7.5. Conducted spurious emission

7.5.1. Requirements:

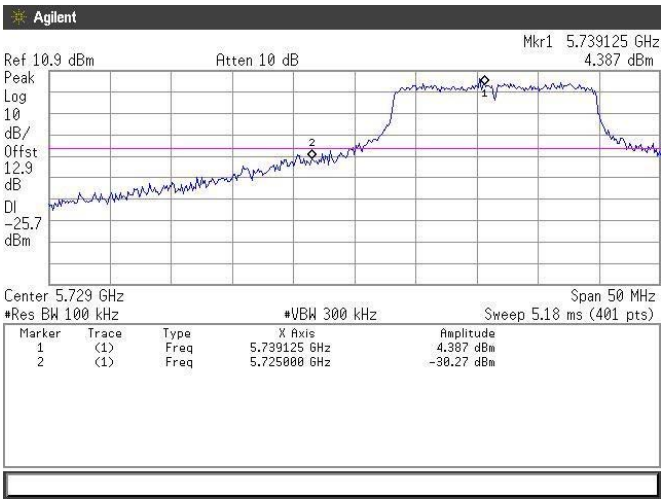
Clause 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Sec. 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a) (see Sec. 15.205(c)).
Due to the conducted power was measured based on the use of RMS averaging over a time interval, the attenuation required here shall be 30 dB instead of 20 dB.

7.5.2. Test Procedure:

The transmitter output is connected to a spectrum analyzer.
The RBW is set to 100 kHz.
The VBW is set to 300 kHz.
The spectrum from 30MHz to 40GHz is investigated with the transmitter set to the low, middle and high frequencies.

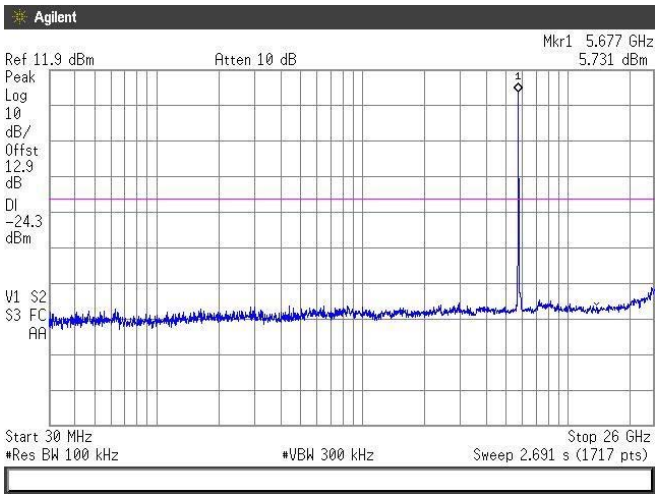
7.5.3. Test Results:

All test results met the requirements.
The tests were performed with the worst case, which is higher power level.
All harmonics/spurs are at least 30 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
The results are shown in plots # 15-62.



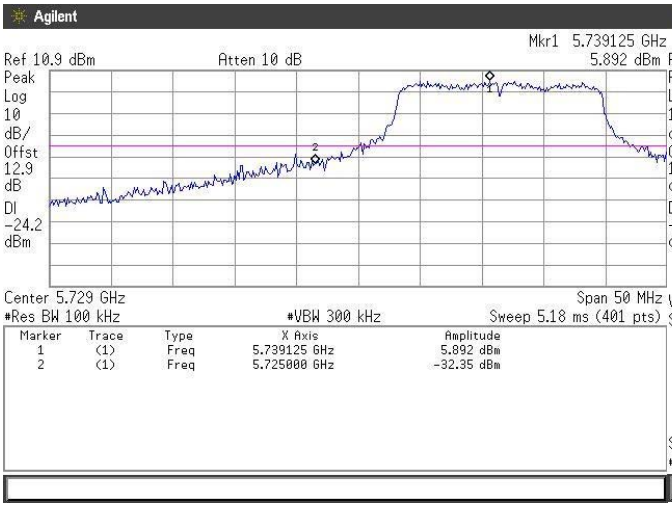
Plot # 15.

Output 1. Low frequency bandedge.
802.11g mode.



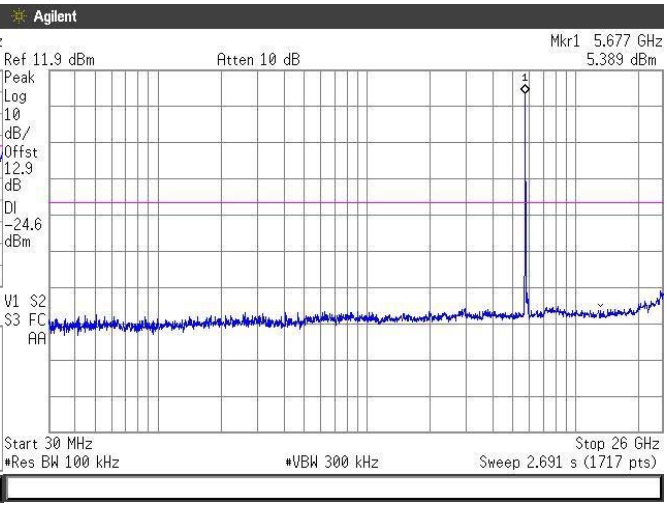
Plot # 16.

Output 1. Low frequency spurious.
802.11g mode.



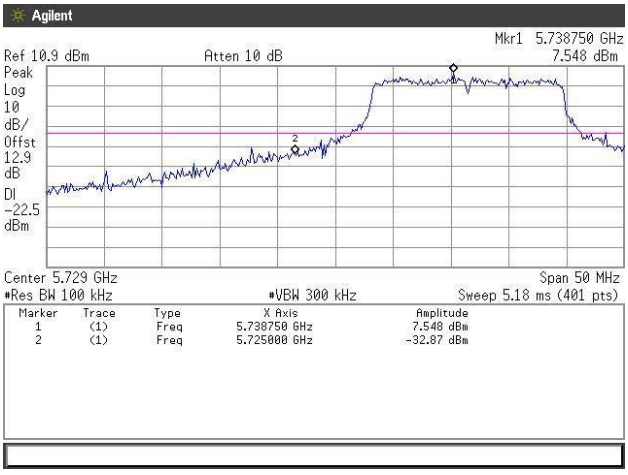
Plot # 17.

Output 2. Low frequency bandedge.
802.11g mode.



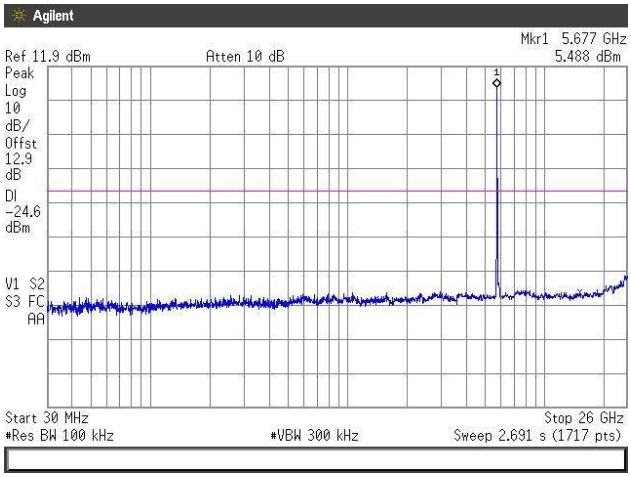
Plot # 18.

Output 2. Low frequency spurious.
802.11g mode.



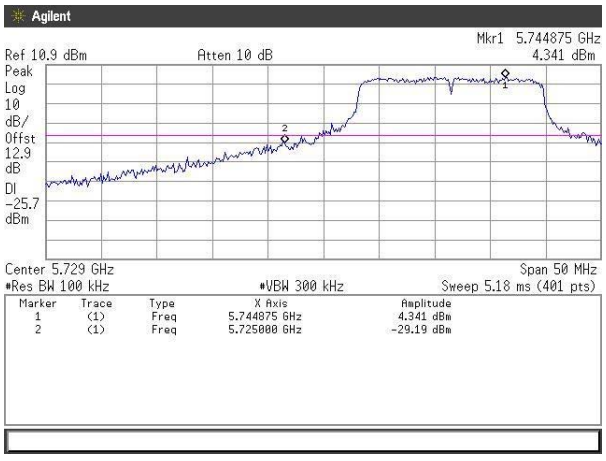
Plot # 19.

