

Test Report No.: 8812372861

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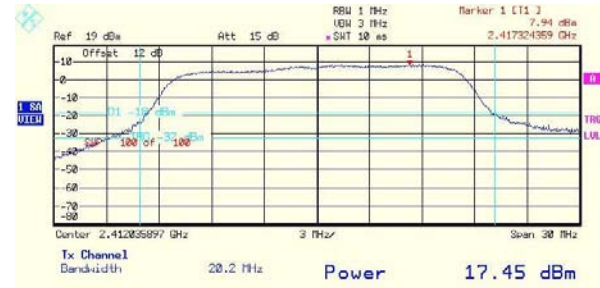
Title: Test on 2.4 GHz Band Outdoor WiFi (802.11b/g) Wireless Base Station

Model: WBS-2400

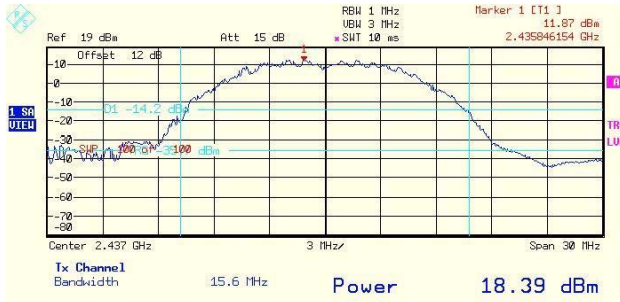
FCC ID: UGM-WBS2400-2



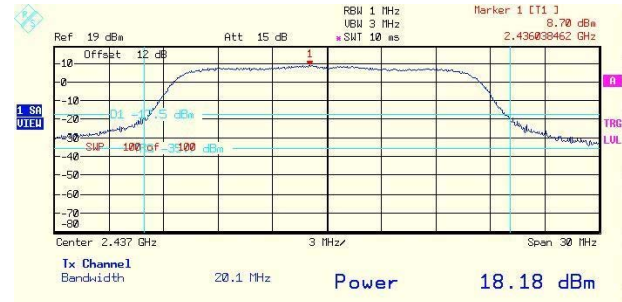
Plot # 168. Output 6 peak power. Lower frequency. 1Mbps rate.



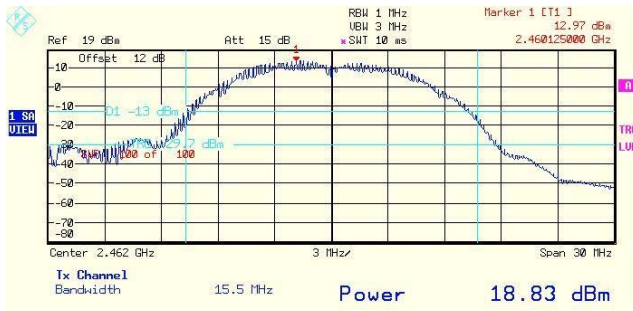
Plot # 169. Output 6 peak power. Lower frequency. 6Mbps rate.



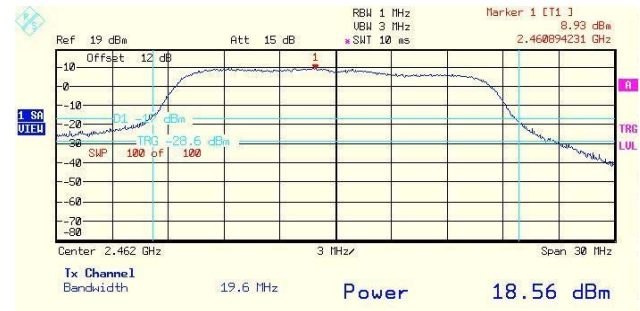
Plot # 170. Output 6 peak power. Middle frequency. 1Mbps rate.



Plot # 171. Output 6 peak power. Middle frequency. 6Mbps rate.



Plot # 172. Output 6 peak power. High frequency. 1Mbps rate.



Plot # 173. Output 6 peak power. High frequency. 6Mbps rate.

