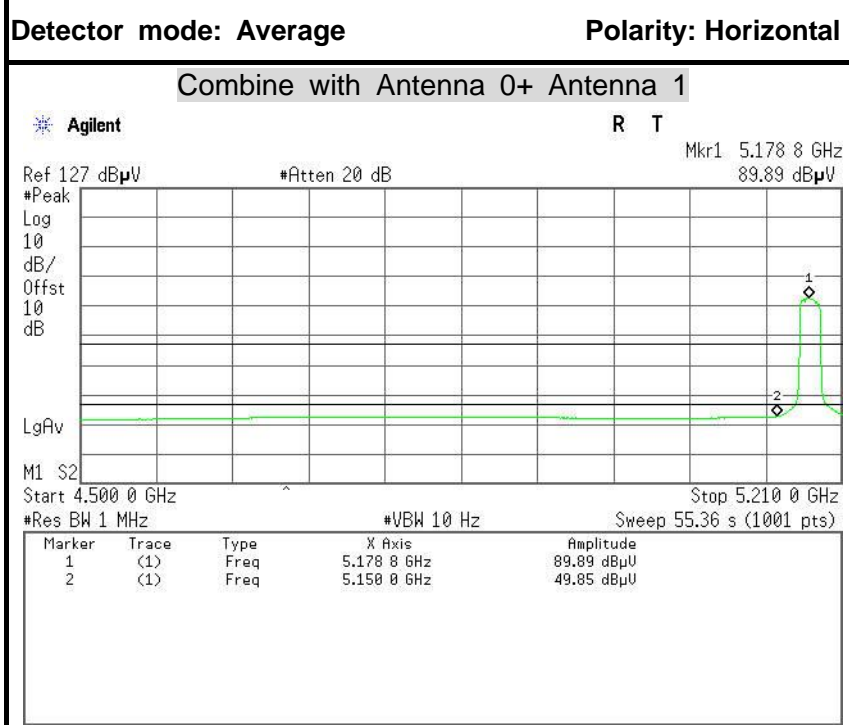
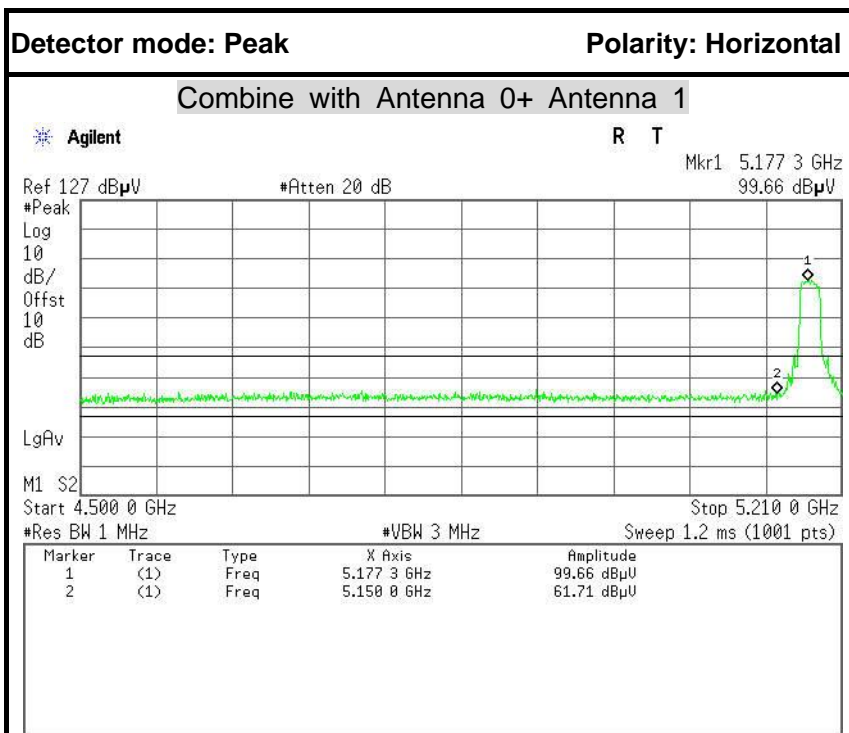
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	66.69	5.60	61.09	74.00	-12.91	Peak	Horizontal
2	5350.0000	53.37	5.60	47.77	54.00	-6.23	Average	Horizontal