Output 3. Low frequency bandedge.
802.11g mode.



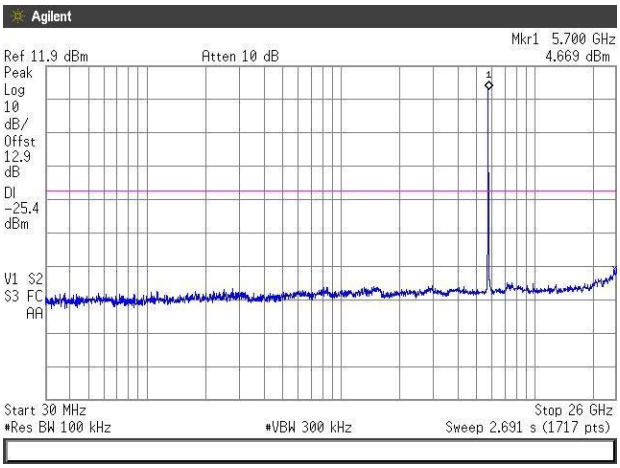
Plot # 20.

Output 3. Low frequency spurious.
802.11g mode.



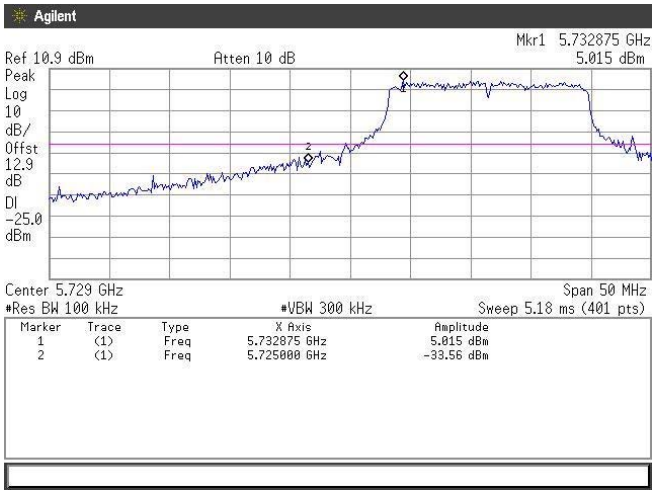
Plot # 21.

Output 4. Low frequency bandedge.
802.11g mode.



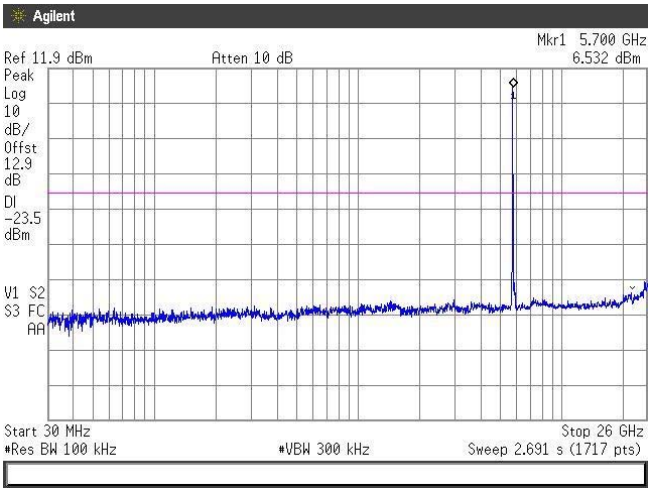
Plot # 22.

Output 4. Low frequency spurious.
802.11g mode.



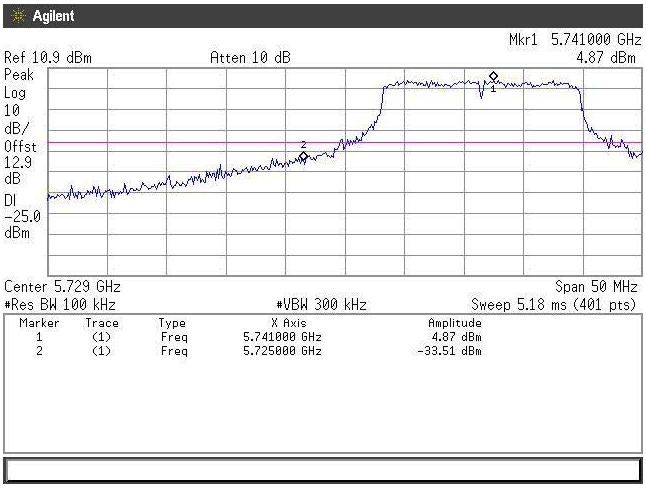
Plot # 23.

Output 5. Low frequency bandedge.
802.11g mode.



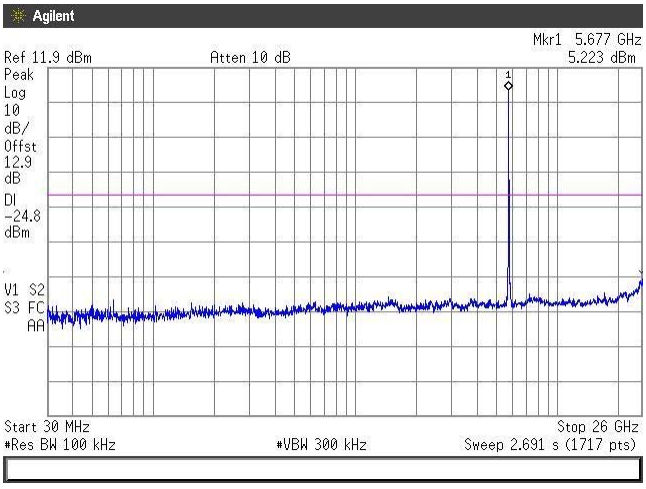
Plot # 24.

Output 5. Low frequency spurious.
802.11g mode.



Plot # 25.

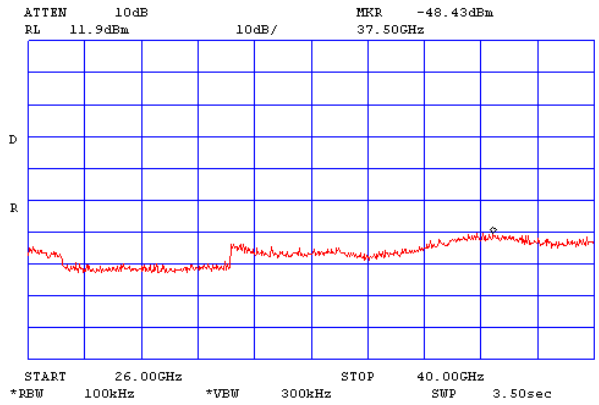
Output 6. Low frequency bandedge.
802.11g mode.



Plot # 26.

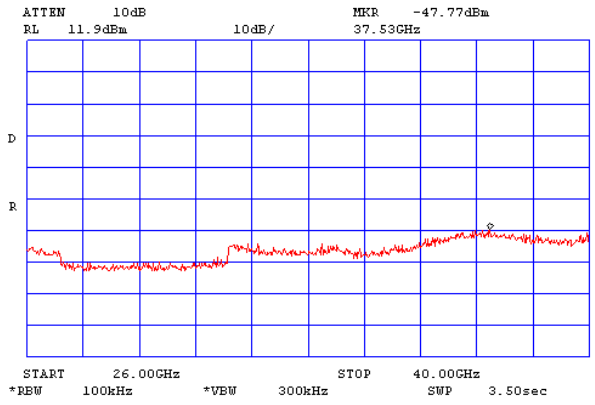
Output 6. Low frequency spurious.
802.11g mode.

