

Test Report No.: 8612332644

Title: Test on 2.4 GHz Band Outdoor WiFi (802.11b/g) access point

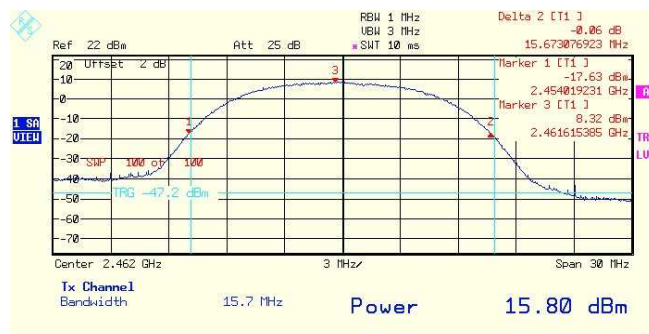
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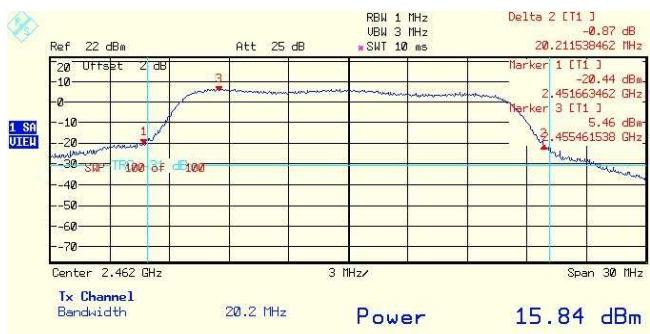
FCC ID: UGMWS410



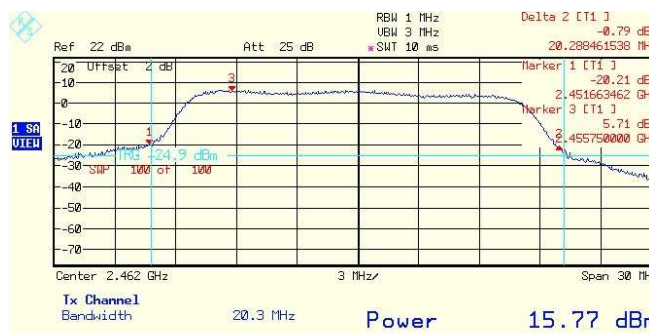
Plot # 75. Output 4 peak power. High frequency. 1Mbps rate.



Plot # 76. Output 4 peak power. High frequency. 11Mbps rate.



Plot # 77. Output 4 peak power. High frequency. 6Mbps rate.



Plot # 78. Output 4 peak power. High frequency. 54Mbps rate.



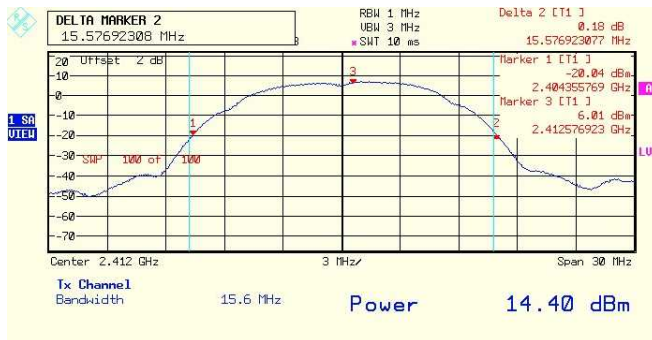
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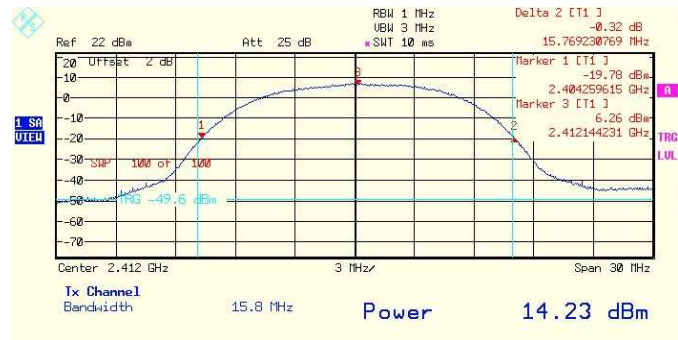
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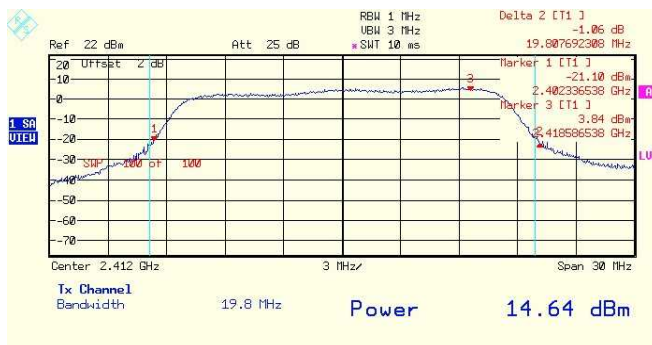
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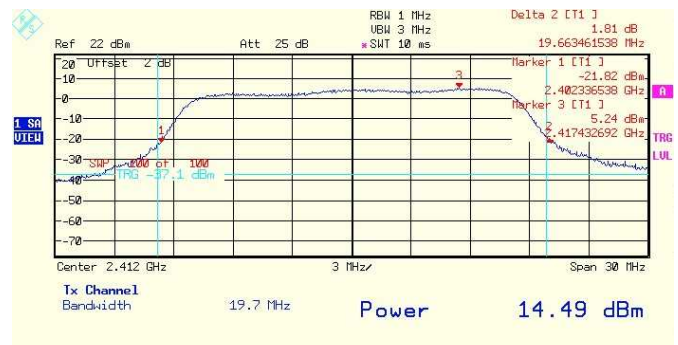
Plot # 79. Output 5 peak power. Lower frequency. 1Mbps rate.



Plot # 80. Output 5 peak power. Lower frequency. 11Mbps rate.



Plot # 81. Output 5 peak power. Lower frequency. 6Mbps rate.



Plot # 82. Output 5 peak power. Lower frequency. 54Mbps rate.

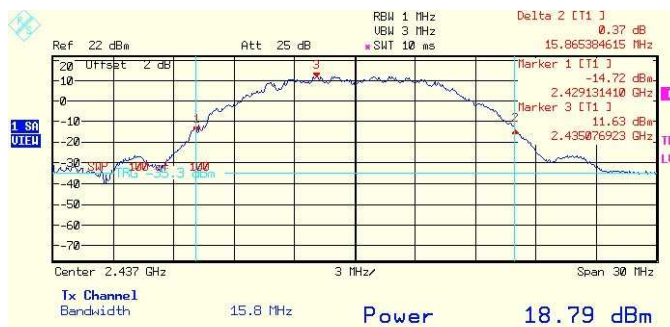
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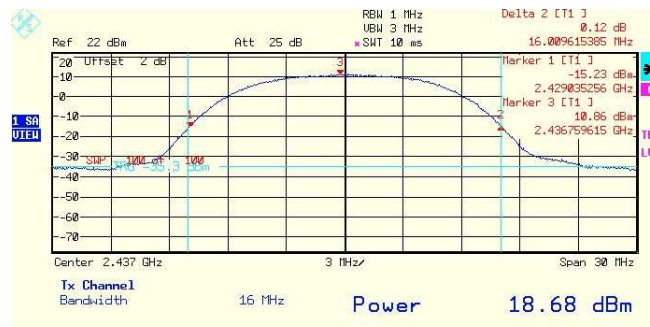
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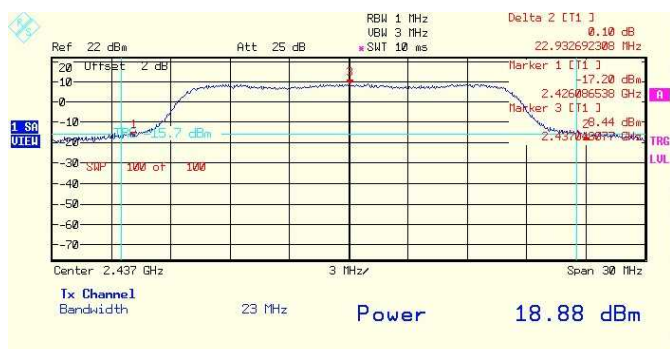
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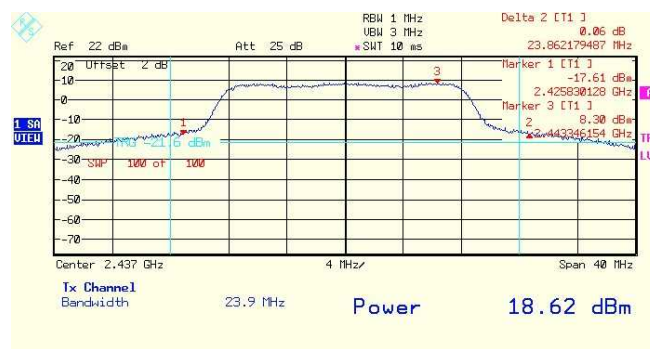
Plot # 83. Output 5 peak power. Middle frequency. 1Mbps rate.



Plot # 84. Output 5 peak power. Middle frequency. 11Mbps rate.



Plot # 85. Output 5 peak power. Middle frequency. 6Mbps rate.



Plot # 86. Output 5 peak power. Middle frequency. 54Mbps rate.