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

7.10.1. 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

7.10.2. Pre-test scanning:

In order to find the “worst case” sample, which can represent all kinds of RF filters, each filter (Murata and Bitel filters) was pre-tested.

After all PSD tests the Bitel model was chosen as the “worst case”, all final measurements were performed with 6 Bitel filters.

7.10.3. 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, the peak power spectral density from combined (max.) output was calculated and presented in table 13.

7.10.4. Test Results:

Pre-compliance measurements

The WBS-2400 configurations for preliminary tests were as following: 2 RF filters Murata (outputs 1 & 2), 4 RF filter Bitel (outputs 3 -6).

The summaries of preliminary PSD measurements are shown in Table 12. The plots of pre-scan for each kind of 2 RF filters (outputs 1&6 accordantly) are presented on the plots 174-185.

Frequency MHz	Rate Mbps	Limit [dBm]	Output 1 PSD [dBm]	Output 6 PSD [dBm]
			Murata	Bitel
2412	1	8	-4.50	-2.67
	6	8	-4.63	-3.85
2437	1	8	-4.62	-3.40
	6	8	-5.98	-3.75
2462	1	8	-4.40	-2.58
	6	8	-7.70	-4.38

Table 12.
Preliminary PSD test results.

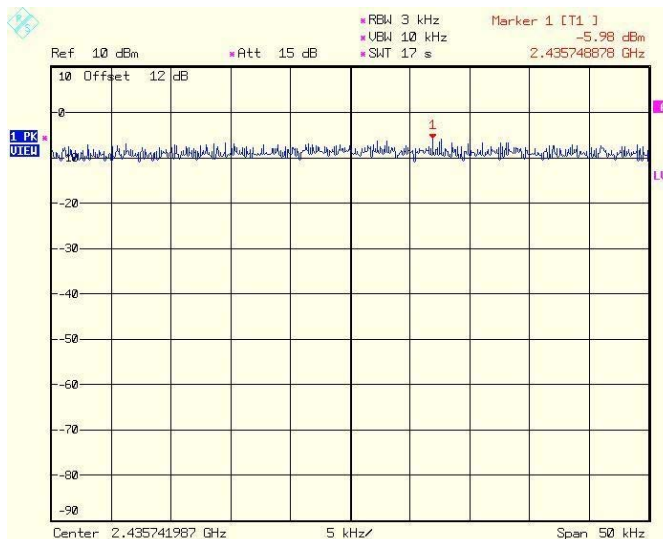
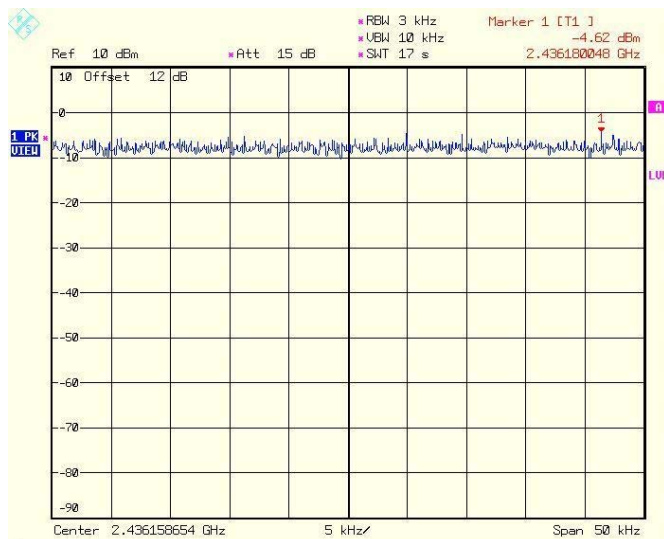
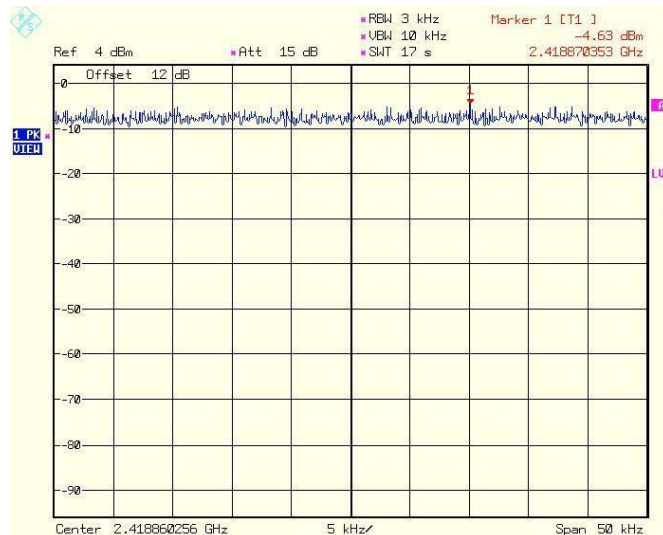
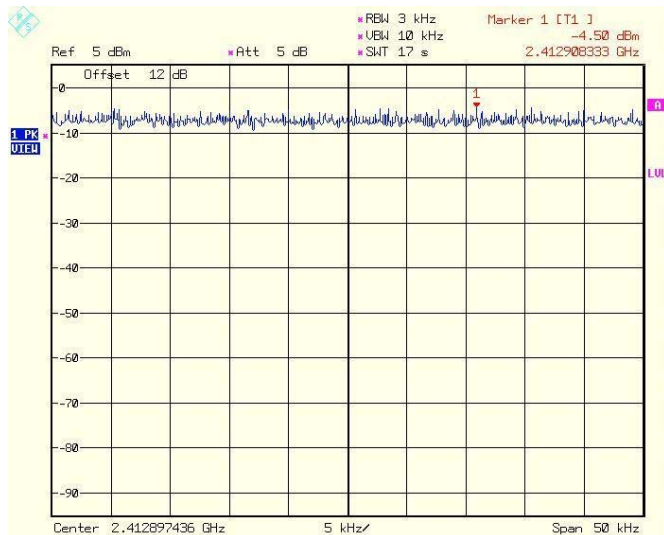
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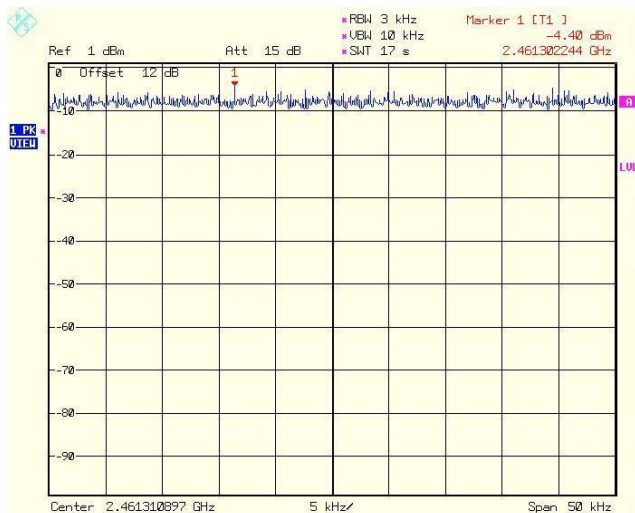
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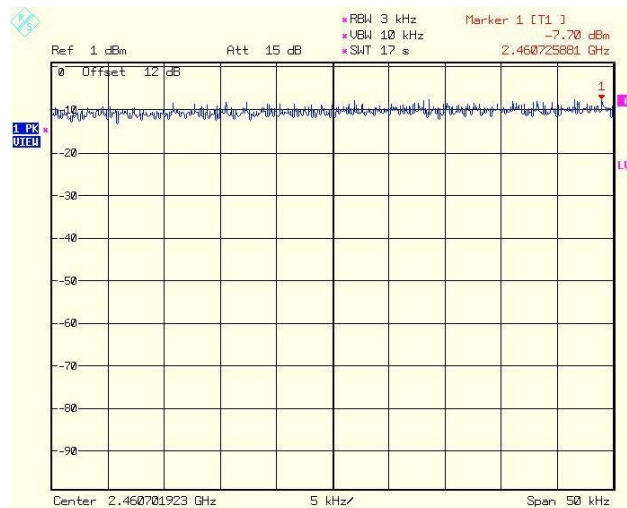
Title: Test on 2.4 GHz Band Outdoor WiFi (802.11b/g) Wireless Base Station