Test Report No.: 8912307342 **Page 24 of 51 Pages**
Title: Test on 5.8 GHz Band Outdoor WiFi (802.11b/g) Wireless Base Station
Model: WBS-5800 **FCC ID: UGM-WBS5800-2**



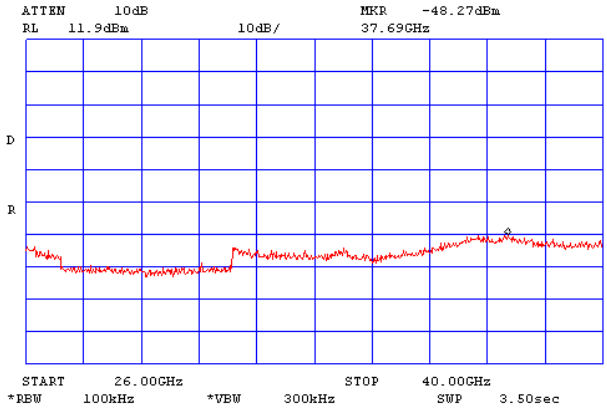
Plot # 27.

Output 1. Low frequency spurious. 802.11g mode.



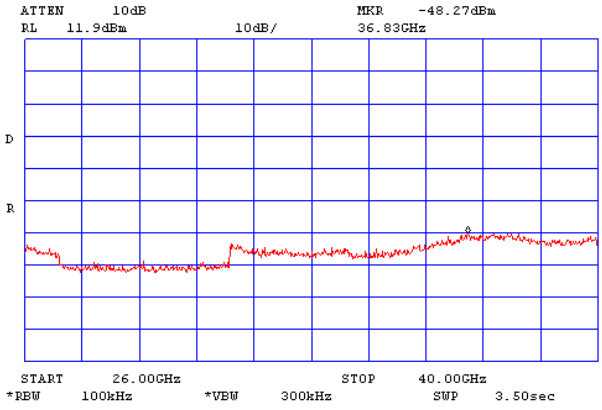
Plot # 28.

Output 2. Low frequency spurious. 802.11g mode.



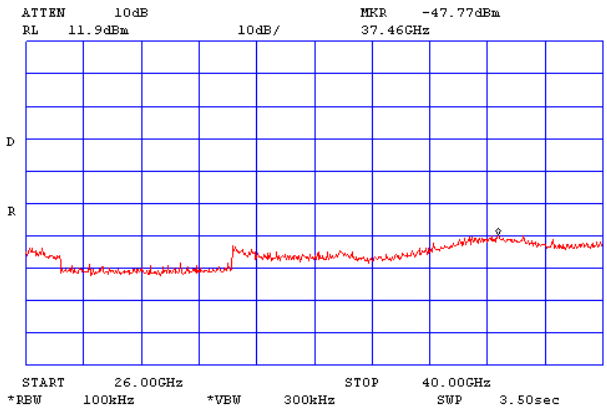
Plot # 29.

Output 3. Low frequency spurious. 802.11g mode.



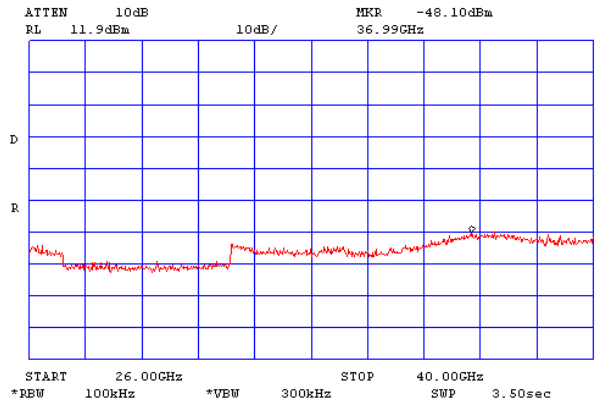
Plot # 30.

Output 4. Low frequency spurious. 802.11g mode.



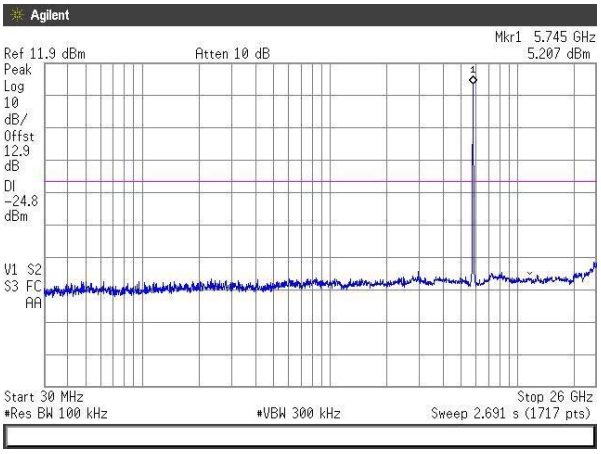
Plot # 31.

Output 5. Low frequency spurious. 802.11g mode.



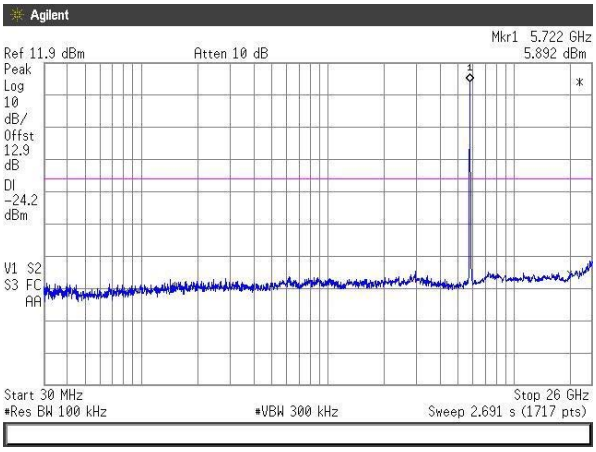
Plot # 32.

Output 6. Low frequency spurious. 802.11g mode.



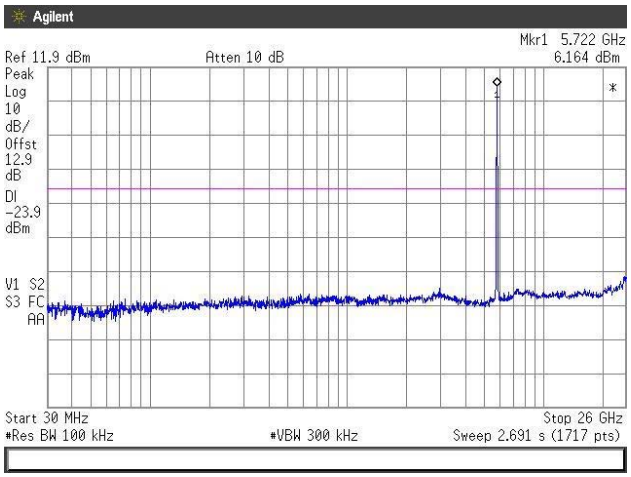
Plot # 33.

Output 1. Middle frequency spurious. 802.11g mode.



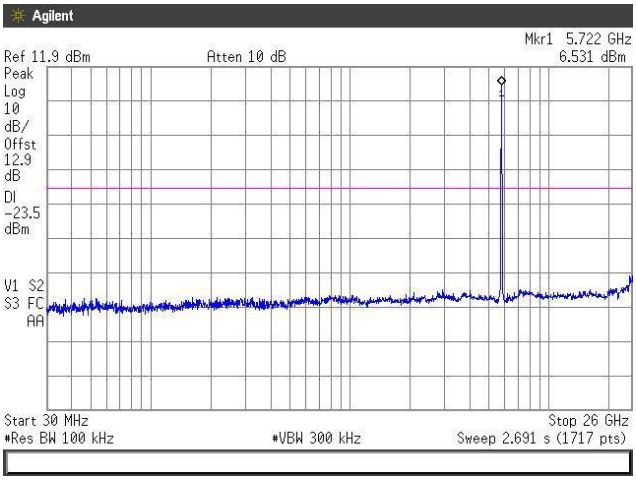
Plot # 34.

Output 2. Middle frequency spurious. 802.11g mode.