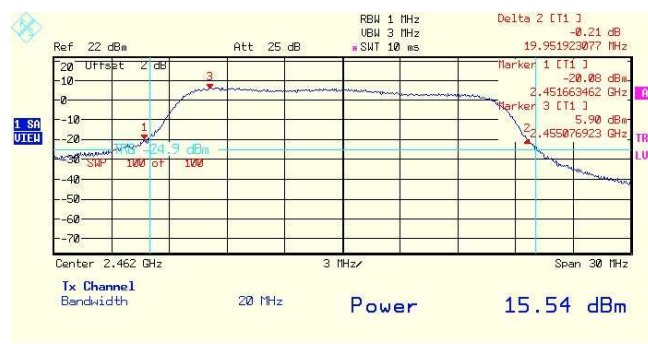
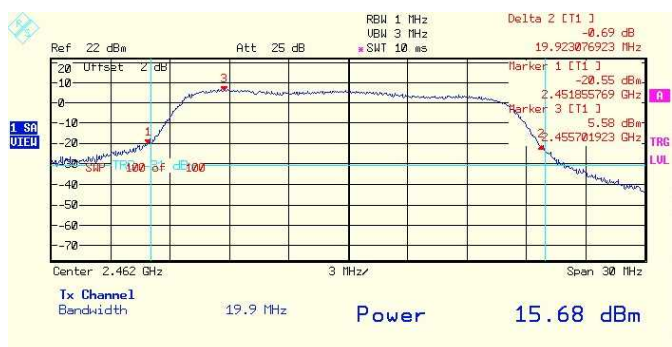
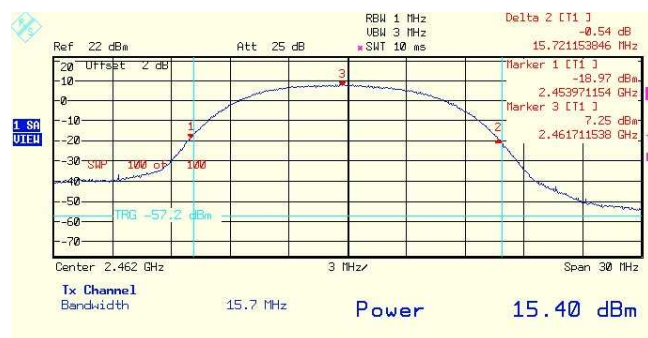
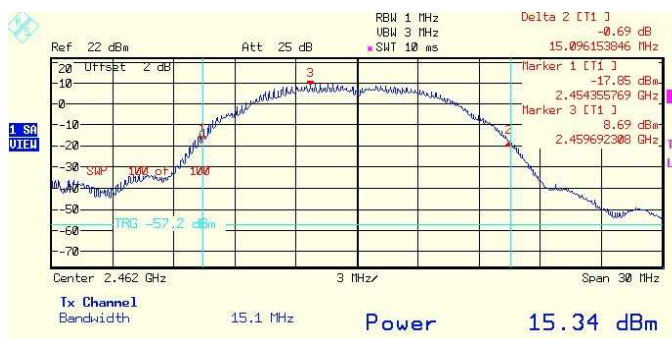
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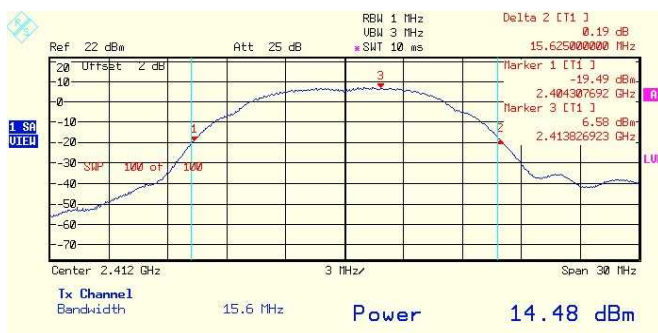
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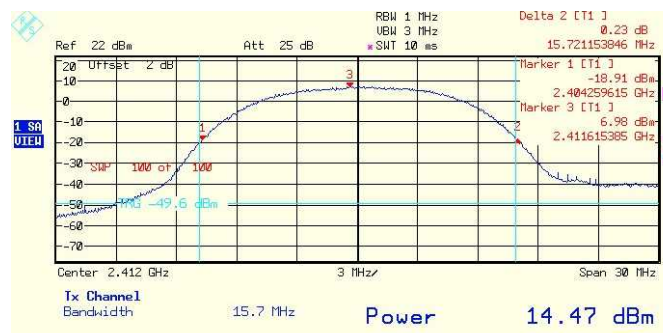
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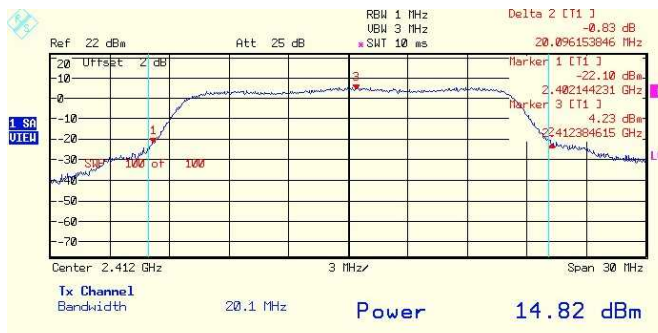
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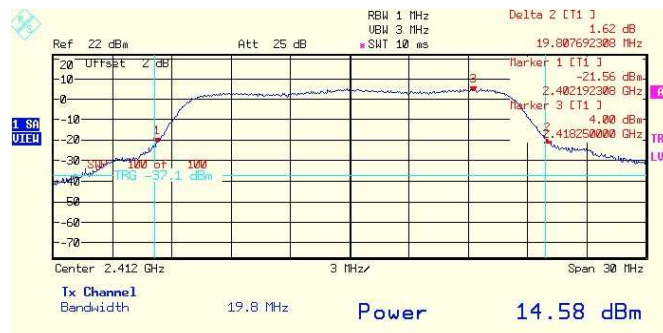
Plot # 91. Output 6 peak power. Lower frequency. 1Mbps rate.



Plot # 92. Output 6 peak power. Lower frequency. 11Mbps rate.



Plot # 93. Output 6 peak power. Lower frequency. 6Mbps rate.



Plot # 94. Output 6 peak power. Lower frequency. 54Mbps rate.

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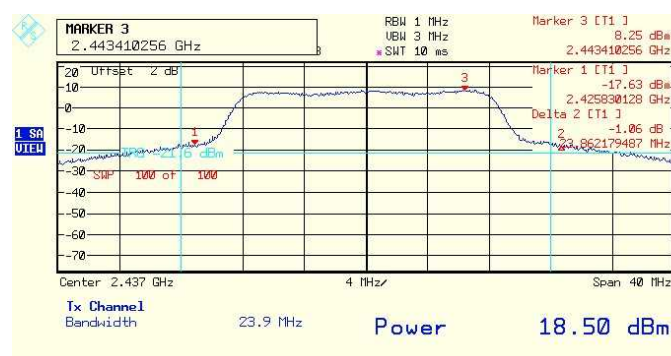
Plot # 95. Output 6 peak power. Middle frequency. 1Mbps rate.



Plot # 96. Output 6 peak power. Middle frequency. 11Mbps rate.



Plot # 97. Output 6 peak power. Middle frequency. 6Mbps rate.



Plot # 98. Output 6 peak power. Middle frequency. 54Mbps rate.





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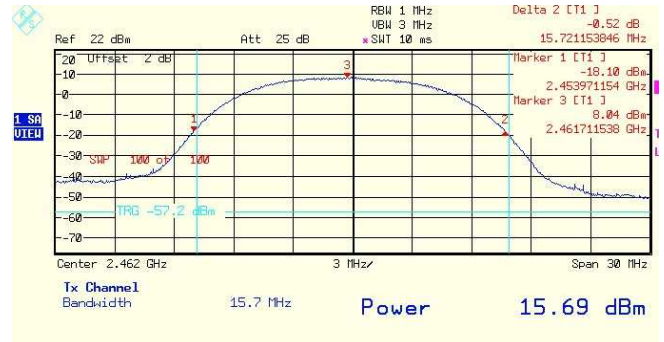
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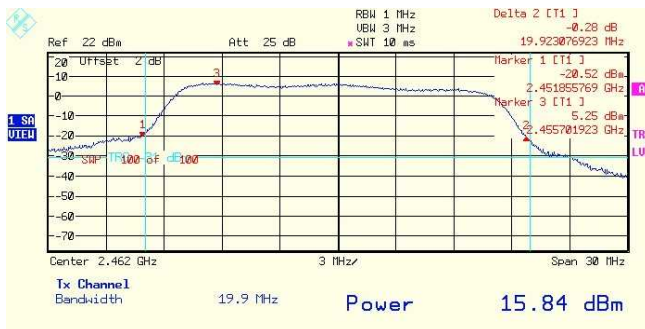
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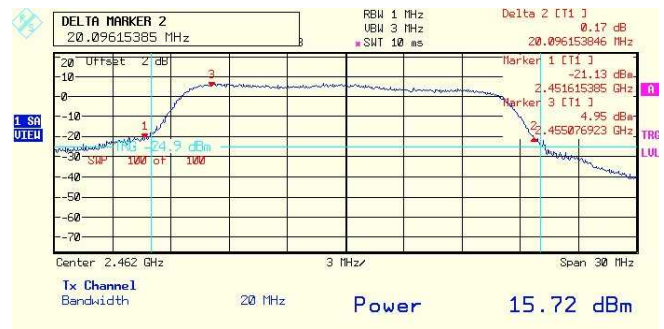
Plot # 99. Output 6 peak power. High frequency. 1Mbps rate.



Plot # 100. Output 6 peak power. High frequency. 11Mbps rate.



Plot # 101. Output 6 peak power. High frequency. 6Mbps rate.



Plot # 102. Output 6 peak power. High frequency. 54Mbps rate.