## IEEE 802.11n HT 20 MHz mode / 5180 MHz



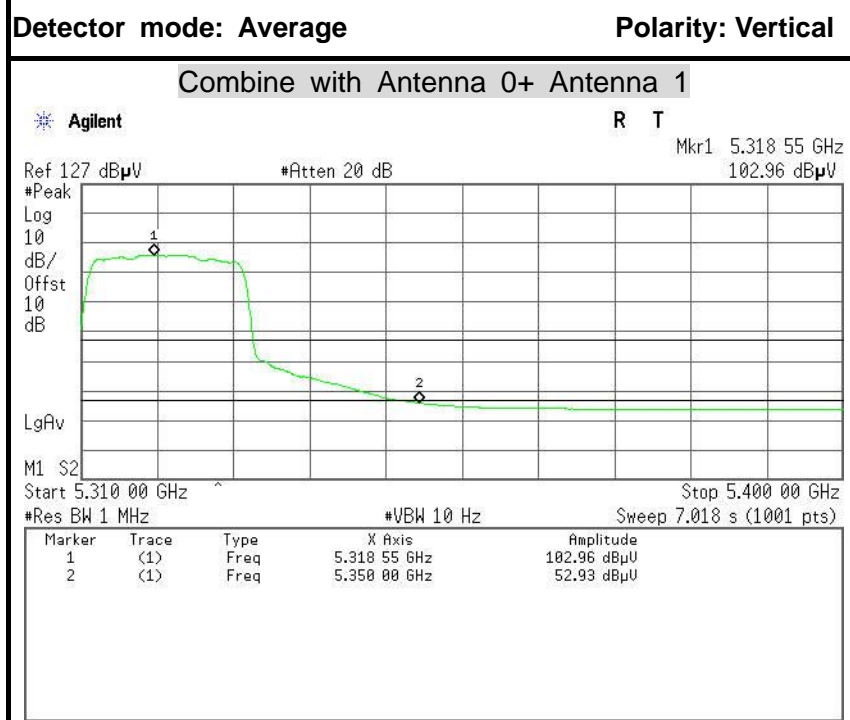
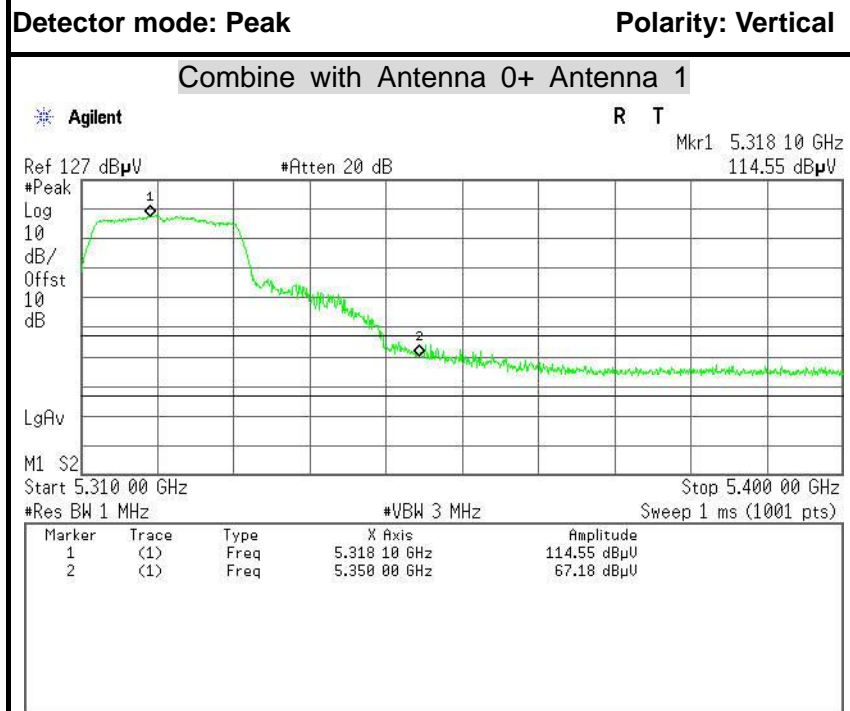
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	74.38	5.60	68.78	74.00	-5.22	Peak	Vertical
2	5150.0000	57.70	5.60	52.10	54.00	-1.90	Average	Vertical



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	67.31	5.60	61.71	74.00	-12.29	Peak	Horizontal
2	5150.0000	55.45	5.60	49.85	54.00	-4.15	Average	Horizontal