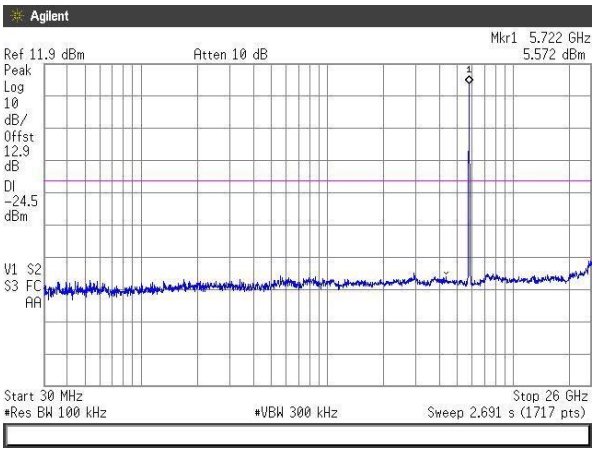
Plot # 35.

Output 3. Middle frequency spurious. 802.11g mode.



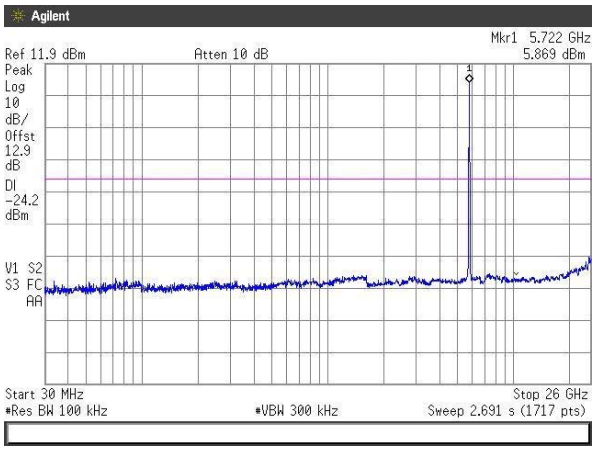
Plot # 36.

Output 4. Middle frequency spurious. 802.11g mode.



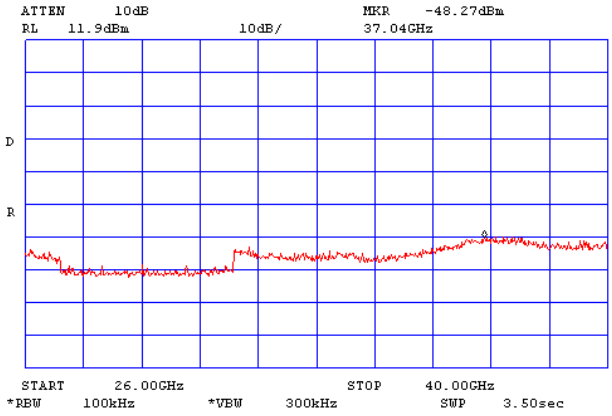
Plot # 37.

Output 5. Middle frequency spurious. 802.11g mode.



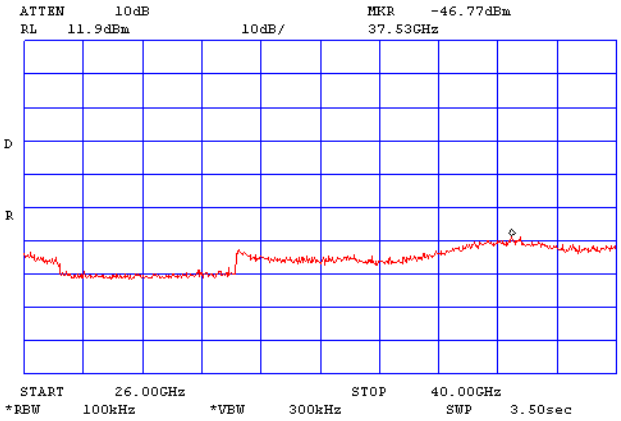
Plot # 38.

Output 6. Middle frequency spurious. 802.11g mode.



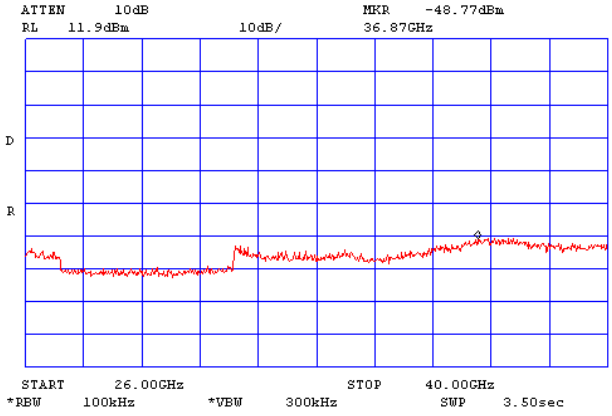
Plot # 39.

Output 1. Middle frequency spurious. 802.11g mode.



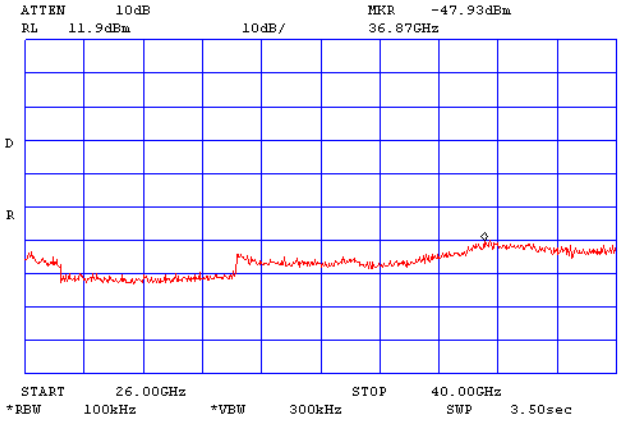
Plot # 40.

Output 2. Middle frequency spurious. 802.11g mode.



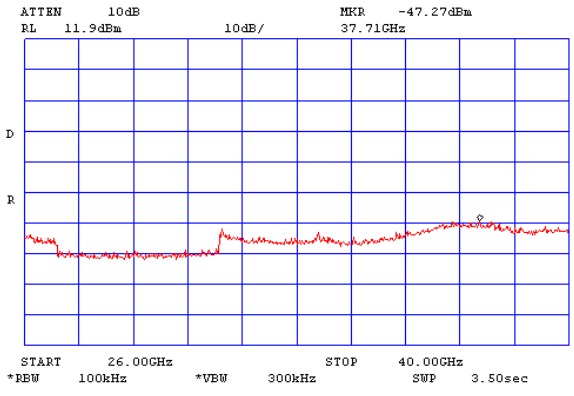
Plot # 41.

Output 3. Middle frequency spurious. 802.11g mode.



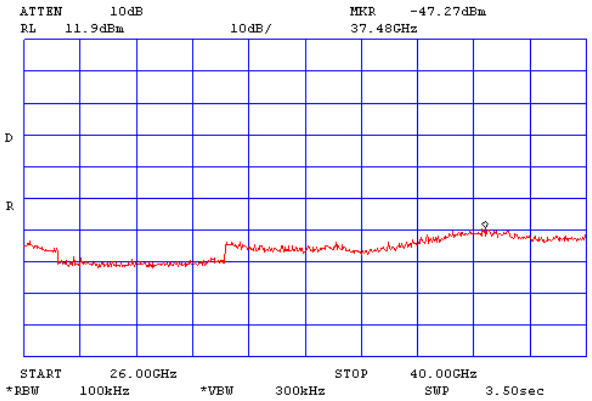
Plot # 42.

Output 4. Middle frequency spurious. 802.11g mode.



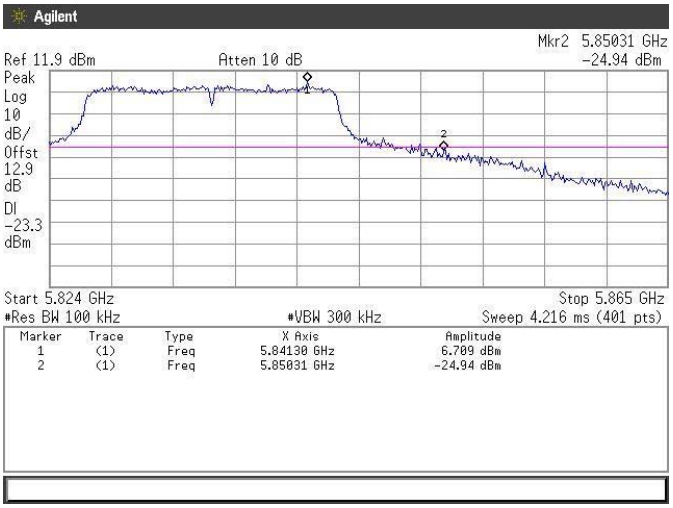
Plot # 43.