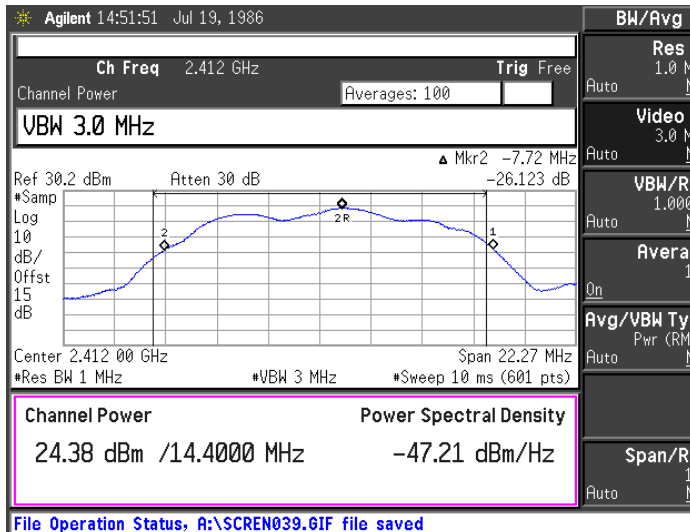
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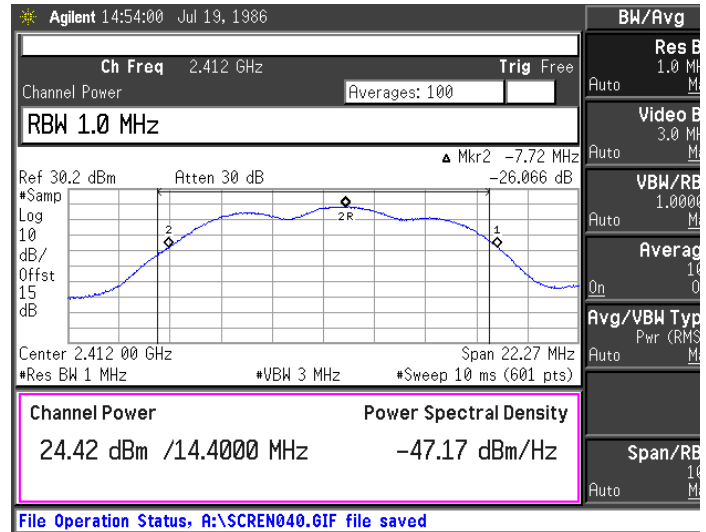
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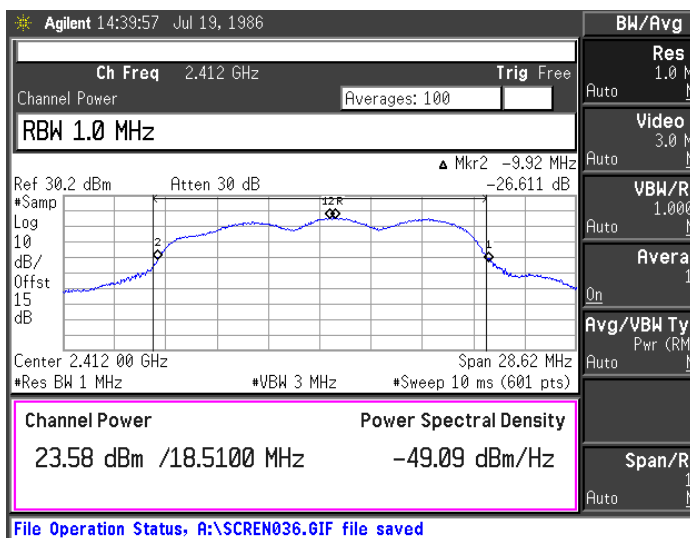
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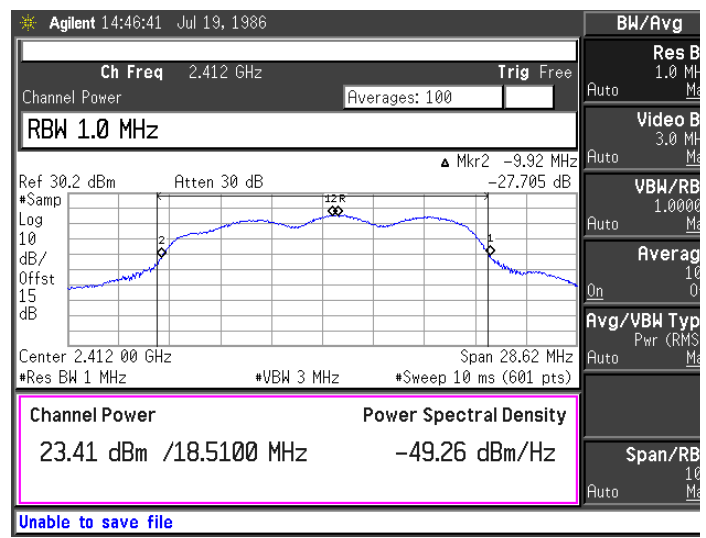
Plot # 103. Combiner output peak power. Low frequency. 1Mbps rate.



Plot # 104. Combiner output peak power. Low frequency. 11Mbps rate.



Plot # 105. Combiner output peak power. Low frequency. 6Mbps rate.



Plot # 106. Combiner output peak power. Low frequency. 54Mbps rate.



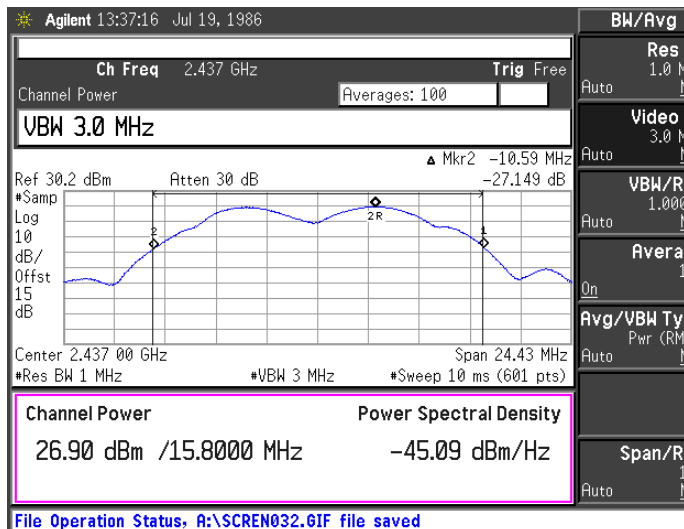
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Title: Test on 2.4 GHz Band Outdoor WiFi (802.11b/g) access point

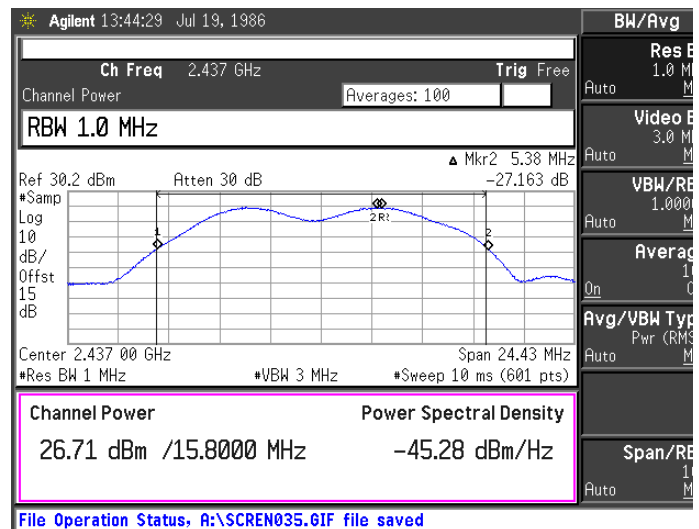
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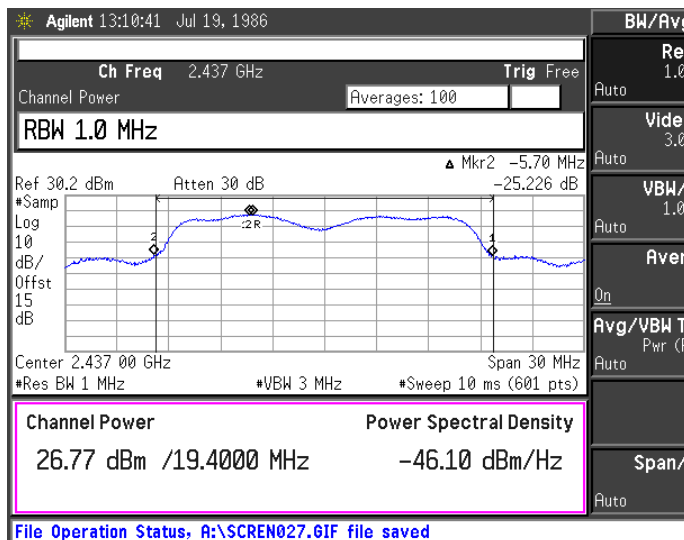
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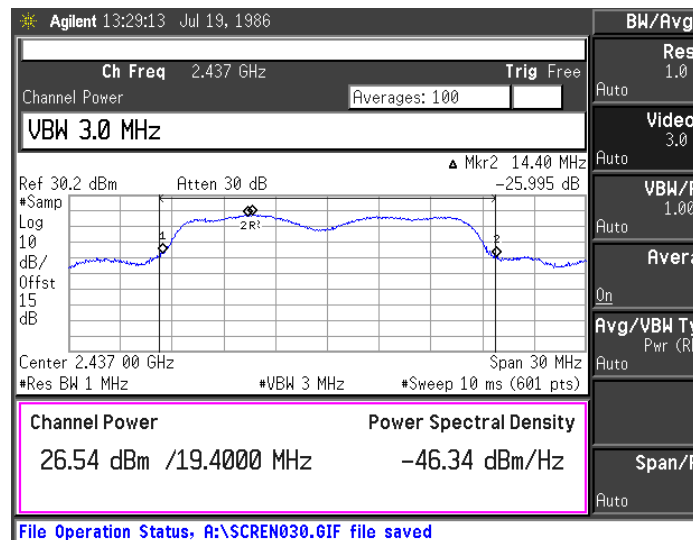
Plot # 107. Combiner output peak power. Middle frequency. 1Mbps rate.



Plot # 108. Combiner output peak power. Middle frequency. 11Mbps rate.



Plot # 109. Combiner output peak power. Middle frequency. 6Mbps rate.



Plot # 110. Combiner output peak power. Middle frequency. 54Mbps rate.