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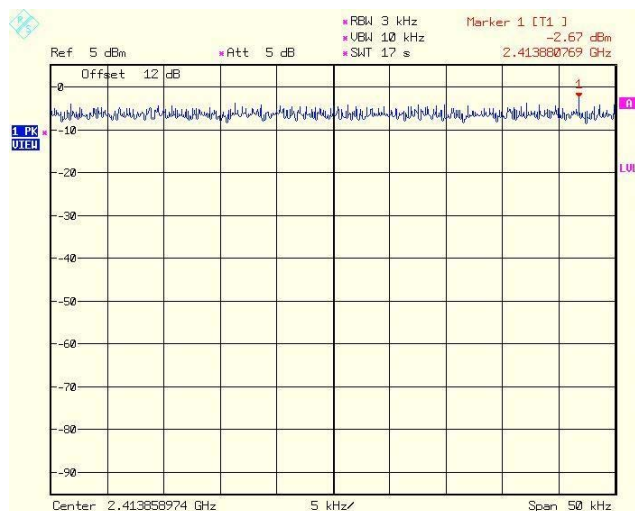
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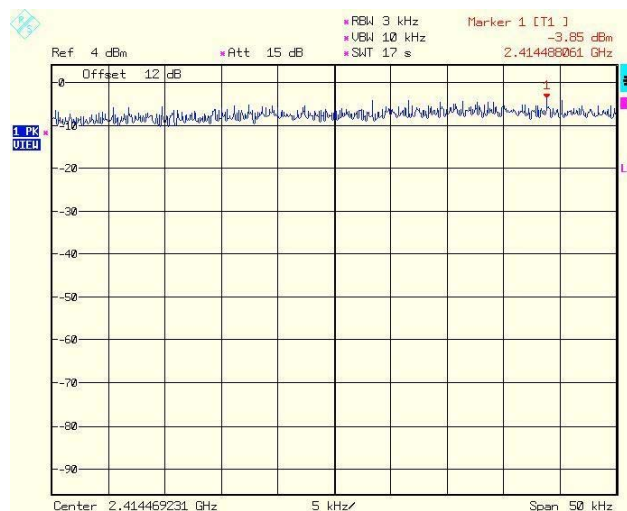
**Plot # 178. Transmitter output 1.
Peak Power Spectral Density.
High frequency. 1Mbps rate.**