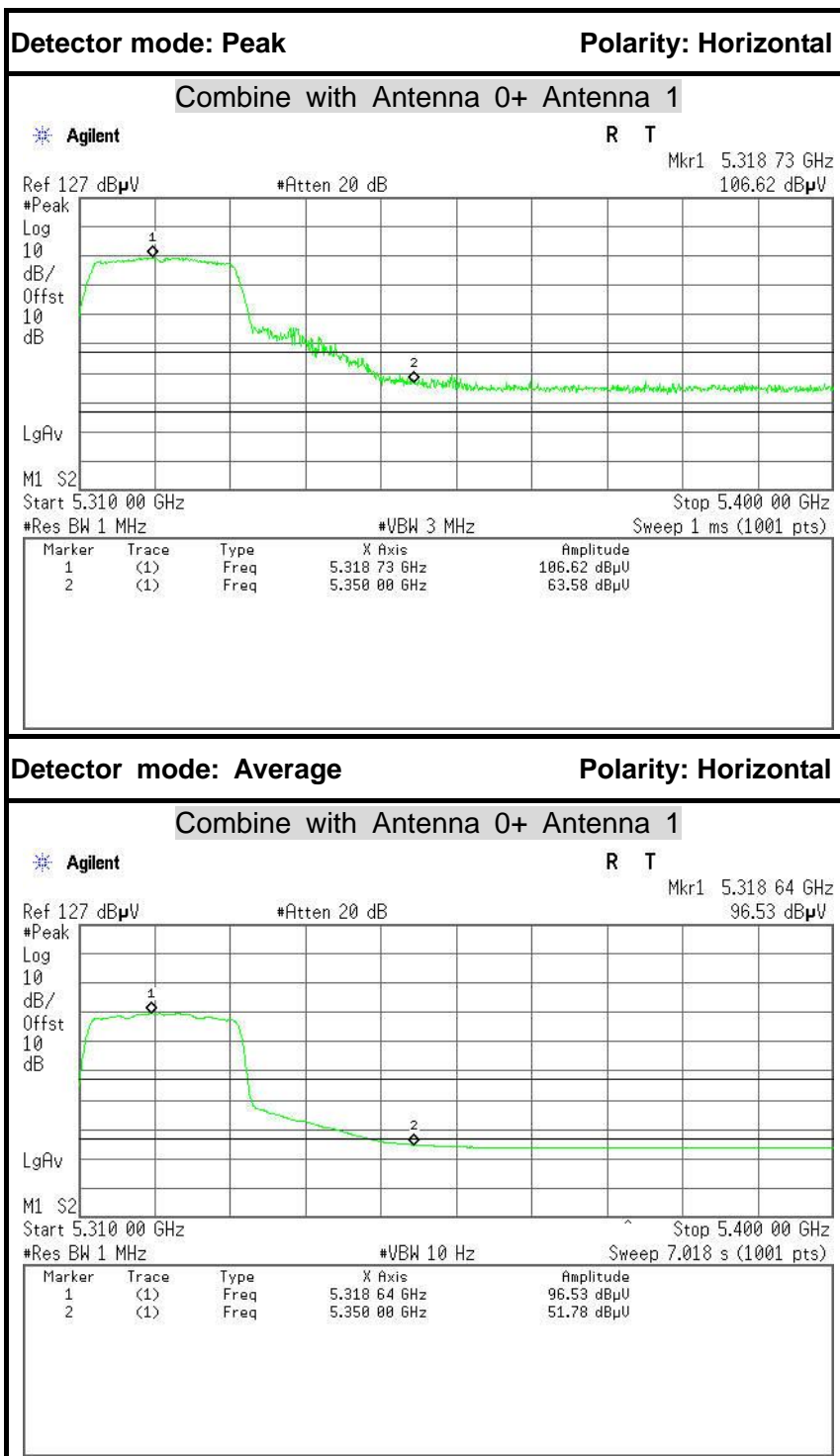


IEEE 802.11n HT 20 MHz mode / 5320 MHz



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	72.78	5.60	67.18	74.00	-6.82	Peak	Vertical
2	5350.0000	58.53	5.60	52.93	54.00	-1.07	Average	Vertical



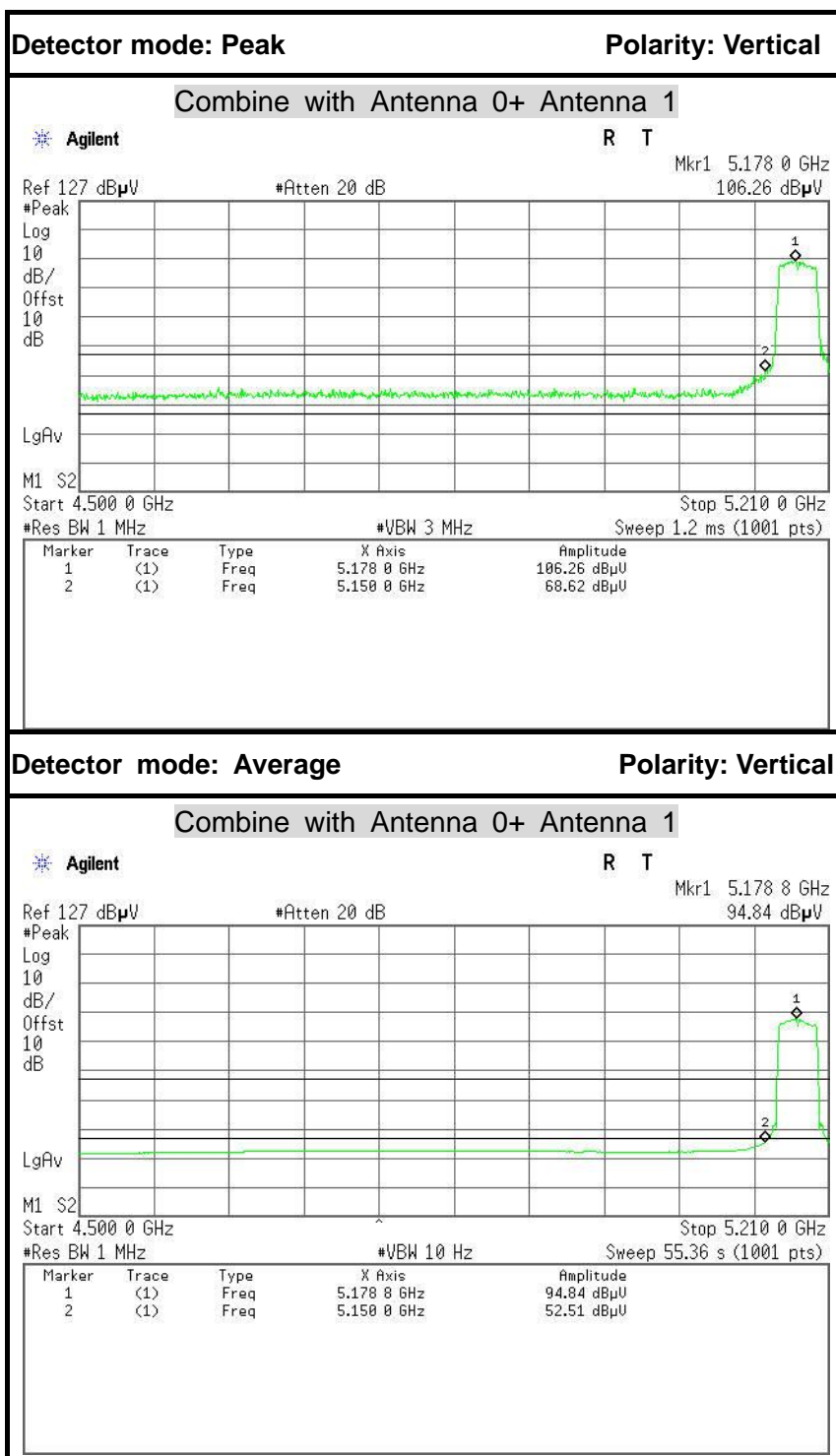


No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	69.18	5.60	63.58	74.00	-10.42	Peak	Horizontal
2	5350.0000	57.38	5.60	51.78	54.00	-2.22	Average	Horizontal