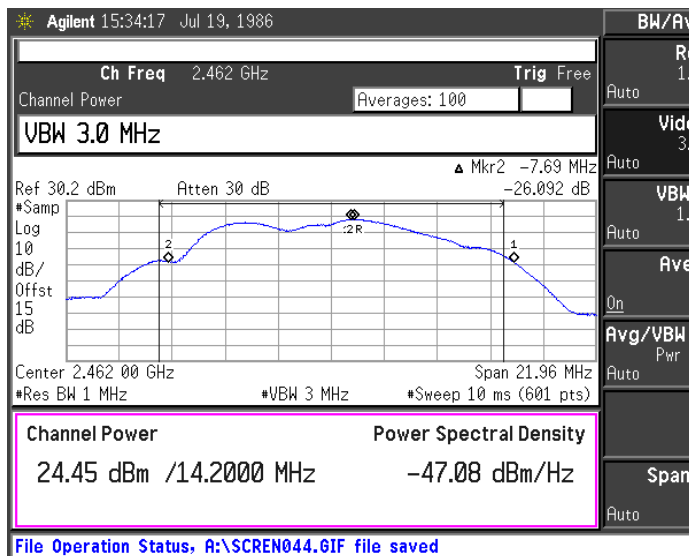
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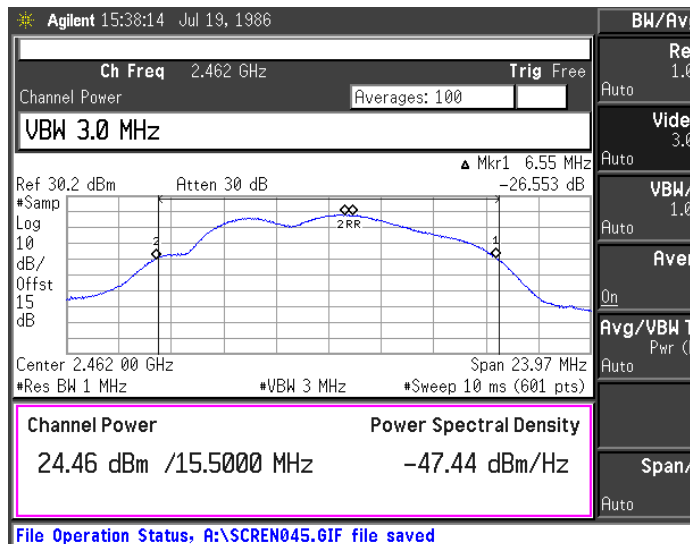
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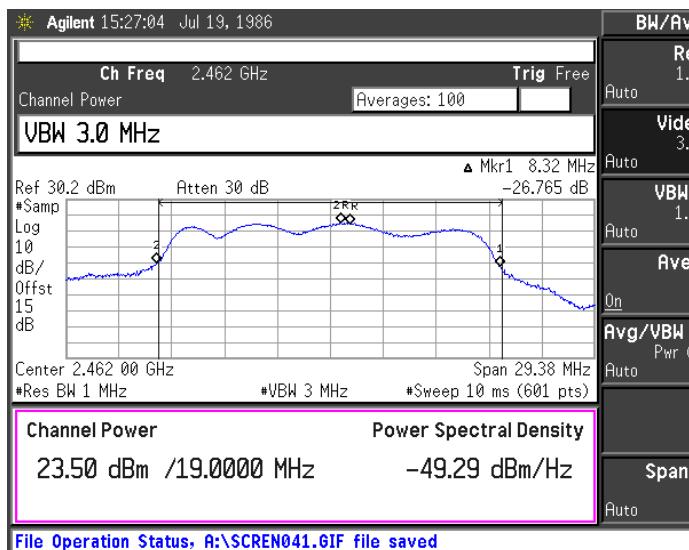
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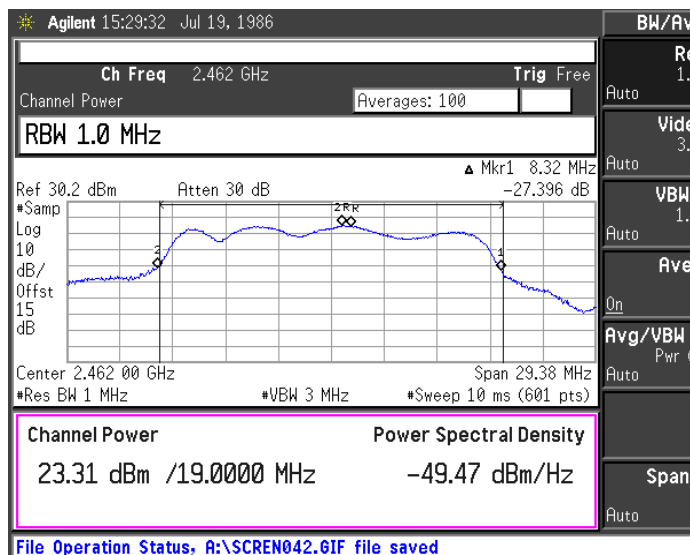
Plot # 111. Combiner output peak power. High frequency. 1Mbps rate.



Plot # 112. Combiner output peak power. High frequency. 11Mbps rate.



Plot # 113. Combiner output peak power. High frequency. 6Mbps rate.



Plot # 114. Combiner output peak power. High frequency. 54Mbps rate.

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### **8.3. Peak power spectral density of digital modulated systems according to § 15.247(d)**

#### **8.3.1. Requirements:**

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission

#### **8.3.2. Test Procedure:**

The measurements were performed in normal (transmitting) mode of operation for carrier (channel) frequency at bottom, middle and the top of the 2.412 - 2.462 GHz frequency range. The EUT RF output was connected to the Spectrum Analyzer and accounted with cable loss in measurement. The maximum level in a 3kHz bandwidth is measured with: RBW=3kHz; VBW>3kHz, sweep time=span/3kHz and video averaging is turned off. The PSD is the highest level found across the emission in any 3kHz band. Additionally, all transmitter outputs were aggregated through a combiner, and the combined output was tested.

#### **8.3.3. Test Results:**

All test results met the requirements.

The summaries of the tests are shown below in Tables 12-14.

The tests were performed with the worst case, which is higher power level.

Frequency MHz	Rate Mbps	Modulation mode	Output 1 PSD [dBm]	Output 2 PSD [dBm]	Output 3 PSD [dBm]	Limit [dBm]	Margin [dBm] Output 1	Plot number	Margin [dBm] Output 2	Plot number	Margin [dBm] Output 3	Plot number
2412	1	802.11b	-8.36	-2.23	-7.28	8	16.36	115	10.23	127	15.28	139
	11	802.11b	-5.76	-0.82	-4.04	8	13.76	116	8.82	128	12.04	140
	6	802.11g	-8.47	-2.32	-7.68	8	16.47	117	10.32	129	15.68	141
	54	802.11g	-8.54	-2.66	-7.06	8	16.54	118	10.66	130	15.06	142
2437	1	802.11b	-4.65	-1.86	-2.58	8	12.65	119	9.86	131	10.58	143
	11	802.11b	-5.24	-3.21	-3.45	8	13.24	120	11.21	132	11.45	144
	6	802.11g	-8.44	-6.76	-6.41	8	16.44	121	14.76	133	14.41	145
	54	802.11g	-8.82	-7.10	-7.30	8	16.82	122	15.10	134	15.30	146
2462	1	802.11b	-6.14	-5.44	-5.33	8	14.14	123	13.44	135	13.33	147
	11	802.11b	-8.01	-6.71	-6.90	8	16.01	124	14.71	136	14.90	148
	6	802.11g	-10.91	-10.85	-10.27	8	18.91	125	18.85	137	18.27	149
	54	802.11g	-11.19	-10.57	-10.03	8	19.19	126	18.57	138	18.03	150

**Table 12.**  
**PSD (Outputs 1-3) test results.**



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Frequency MHz	Rate Mbps	Modulation mode	Output 4 PSD [dBm]	Output 5 PSD [dBm]	Output 6 PSD [dBm]	Limit [dBm]	Margin [dBm] Output 4	Plot number	Margin [dBm] Output 5	Plot number	Margin [dBm] Output 6	Plot number
2412	1	802.11b	-0.65	-1.01	-0.69	8	8.65	151	9.01	163	8.69	175
	11	802.11b	1.07	-0.03	1.34	8	6.93	152	8.03	164	6.66	176
	6	802.11g	0.16	-0.50	-0.36	8	7.84	153	8.5	165	8.36	177
	54	802.11g	-0.40	-1.22	-0.33	8	8.40	154	9.22	166	8.33	178
2437	1	802.11b	-2.97	-2.37	-7.41	8	10.97	155	10.37	167	15.41	179
	11	802.11b	-4.25	-3.36	-3.02	8	12.25	156	11.36	168	11.02	180
	6	802.11g	-8.27	-7.59	-6.98	8	16.27	157	15.59	169	14.98	181
	54	802.11g	-7.82	-7.96	-7.41	8	15.82	158	15.96	170	15.41	182
2462	1	802.11b	-5.09	-4.23	-4.57	8	13.09	159	12.23	171	12.57	183
	11	802.11b	-6.98	-6.32	-6.39	8	14.98	160	14.32	172	14.39	184
	6	802.11g	-9.36	-10.00	-9.20	8	17.36	161	18.00	173	17.20	185
	54	802.11g	-11.28	-10.58	-9.95	8	19.28	162	18.58	174	17.95	186

**Table 13.**  
**PSD (Outputs 4-6) test results.**

Frequency MHz	Rate Mbps	Modulation mode	Limit [dBm]	Calculated Combined (max) Output *, PSD [dBm]	Margin [dBm]	Measured Combined Output, PSD [dBm]	Margin [dBm]	Plot number
2412	1	802.11b	8	5.4	2.60	0.65	7.35	187
	11	802.11b	8	7.1	0.90	1.65	6.35	188
	6	802.11g	8	5.7	2.30	-0.74	8.74	189
	54	802.11g	8	5.4	2.60	-0.57	8.57	190
2437	1	802.11b	8	4.5	3.50	4.7	3.3	191
	11	802.11b	8	4.1	3.90	4.99	3.01	192
	6	802.11g	8	0.4	7.60	4.34	3.66	193
	54	802.11g	8	0.1	7.90	4.87	3.13	194
2462	1	802.11b	8	2.7	5.30	0.43	7.57	195
	11	802.11b	8	0.9	7.10	1.72	6.28	196
	6	802.11g	8	-2.3	10.30	0.49	7.51	197
	54	802.11g	8	-2.8	10.80	-0.23	8.23	198

**Table 14.**  
**PSD (Combined Output) test results.**

(\*)- Calculated Combined (max) Output, PSD [dBm] is the sum of the measured PSD from all Output terminals, where each result (PSD from separate output terminal) mathematically converted from Logarithm to linear units. The results were present in dBm.