Output 5. Middle frequency spurious. 802.11g mode.



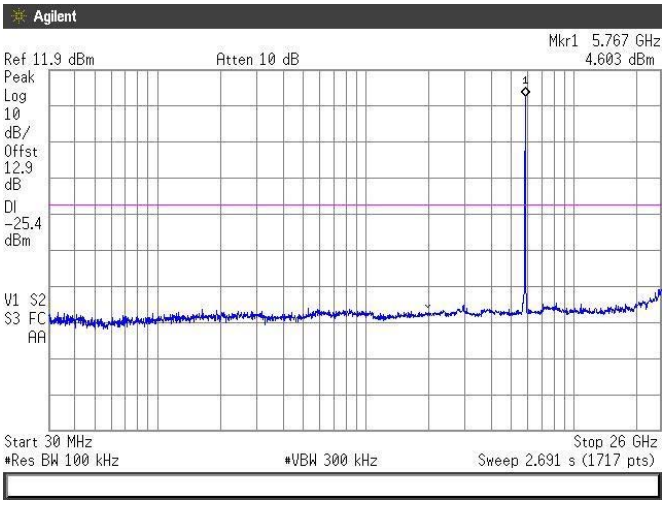
Plot # 44.

Output 6. Middle frequency spurious. 802.11g mode.



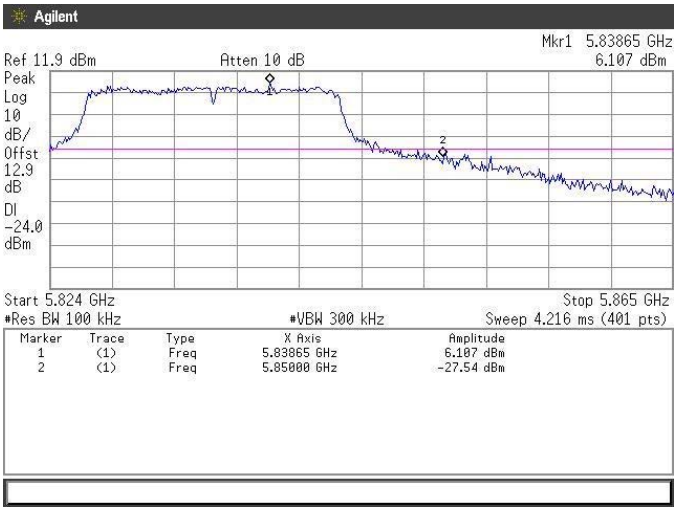
Plot # 45.

Output 1. High frequency bandedge.
802.11g mode.



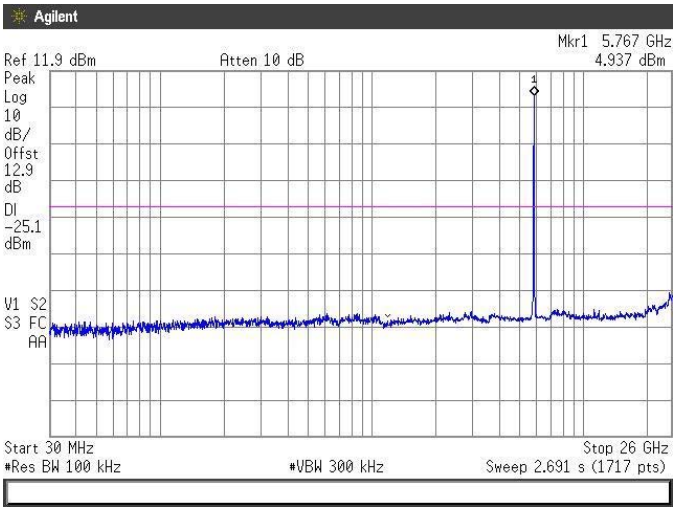
Plot # 46.

Output 1. High frequency spurious.
802.11g mode.



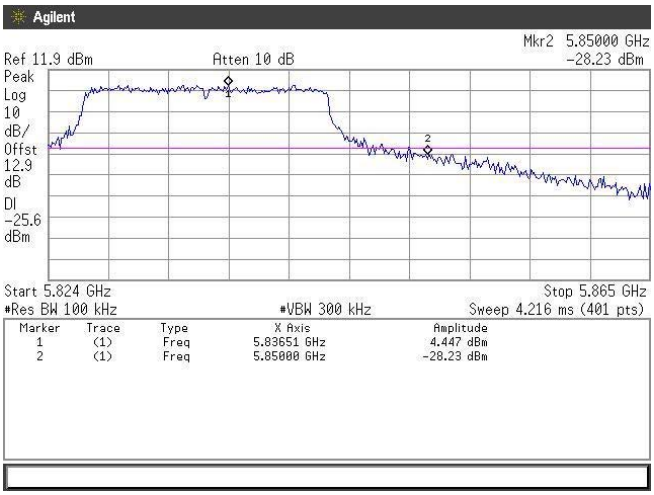
Plot # 47.

Output 2. High frequency bandedge.
802.11g mode.



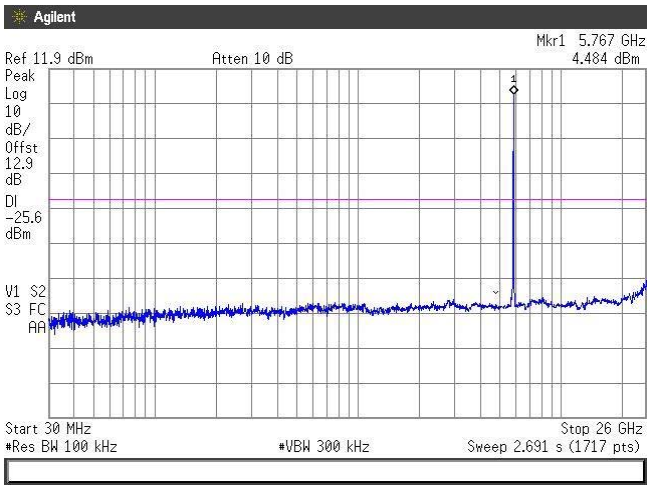
Plot # 48.

Output 2. High frequency spurious.
802.11g mode.



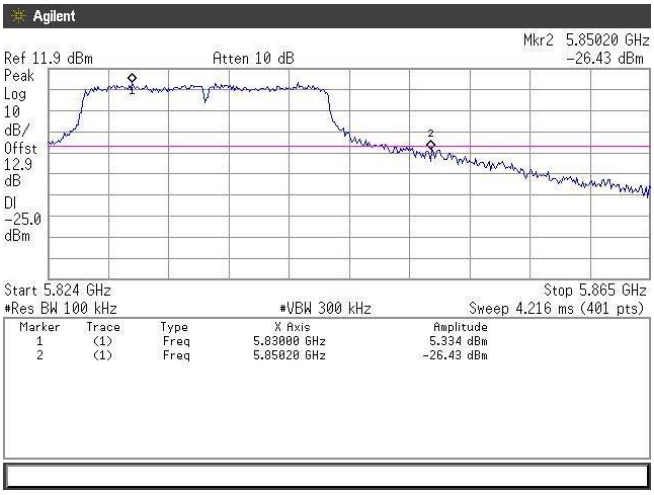
Plot # 49.

Output 3. High frequency bandedge.
802.11g mode.



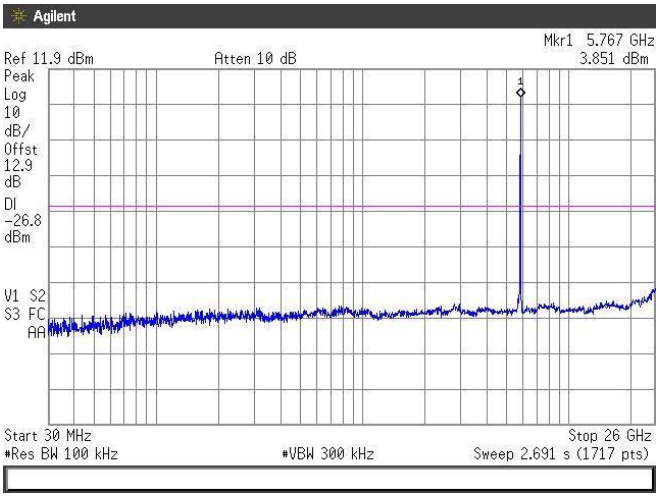
Plot # 50.