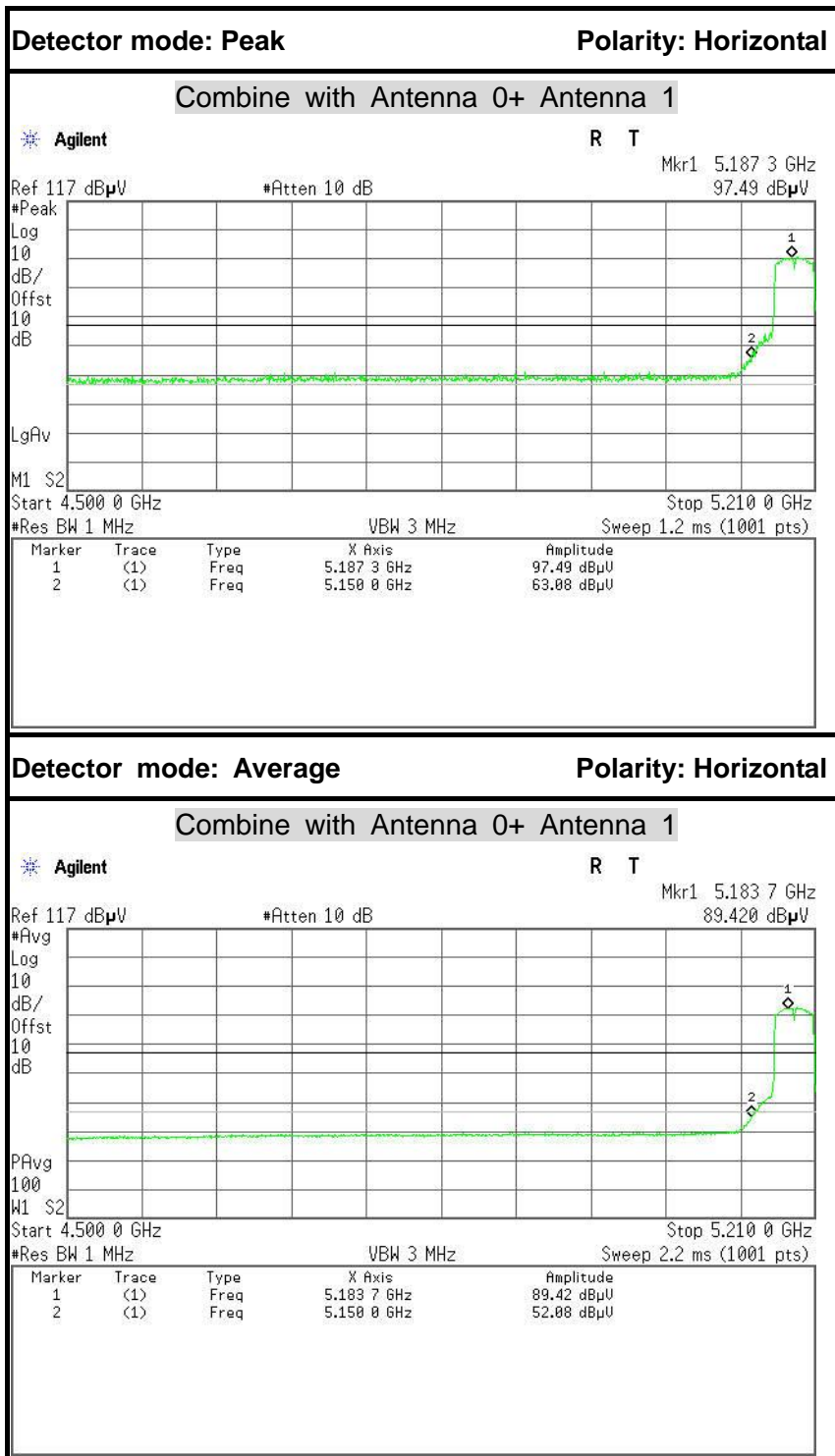




## IEEE 802.11n HT 40 MHz mode / 5190 MHz



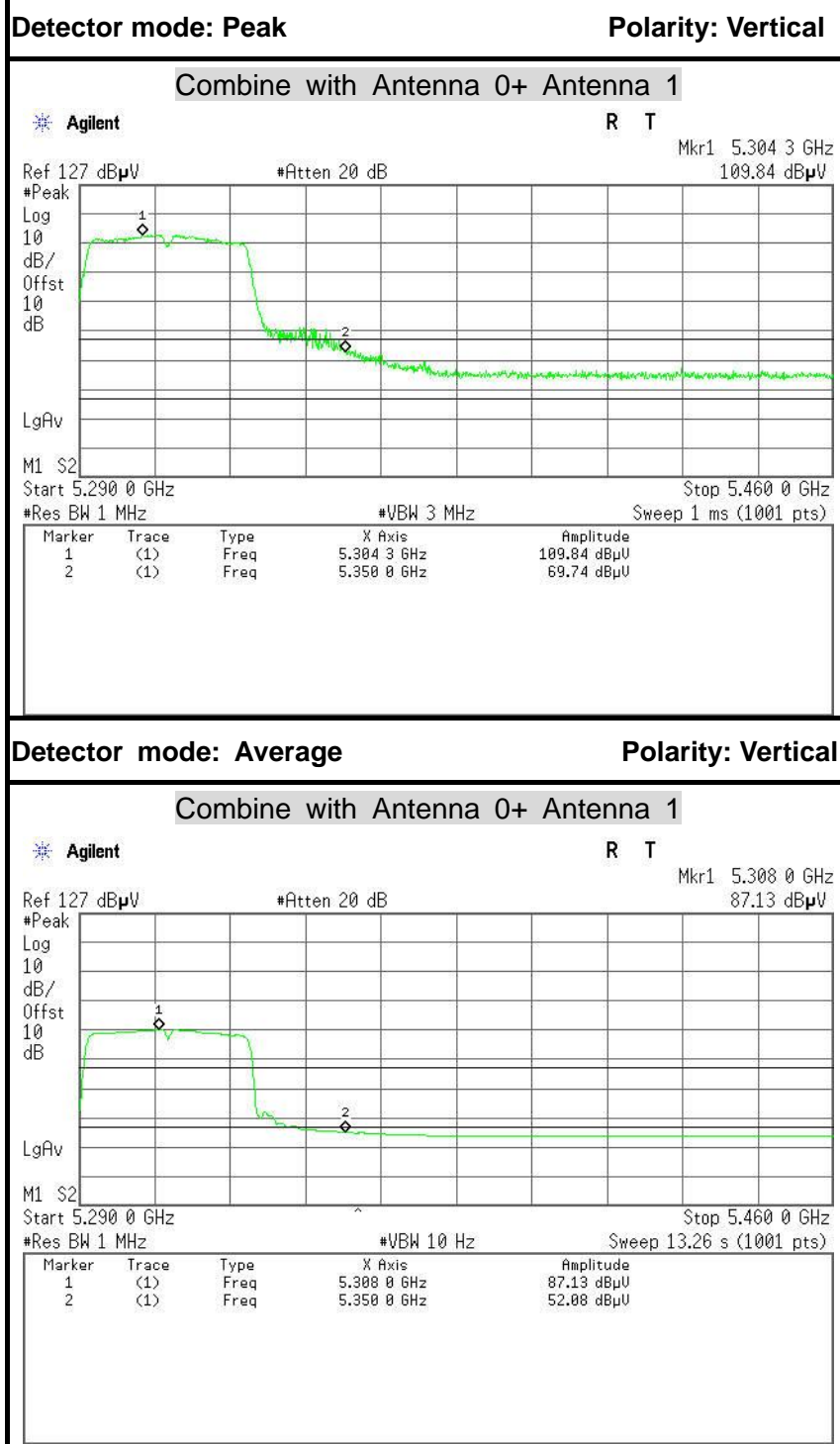
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	74.22	5.60	68.62	74.00	-5.38	Peak	Vertical
2	5150.0000	58.11	5.60	52.51	54.00	-1.49	Average	Vertical