For example, the calculation for 2412 MHz frequency (1 Mbps bit rate, 802.11b modulation) is the following:

1. (-8.36) dBm = 0.15mW; (-2.23) dBm = 0.60mW; (-7.28) dBm = 0.19mW; (-0.65) dBm = 0.86mW; (-1.01) dBm = 0.79mW; (-0.69) dBm = 0.85 mW
2.  $0.15+0.60+0.19+0.86+0.79+0.85 = 3.44$  [mW]
3.  $3.44\text{mW} = 5.4\text{dBm}$

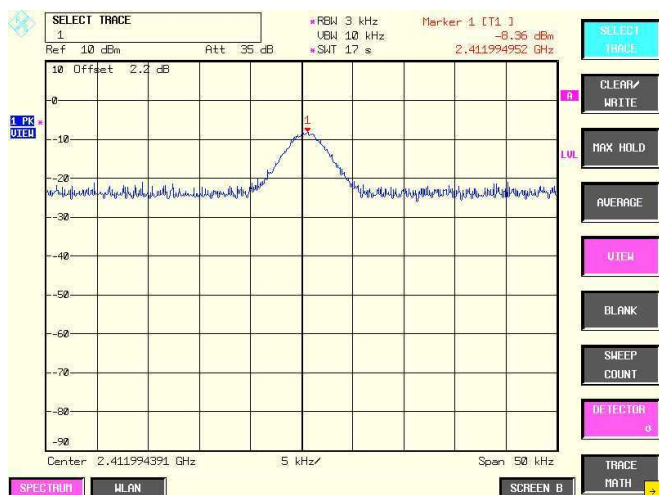
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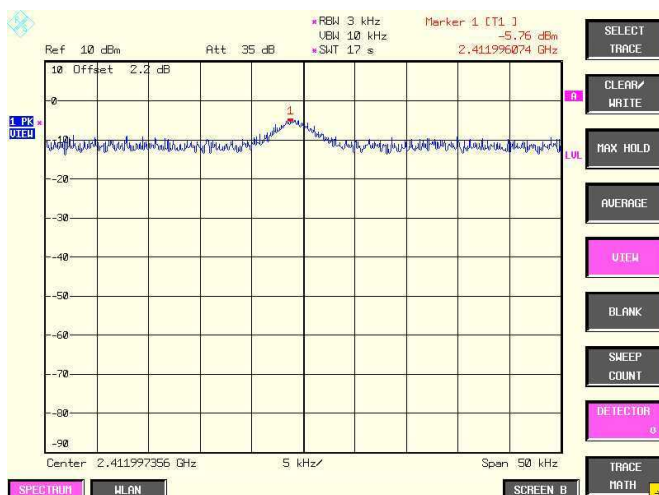
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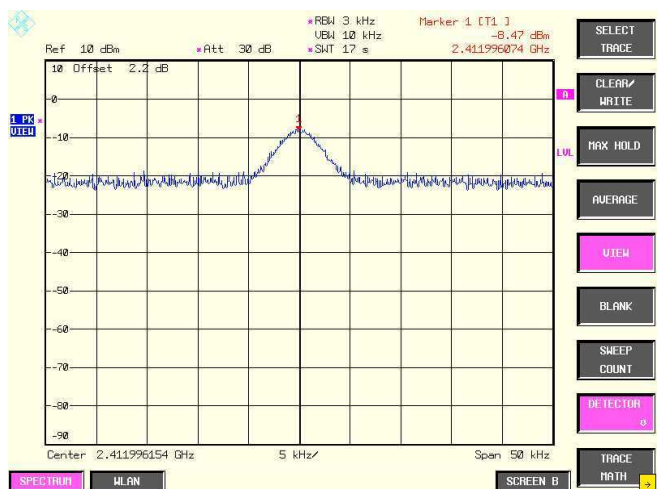
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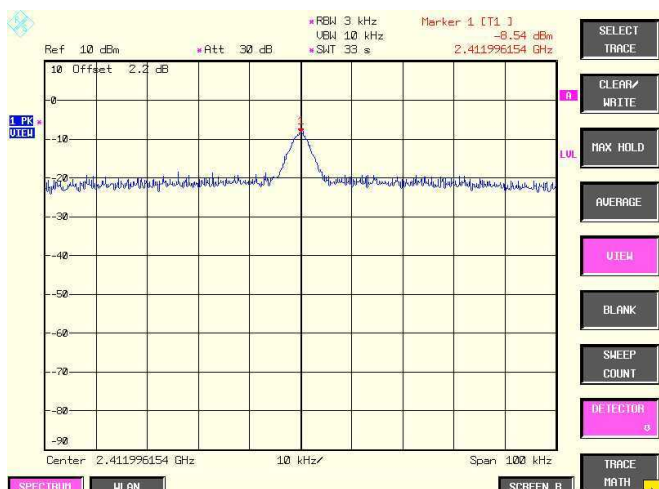
Plot # 115. Transmitter output 1. Peak Power Spectral Density.  
Low frequency. 1Mbps rate.



Plot # 116. Transmitter output 1. Peak Power Spectral Density.  
Low frequency. 11Mbps rate.



Plot # 117. Transmitter output 1. Peak Power Spectral Density.  
Low frequency. 6Mbps rate.



Plot # 118. Transmitter output 1. Peak Power Spectral Density.  
Low frequency. 54Mbps rate.

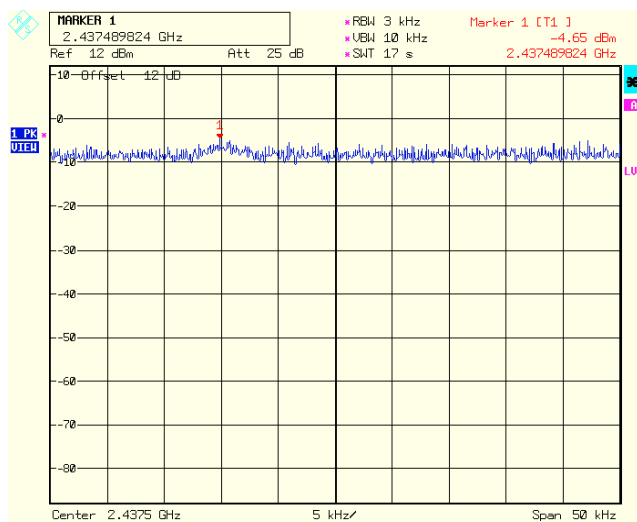
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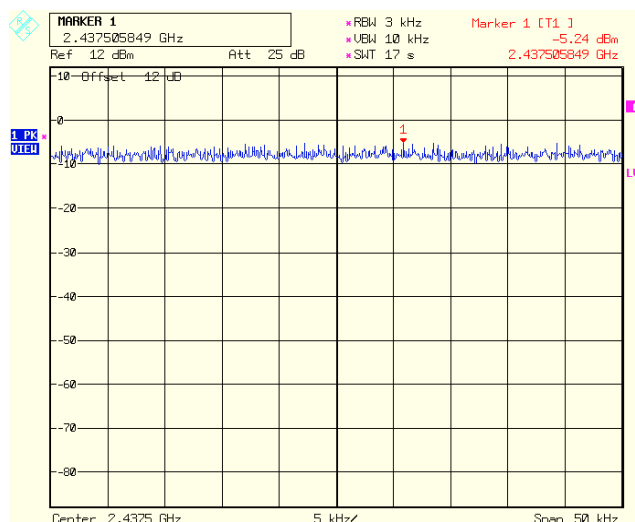
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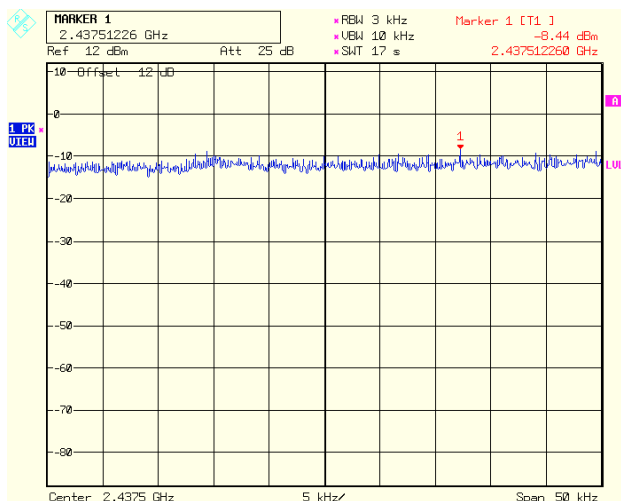
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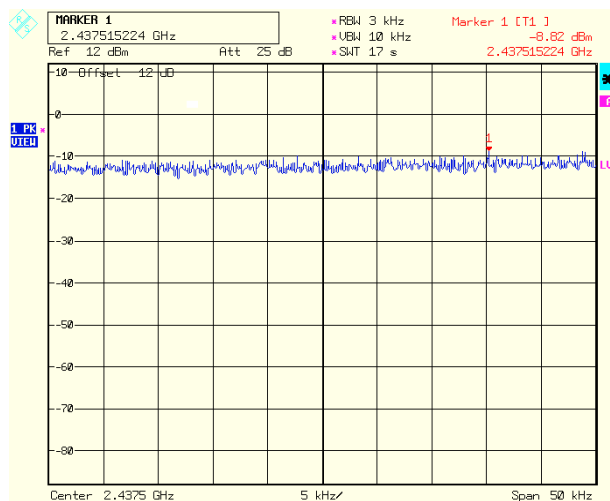
**Plot # 119. Transmitter output 1.  
Peak Power Spectral Density.  
Middle frequency. 1Mbps rate.**