Output 3. High frequency spurious.
802.11g mode.



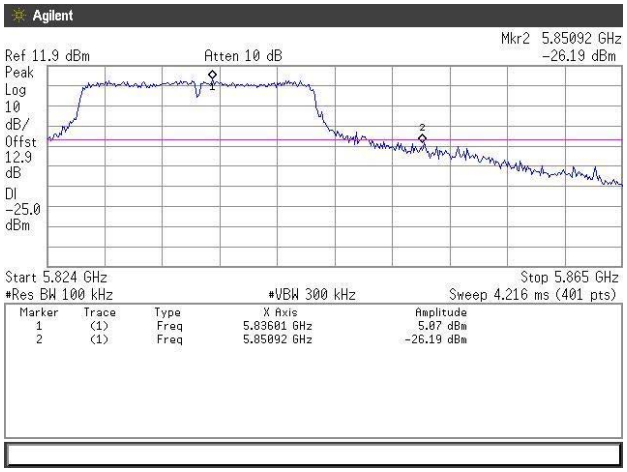
Plot # 51.

Output 4. High frequency bandedge.
802.11g mode.



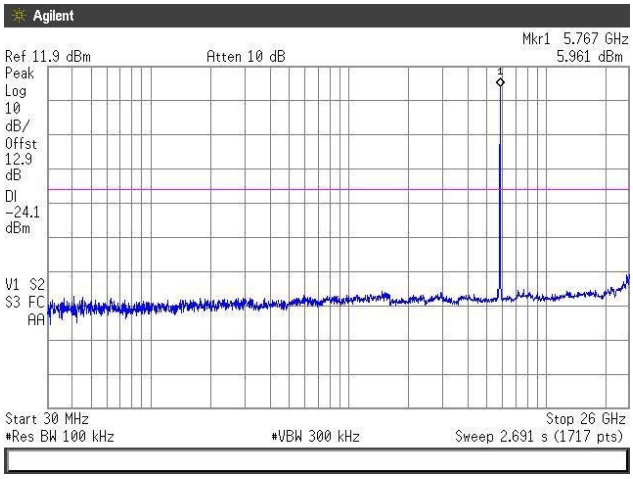
Plot # 52.

Output 4. High frequency spurious.
802.11g mode.



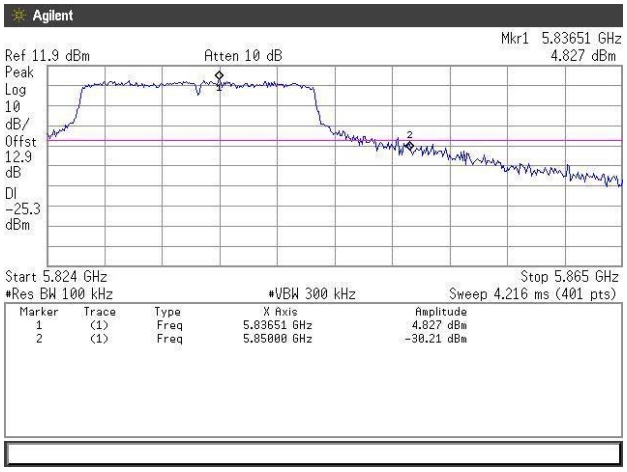
Plot # 53.

Output 5. High frequency bandedge.
802.11g mode.



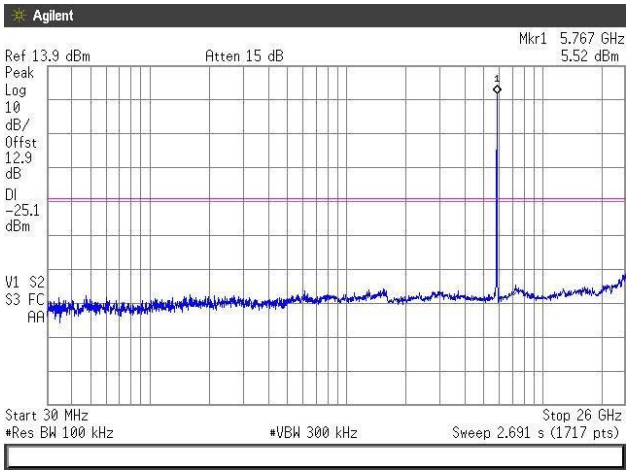
Plot # 54.

Output 5. High frequency spurious.
802.11g mode.



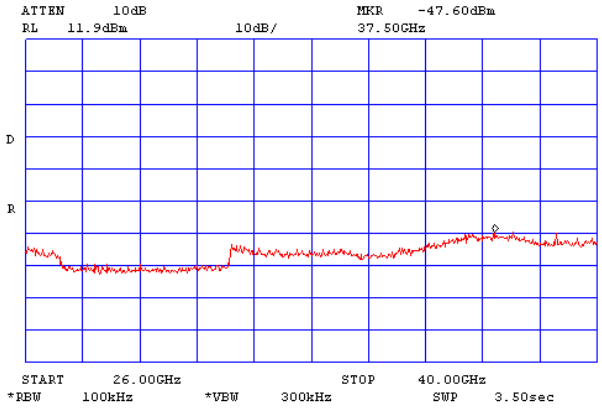
Plot # 55.

Output 6. High frequency bandedge.
802.11g mode.



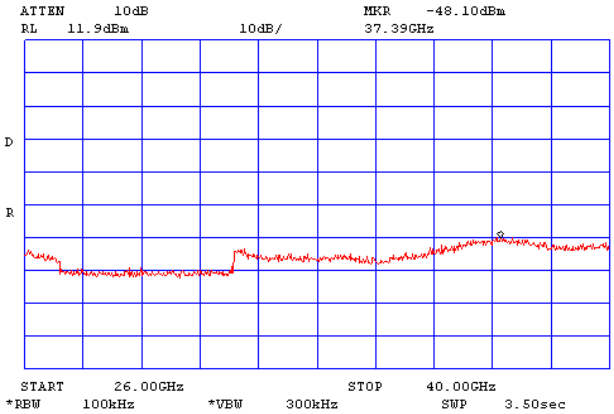
Plot # 56.

Output 6. High frequency spurious.
802.11g mode.



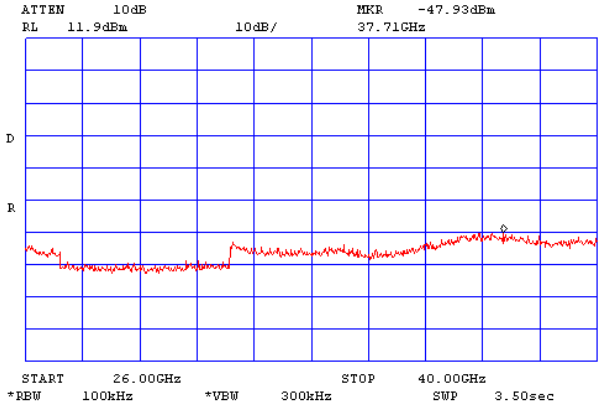
Plot # 57.

Output 1. High frequency spurious.
802.11g mode.



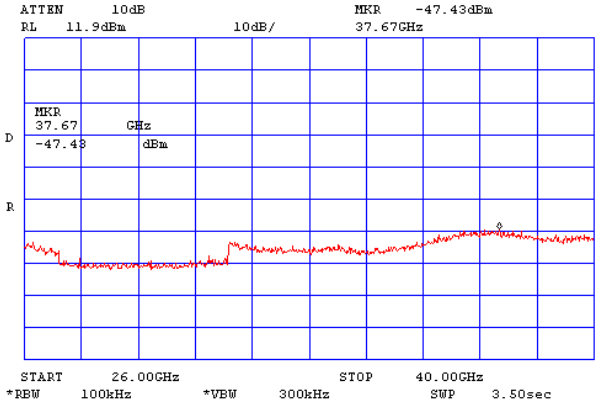
Plot # 58.