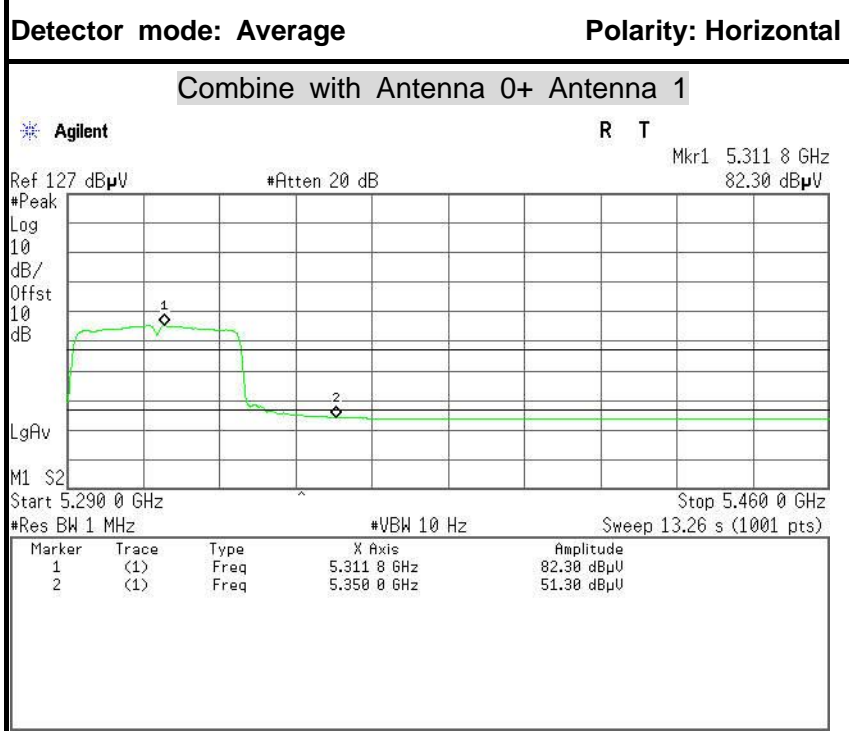
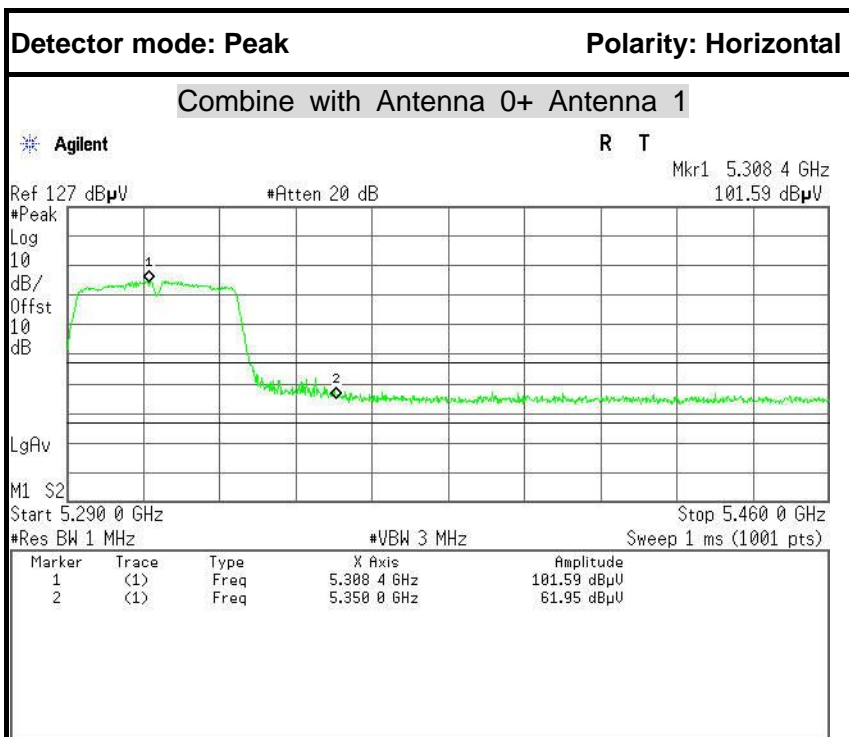
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	68.68	5.60	63.08	74.00	-10.92	Peak	Horizontal
2	5150.0000	57.68	5.60	52.08	54.00	-1.92	Average	Horizontal