**Plot # 120. Transmitter output 1.  
Peak Power Spectral Density.  
Middle frequency. 11Mbps rate.**



**Plot # 121. Transmitter output 1.  
Peak Power Spectral Density.  
Middle frequency. 6Mbps rate.**



**Plot # 122. Transmitter output 1.  
Peak Power Spectral Density.  
Middle frequency. 54Mbps rate.**



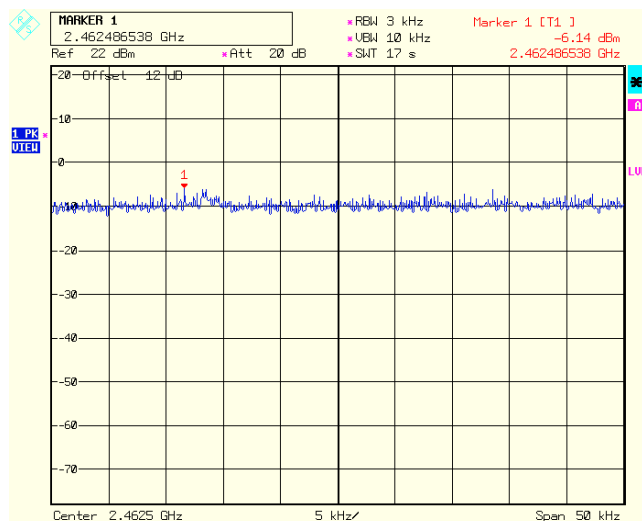
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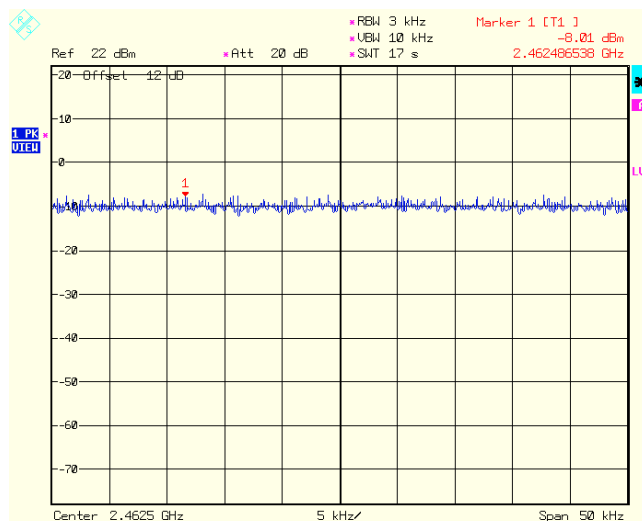
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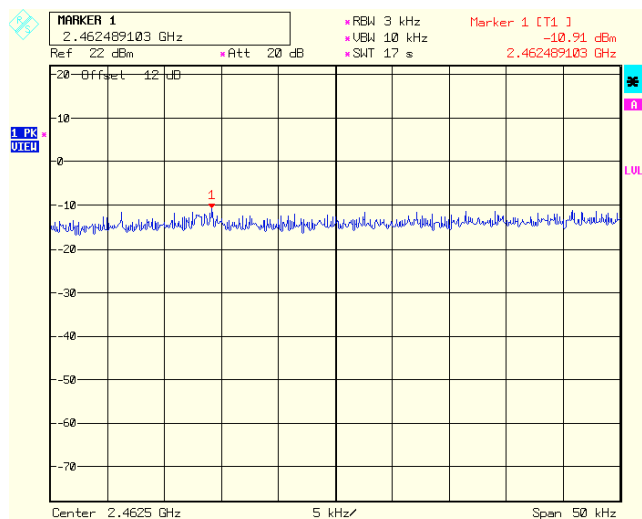
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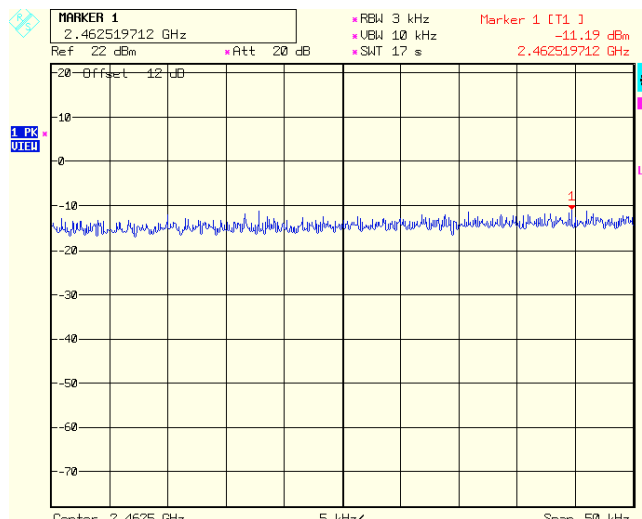
Plot # 123. Transmitter output 1.  
Peak Power Spectral Density.  
High frequency. 1Mbps rate.



Plot # 124. Transmitter output 1.  
Peak Power Spectral Density.  
High frequency. 11Mbps rate.



Plot # 125. Transmitter output 1.  
Peak Power Spectral Density.  
High frequency. 6Mbps rate.



Plot # 126. Transmitter output 1.  
Peak Power Spectral Density.  
High frequency. 54Mbps rate.

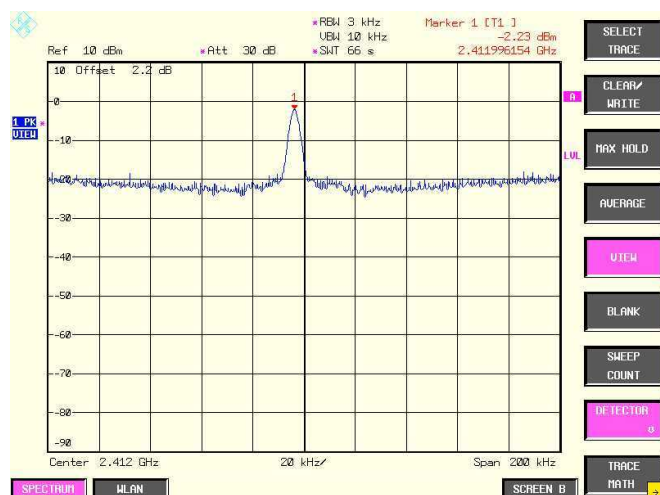
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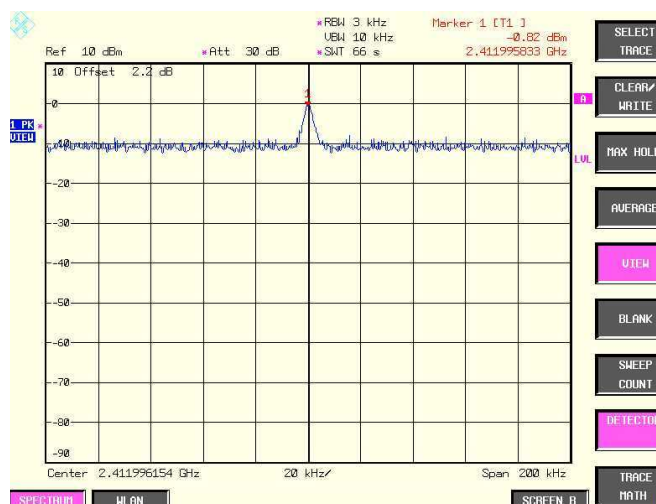
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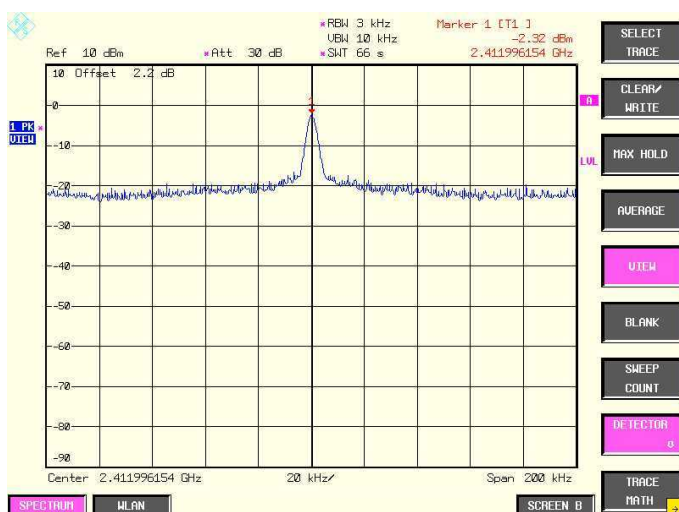
FCC ID: UGMWS410



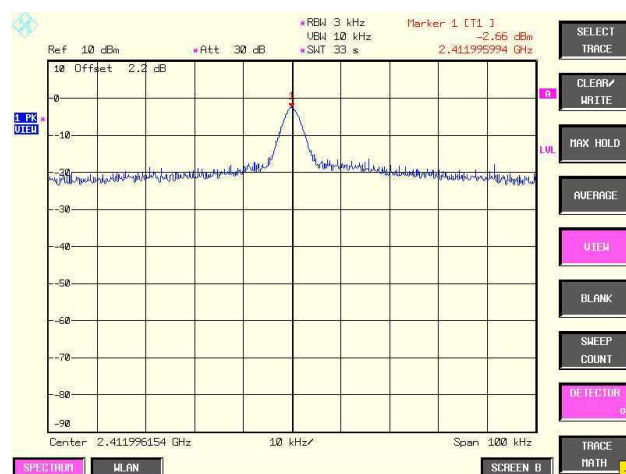
Plot # 127. Transmitter output 2.  
Peak Power Spectral Density.  
Low frequency. 1Mbps rate.



Plot # 128. Transmitter output 2.  
Peak Power Spectral Density.  
Low frequency. 11Mbps rate.



Plot # 129. Transmitter output 2.  
Peak Power Spectral Density.  
Low frequency. 6Mbps rate.



Plot # 130. Transmitter output 2.  
Peak Power Spectral Density.  
Low frequency. 54Mbps rate.