Output 2. High frequency spurious.
802.11g mode.



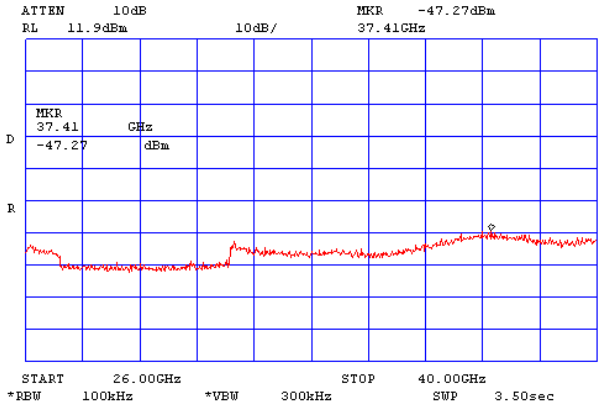
Plot # 59.

Output 3. High frequency spurious.
802.11g mode.



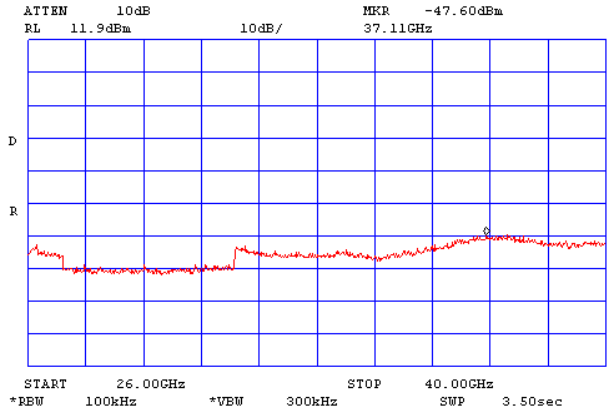
Plot # 60.

Output 4. High frequency spurious.
802.11g mode.



Plot # 61.

Output 5. High frequency spurious.
802.11g mode.



Plot # 62.

Output 6. High frequency spurious.
802.11g mode.

7.6. Radiated emission test on Outdoor Radio Unit – spurious (per Section 15.209):

7.6.1. Requirements:

EUTs radiated emission shall not exceed value required in section 15.209 Subpart C.

7.6.2. EUT configuration:

The EUT was tested with six Omni-directional antennas model MT-462007.

7.6.3. Test procedure:

The measurements were performed in the anechoic chamber.
The EUT was arranged on a non-metallic table 0.8 m placed on the turntable.
Cable loss (in dB) is included in SA measurement setup.
The emission levels of the EUT more than 20 dB lower than the specified limit were not recorded in the tables. For the test results refer to relevant Plots.
Test results found in 30 – 2000 MHz are brought in section 7.4 of this test report.
Antenna height = 1 m.
Polarization: Vertical/Horizontal
Measurement distance = 3m.
The frequency range was investigated up to 26 GHz.
The measurements were performed in vertical and horizontal polarization, the maximum reading recorded.

7.6.4. Radiated emission test results and calculation ratio:

The test results were found complies with relevant standard requirements.
Test results are presented in Table 6. Spurious emissions test results
The emission level was calculated as:
E Reading (dBμV) + measuring cable loss (dB) + measuring antenna factor (dB/m)
For measuring antenna factor refer to Appendix 2.

Frequency (GHz)	Emission Level (dBμV/m)		Limit @ 3m (dBμV/m)		Margin (dB)		Results
	Average	Peak	Average	Peak	Average	Peak	
LOW 5.740 GHz							
11.480	Noise floor	Noise floor	54	74	10 dB at least	10 dB at least	Complies
22.960	Noise floor	Noise floor			10 dB at least	10 dB at least	Complies
MIDDLE 5.790 GHz							
11.580	Noise floor	Noise floor	54	74	10 dB at least	10 dB at least	Complies
HIGH 5.835 GHz							
11.680	Noise floor	Noise floor	54	74	10 dB at least	10 dB at least	Complies

Table 6. Spurious emissions test results.

7.7. Radiated emission test on Outdoor Radio Unit - restricted bands (per Section 15.205):

7.7.1. Requirements:

Radiated emission in restricted bands should meet the requirements sec. 15.205 Subpart C. Operating Frequency Range 5.740-5.835 GHz

7.7.2. EUT configuration:

The EUT was tested with all six Omni-directional antennas (model MT-462007) connected to EUT, as it shown on the photo 3.

7.7.3. Test procedure:

The measurements were performed in the anechoic chamber.
The EUT was arranged on a non-metallic table 0.8 m placed on the turntable.
Cable loss (in dB) is included in SA measurement calculation.
First, initial scans were performed in normal (transmitting) mode of operation for carrier (channel) frequency at the low and the high of the 5.740-5.835 MHz frequency range. The Output Power (19.7dBm) was adjusted from the data and control transfer equipment with the system integrator access only (following to Important Safety Instruction of Installation Guide). The worst results from all measurements (Low band edge frequency-5740MHz frequency, and High band edge frequency-5835MHz) are presented in summary table of clause 7.7.4 and at the plots 45-48.
Measuring antennas used: Double Ridge EMCO model 3115
Antenna height = 1 m.
Measurement distance = 1m.
Measuring detector function and bandwidths:

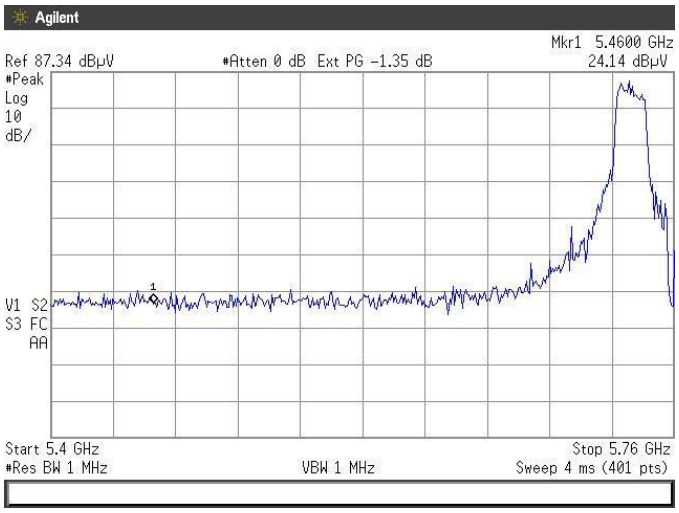
Detector type	Peak
Resolution bandwidth	1MHz
Video bandwidth	1MHz

7.7.4. Test results and calculation ratio:

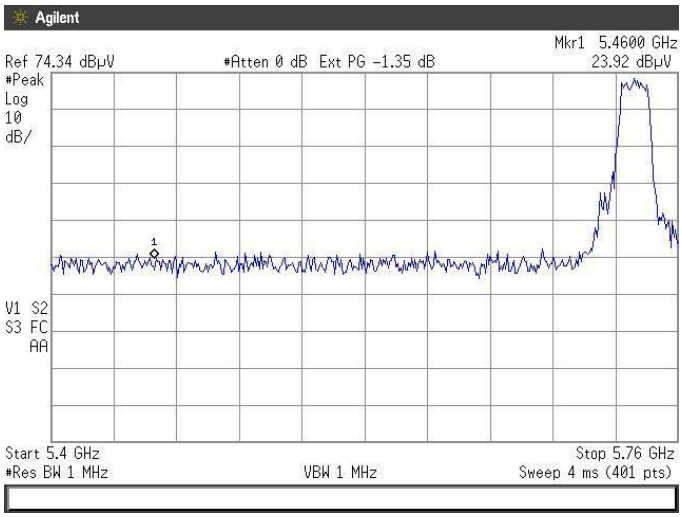
The test results for the operation frequency bandedge are shown in Plots - as detailed in Table below.

Notes: The AVG measurements with limit 64 dBµV/m are not shown in the plots.
All measurements at the frequency bandedge lie far from the restricted bands and not exceed the SA noise floor level; so the plots are informative only.