## IEEE 802.11n HT 40 MHz mode / 5310 MHz



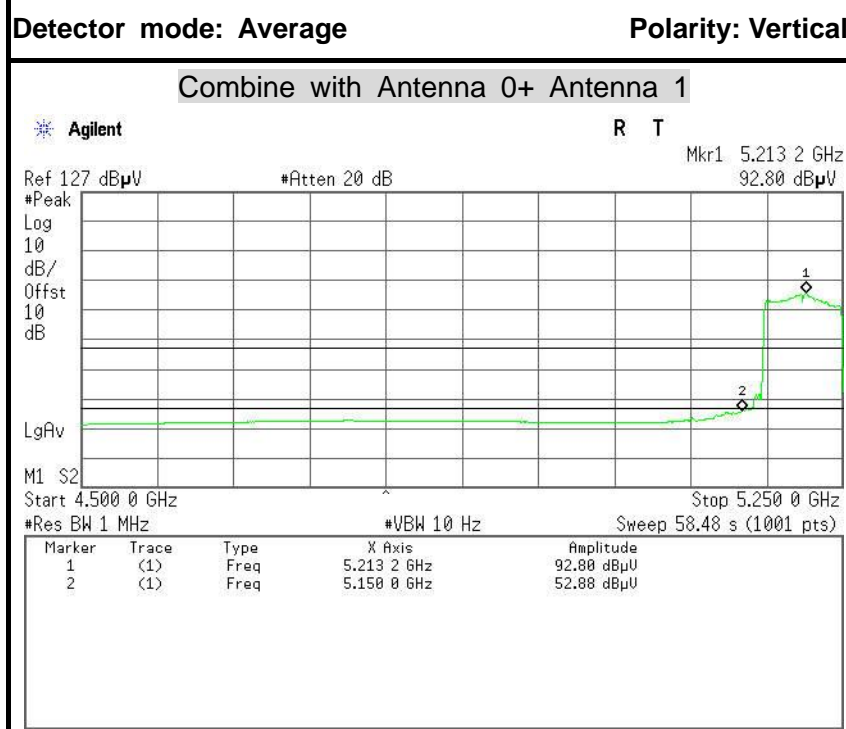
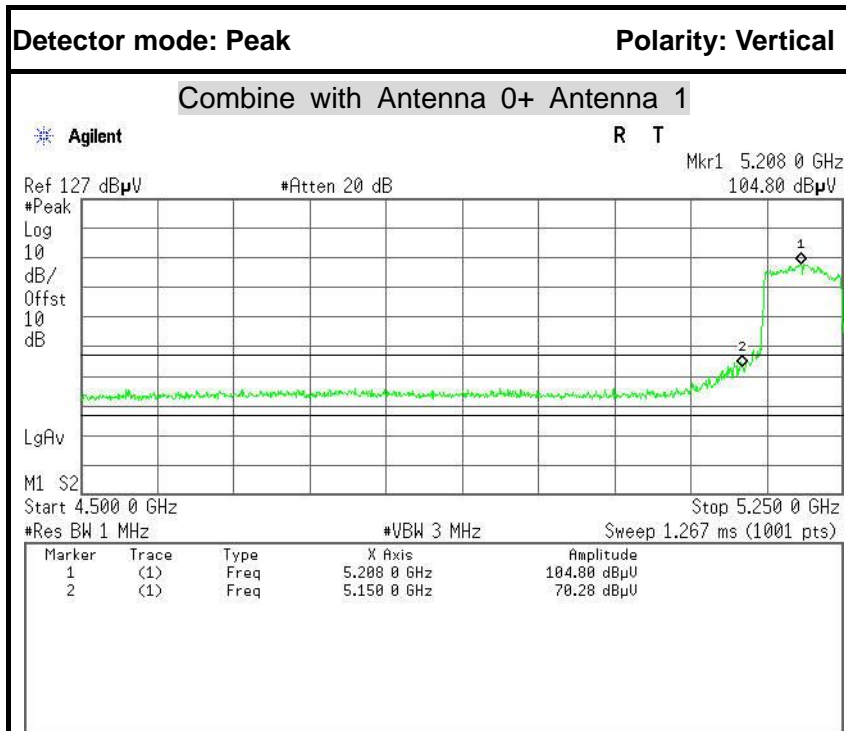
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	75.34	5.60	69.74	74.00	-4.26	Peak	Vertical
2	5350.0000	57.68	5.60	52.08	54.00	-1.92	Average	Vertical