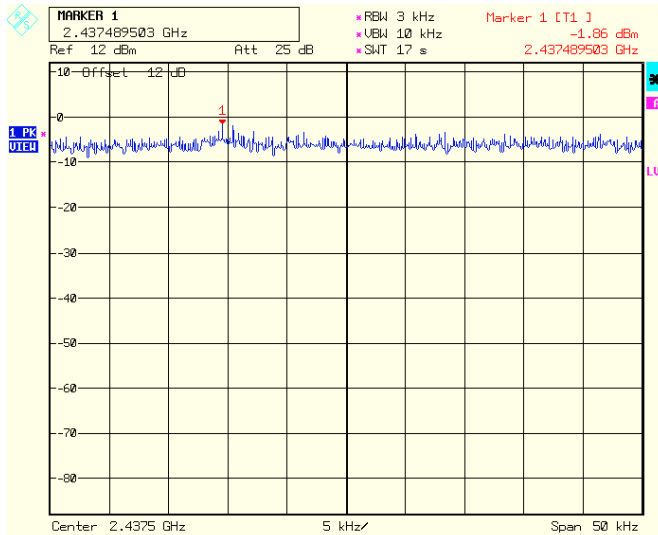
Test Report No.: 8612332644

Title: Test on 2.4 GHz Band Outdoor WiFi (802.11b/g) access point

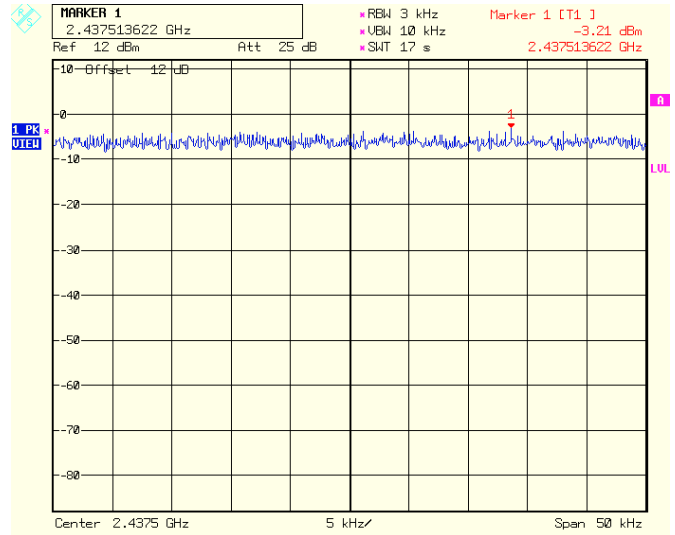
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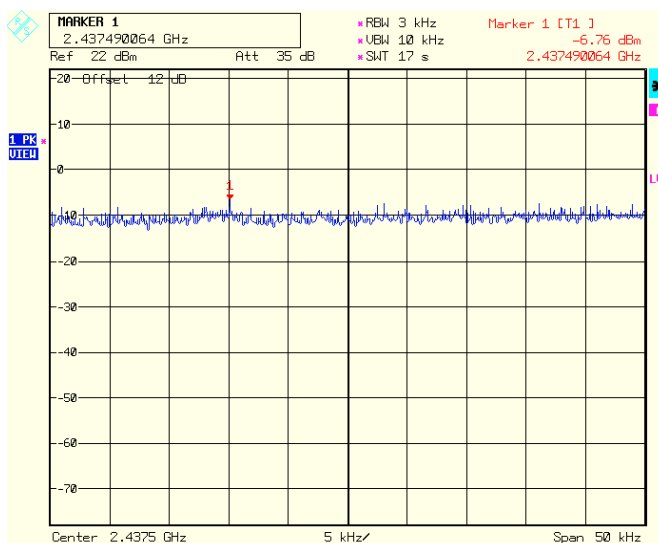
FCC ID: UGMWS410



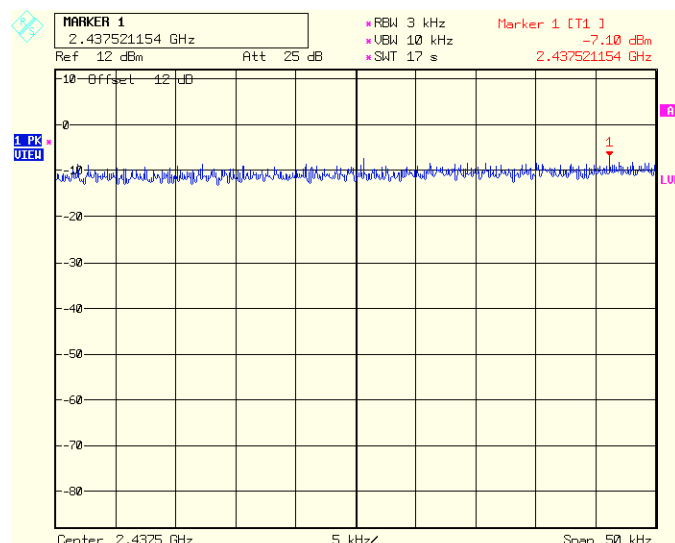
**Plot # 131. Transmitter output 2.  
Peak Power Spectral Density.  
Middle frequency. 1Mbps rate.**



**Plot # 132. Transmitter output 2.  
Peak Power Spectral Density.  
Middle frequency. 11Mbps rate.**



**Plot # 133. Transmitter output 2.  
Peak Power Spectral Density.  
Middle frequency. 6Mbps rate.**



**Plot # 134. Transmitter output 2.  
Peak Power Spectral Density.  
Middle frequency. 54Mbps rate.**



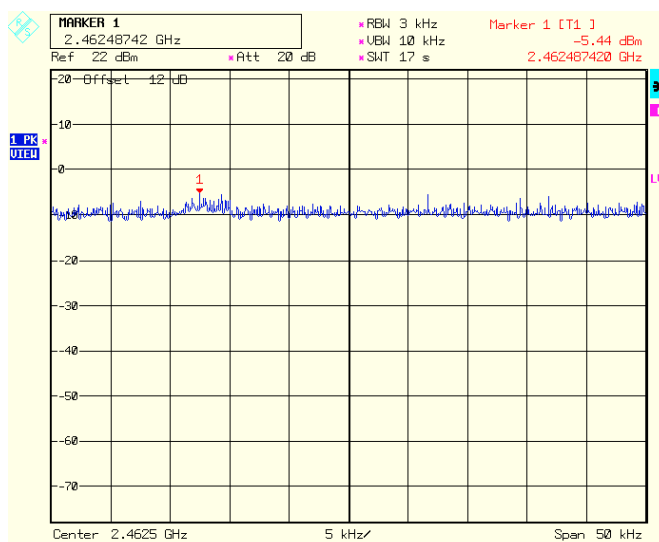
Test Report No.: 8612332644

Title: Test on 2.4 GHz Band Outdoor WiFi (802.11b/g) access point

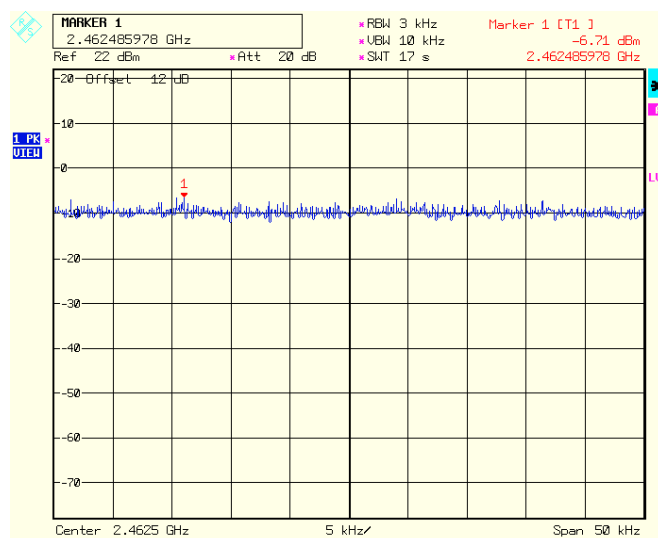
Model: WS410

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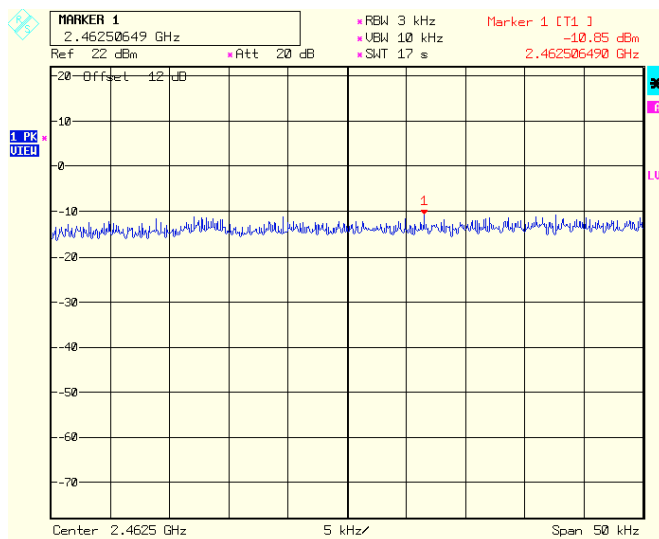
FCC ID: UGMWS410



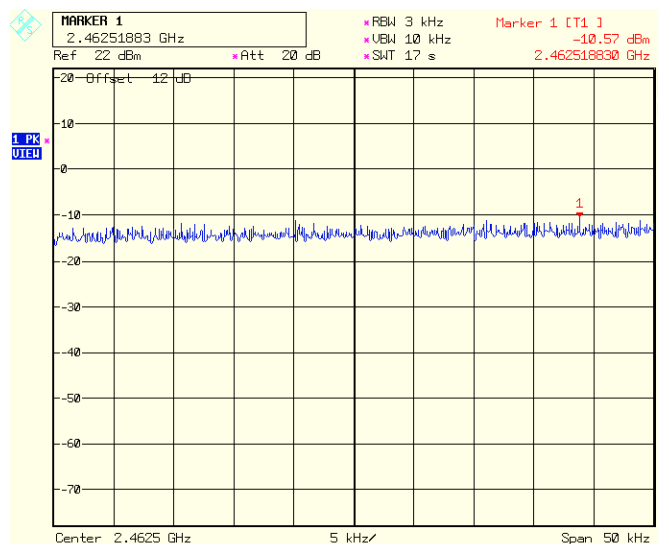
**Plot # 135. Transmitter output 2.  
Peak Power Spectral Density.  
High frequency. 1Mbps rate.**