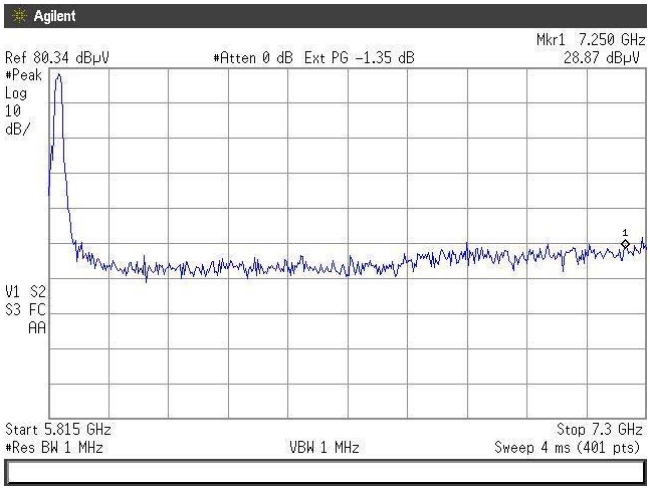
Band edge Freq. MHz	Pol V/H	Rate, Mbps	Read Pk, dBµV	AF, 1/m	Peak, dBµV/m	Peak Limit, dB(µV/m)	Peak Margin dB	Verdict	Plot Number
Transmitting on Low (5.740GHz) frequency.									
5460	V	6	24.14	34.7	58.84	84	15.16	Pass	63
5460	H	6	23.92	34.7	58.62	84	15.38	Pass	64
Transmitting on High (5.835GHz) frequency.									
7250	V	6	28.87	36.7	65.57	84	8.43	Pass	65
7250	H	6	31.43	36.7	68.13	84	5.87	Pass	66



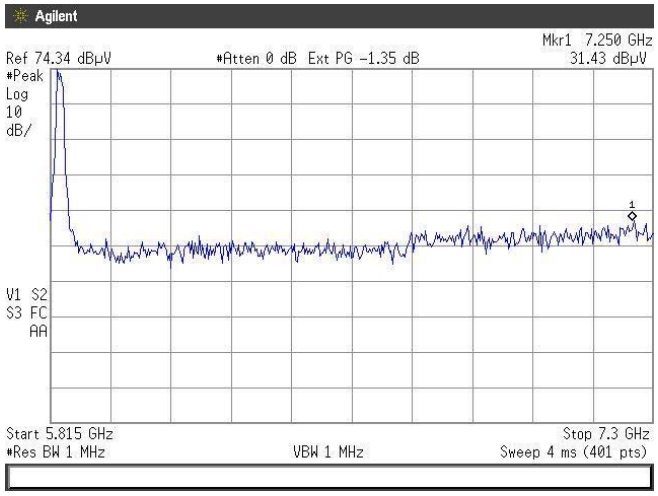
Plot # 63. Low frequency 6Mbps rate.
802.11g; Peak; Vertical.



Plot # 64. Low frequency 6Mbps rate.
802.11g; Peak; Horizontal.



Plot # 65. High frequency 6Mbps rate.
802.11g; Peak; Vertical.



Plot # 66. High frequency 6Mbps rate.
802.11g; Peak; Horizontal.

7.8. Minimum bandwidth

7.8.1. Requirements:

The minimum 6dB bandwidth shall be at least 500 KHz as required in sec. 15.247 (a)(2).

7.8.2. Test procedure:

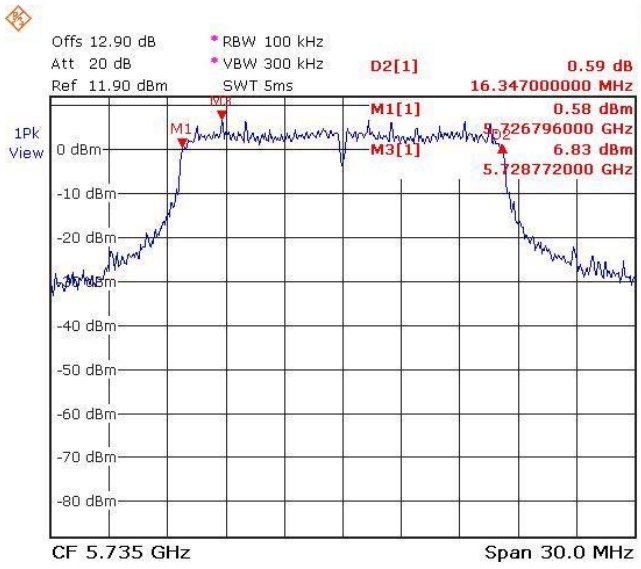
The measurements were performed in normal (transmitting) mode of operation for carrier (channel) frequency at low, middle and the high of the 5.740-5.835 GHz frequency range that reflect to the worst test results. All final tests were performed on Output 6 that is the worst case between all outputs.
The EUT RF output was connected to the Spectrum Analyzer accounted with cable loss in SA settings.
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

7.8.3. Test results:

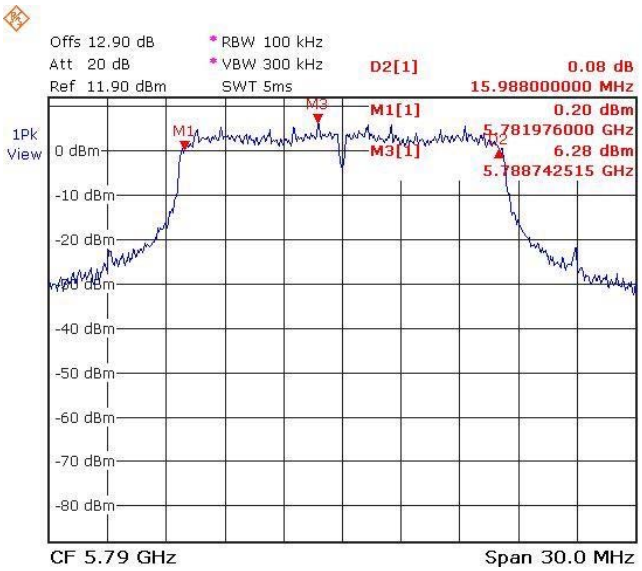
The summaries of final minimum bandwidth measurements from output 6 are shown in Table 7.
The minimum measured bandwidth for all configurations is 9006 kHz that is comply with standard required bandwidth.

Frequency MHz	Rate Mbps	Modulation Mode	6dB Bandwidth [kHz]	Minimum Limit [kHz]	Verdict	Plot number
5740	6	802.11g	16347	500	Pass	67
5790	6	802.11g	15988	500	Pass	68
5835	6	802.11g	16048	500	Pass	69

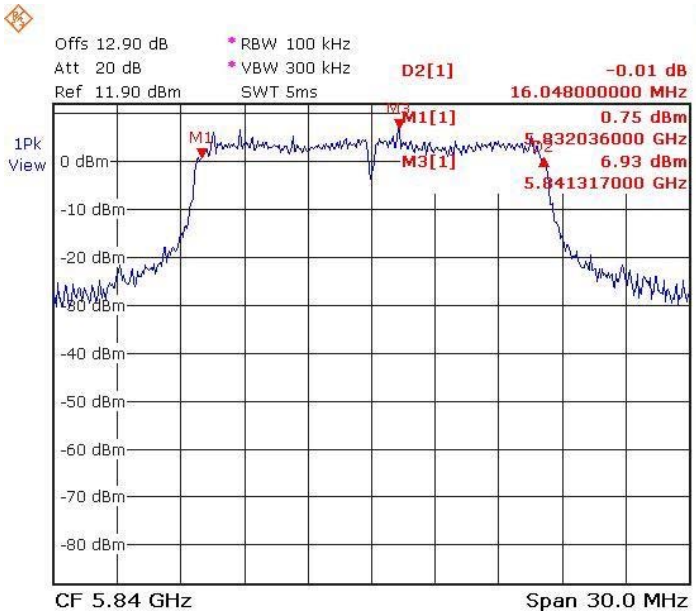
Table 7. 6dB bandwidth results



Plot # 67. 6 dB Bandwidth. Low frequency. 6Mbps rate.



Plot # 68. 6 dB Bandwidth. Middle frequency. 6Mbps rate.



Plot # 69. 6 dB Bandwidth. High frequency. 6Mbps rate.