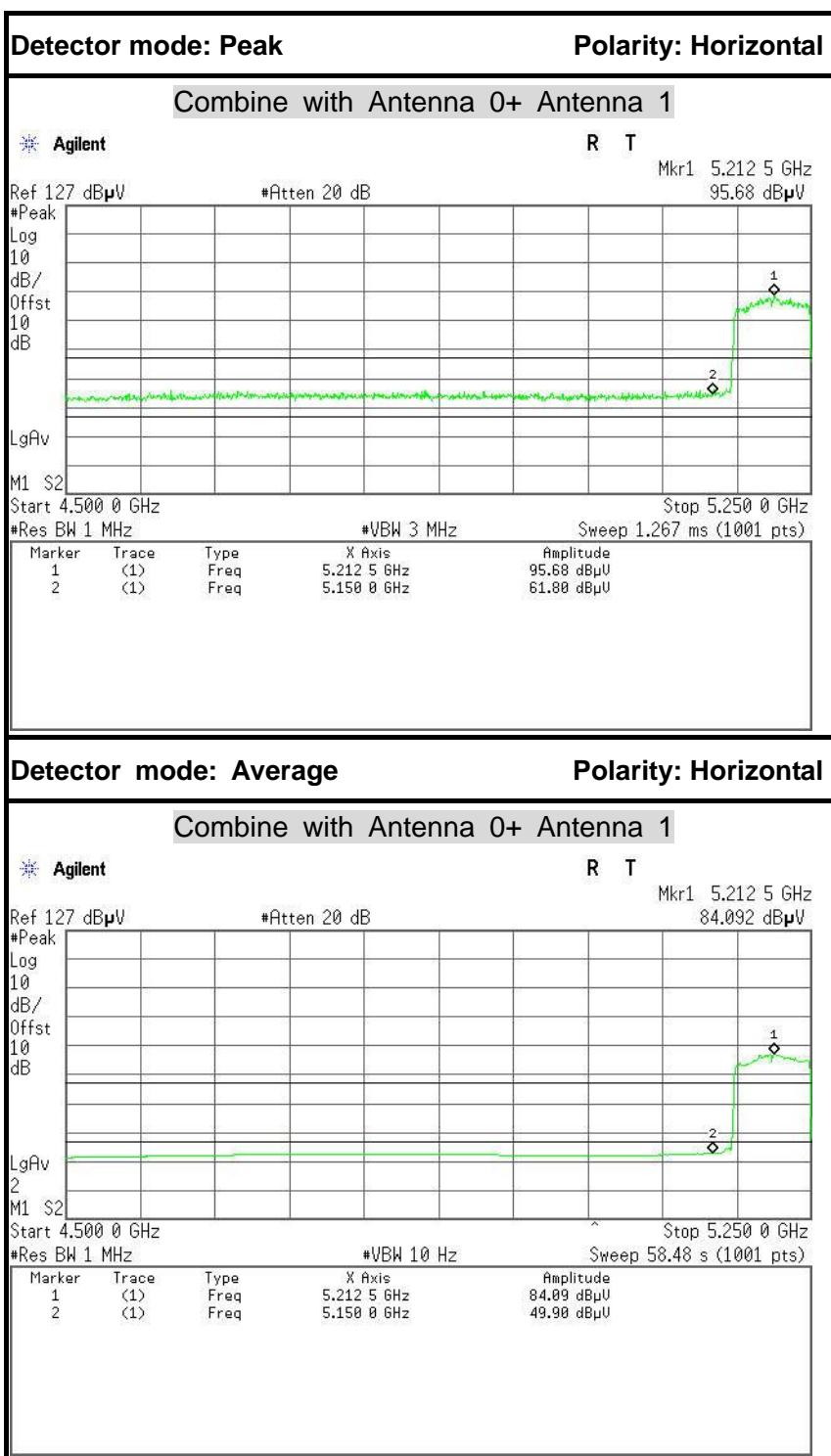
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	67.55	5.60	61.95	74.00	-12.05	Peak	Horizontal
2	5350.0000	56.90	5.60	51.30	54.00	-2.70	Average	Horizontal



IEEE 802.11ac 80 mode / 5210 MHz



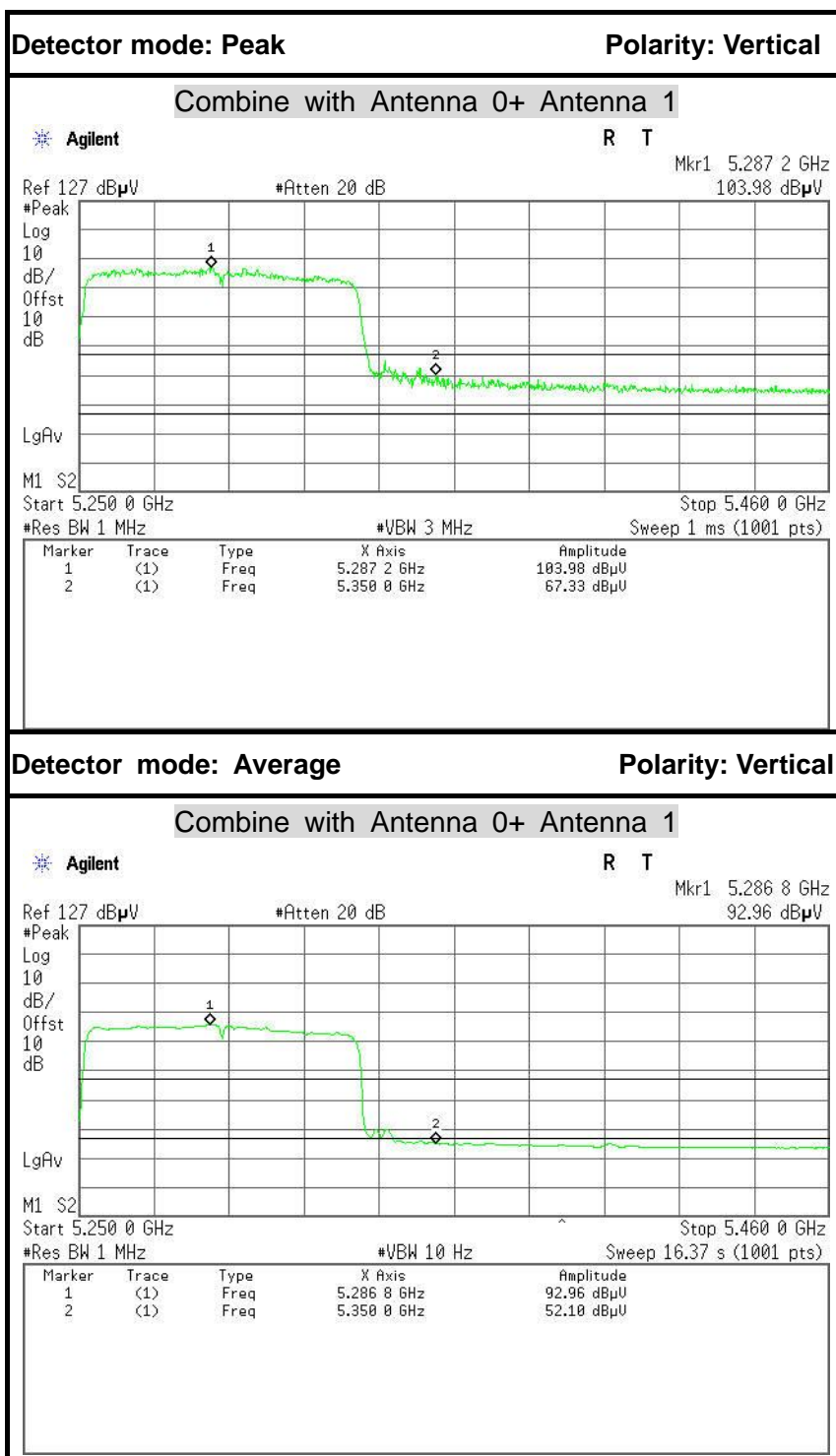
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	75.88	5.60	70.28	74.00	-3.72	Peak	Vertical
2	5150.0000	58.48	5.60	52.88	54.00	-1.12	Average	Vertical