**Plot # 136. Transmitter output 2.  
Peak Power Spectral Density.  
High frequency. 11Mbps rate.**



**Plot # 137. Transmitter output 2.  
Peak Power Spectral Density.  
High frequency. 6Mbps rate.**



**Plot # 138. Transmitter output 2.  
Peak Power Spectral Density.  
High frequency. 54Mbps rate.**

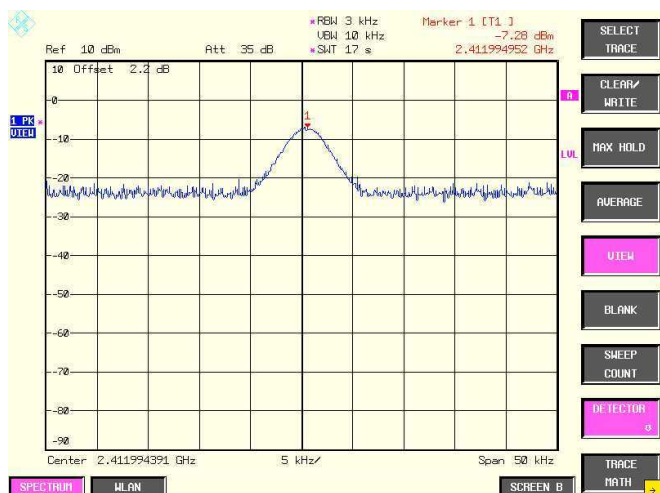
Test Report No.: 8612332644

Title: Test on 2.4 GHz Band Outdoor WiFi (802.11b/g) access point

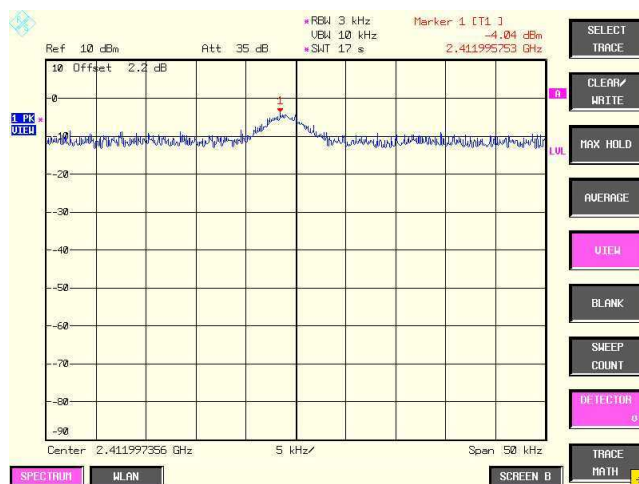
Model: WS410

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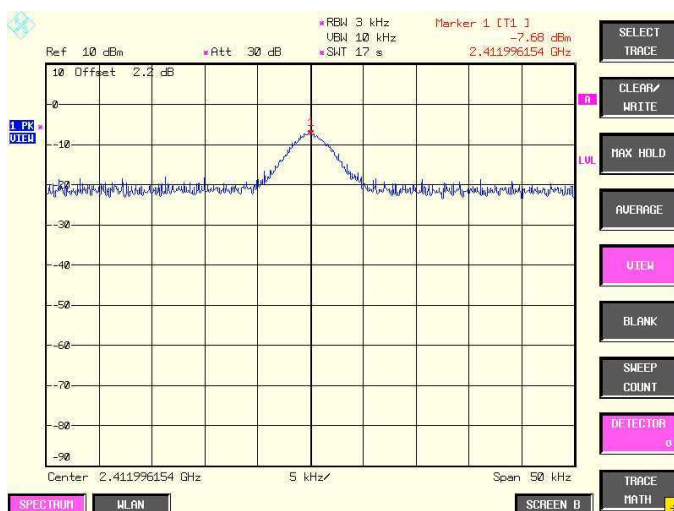
FCC ID: UGMWS410



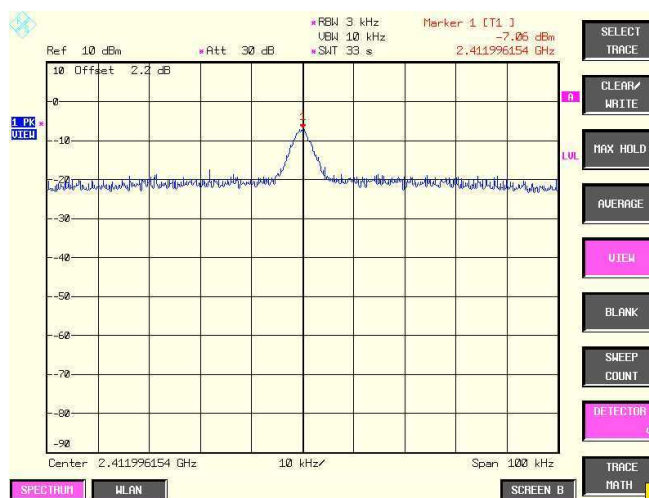
Plot # 139. Transmitter output 3.  
Peak Power Spectral Density.  
Low frequency. 1Mbps rate.



Plot # 140. Transmitter output 3.  
Peak Power Spectral Density.  
Low frequency. 11Mbps rate.



Plot # 141. Transmitter output 3.  
Peak Power Spectral Density.  
Low frequency. 6Mbps rate.



Plot # 142. Transmitter output 3.  
Peak Power Spectral Density.  
Low frequency. 54Mbps rate.

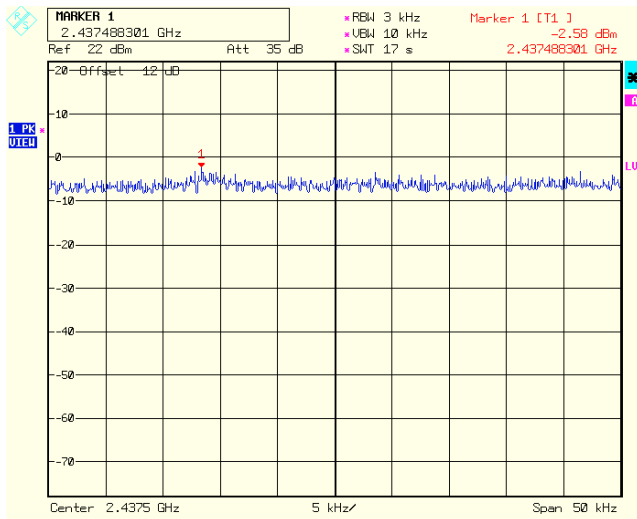
Test Report No.: 8612332644

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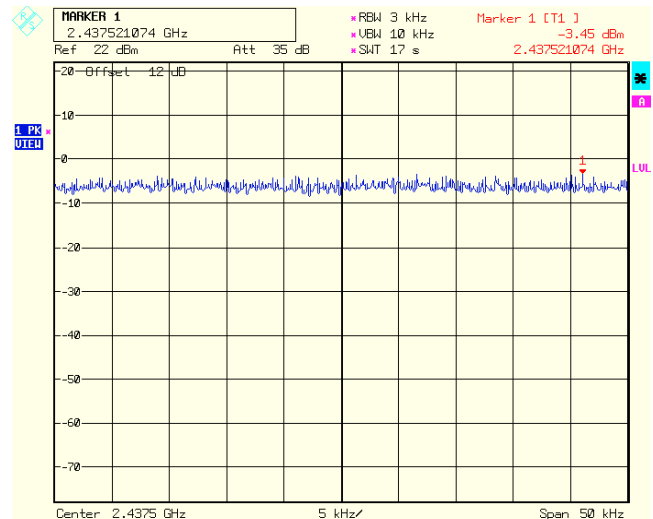
Title: Test on 2.4 GHz Band Outdoor WiFi (802.11b/g) access point

Model: WS410

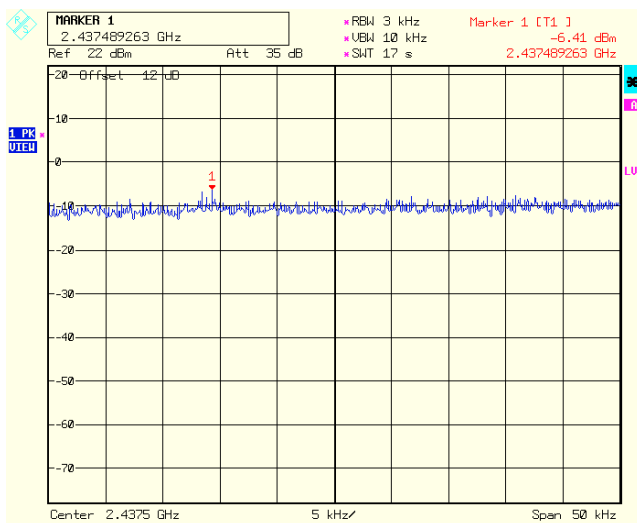
FCC ID: UGMWS410



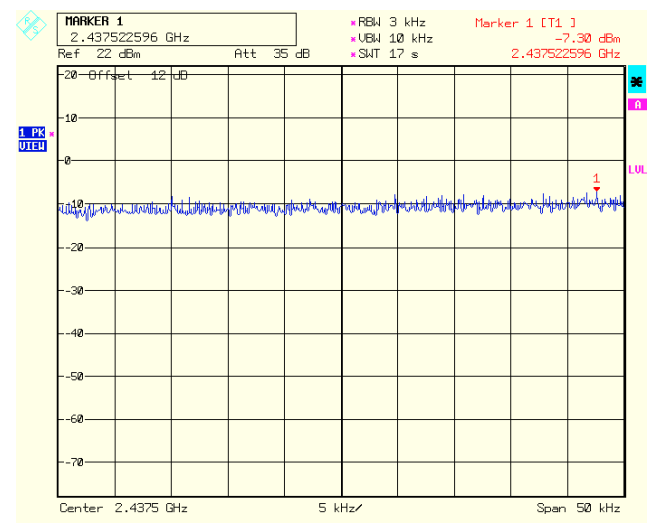
**Plot # 143. Transmitter output 3.  
Peak Power Spectral Density.  
Middle frequency. 1Mbps rate.**



**Plot # 144. Transmitter output 3.  
Peak Power Spectral Density.  
Middle frequency. 11Mbps rate.**



**Plot # 145. Transmitter output 3.  
Peak Power Spectral Density.  
Middle frequency. 6Mbps rate.**



**Plot # 146. Transmitter output 3.  
Peak Power Spectral Density.  
Middle frequency. 54Mbps rate.**