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5150.0000	67.40	5.60	61.80	74.00	-12.20	Peak	Horizontal
2	5150.0000	55.50	5.60	49.90	54.00	-4.10	Average	Horizontal

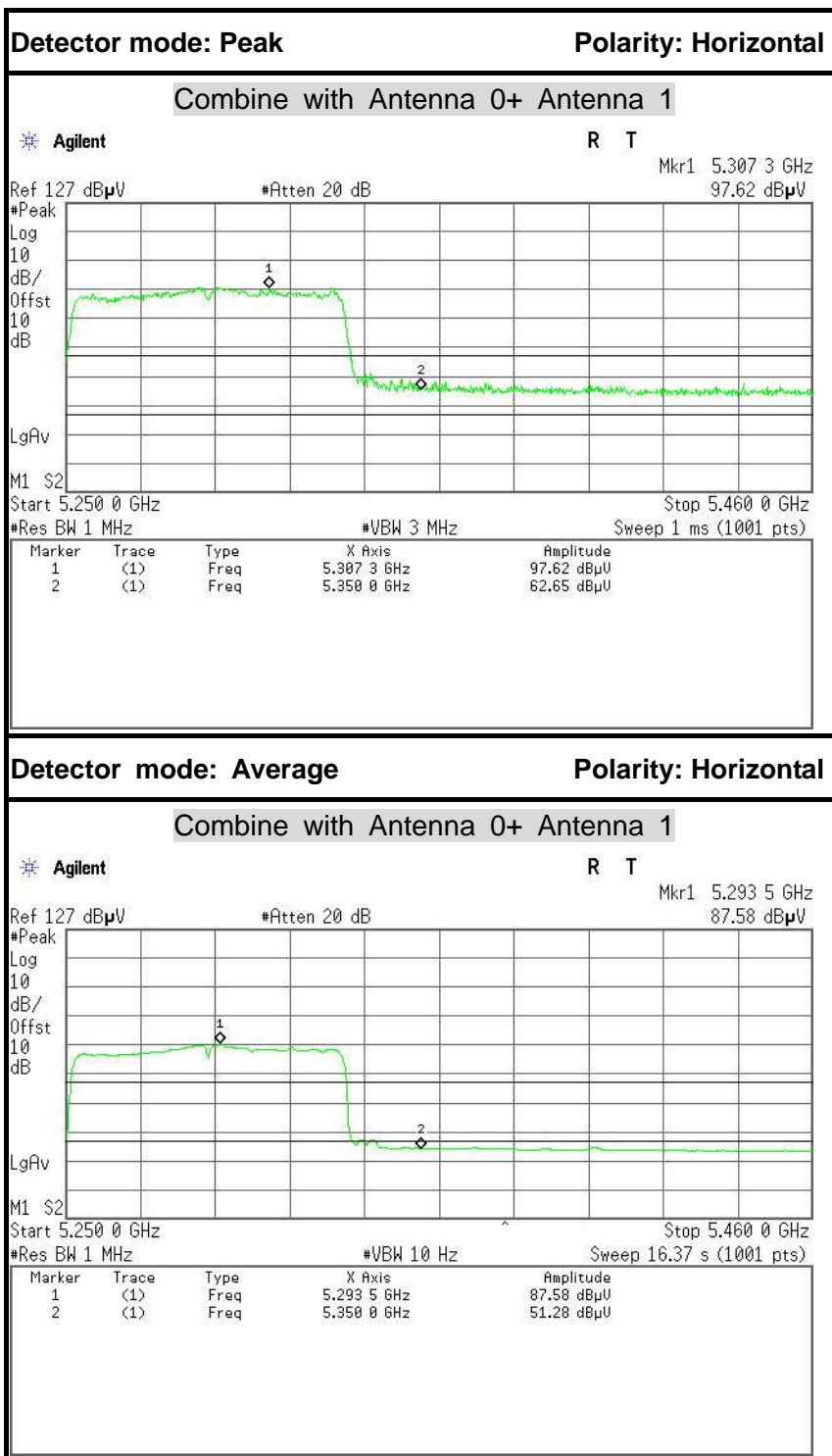


## IEEE 802.11ac 80 mode / 5290 MHz



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	72.93	5.60	67.33	74.00	-6.67	Peak	Vertical
2	5350.0000	57.70	5.60	52.10	54.00	-1.90	Average	Vertical





No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Antenna Pole
1	5350.0000	68.25	5.60	62.65	74.00	-11.35	Peak	Horizontal
2	5350.0000	56.88	5.60	51.28	54.00	-2.72	Average	Horizontal