**Plot # 179. Transmitter output 1.
Peak Power Spectral Density.
High frequency. 6Mbps rate.**



**Plot # 180. Transmitter output 6.
Peak Power Spectral Density.
Low frequency. 1Mbps rate.**



**Plot # 181. Transmitter output 6.
Peak Power Spectral Density.
Low frequency. 6Mbps rate.**

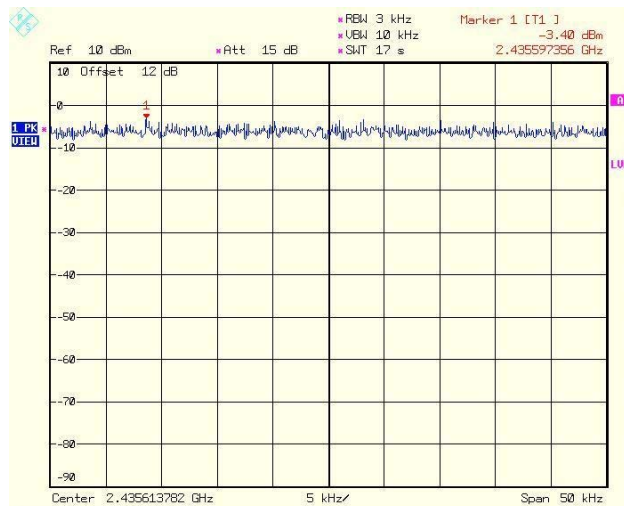
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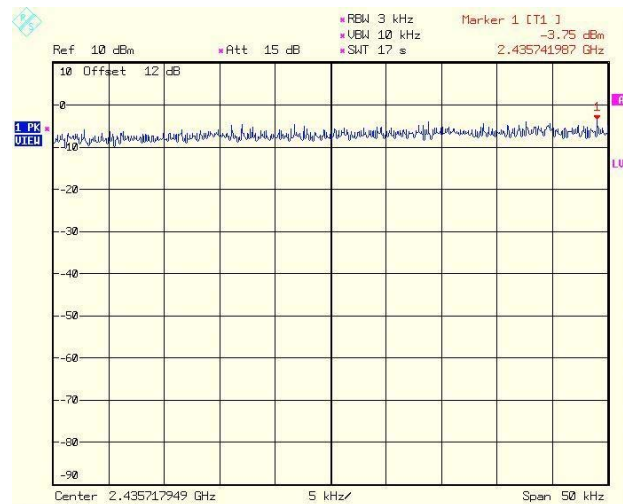
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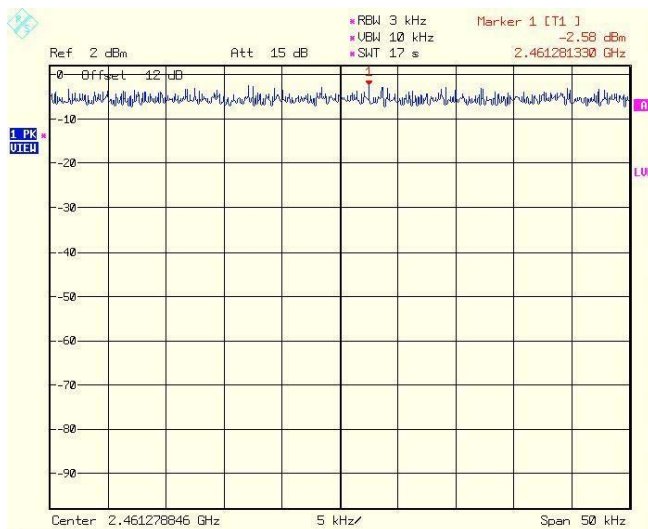
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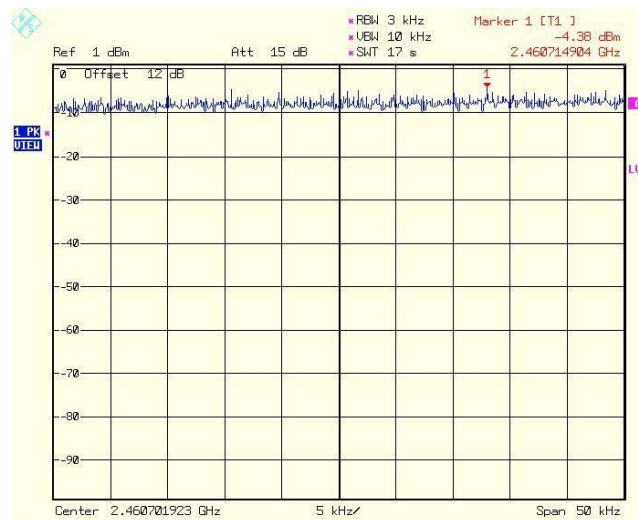
**Plot # 182. Transmitter output 6.
Peak Power Spectral Density.
Middle frequency. 1Mbps rate.**



**Plot # 183. Transmitter output 6.
Peak Power Spectral Density.
Middle frequency. 6Mbps rate.**



**Plot # 184. Transmitter output 6.
Peak Power Spectral Density.
High frequency. 1Mbps rate.**



**Plot # 185. Transmitter output 6.
Peak Power Spectral Density.
High frequency. 6Mbps rate.**

Following pre-scan tests results the “worst case” from the point of view of spurious emissions is Bitel filter.

The final configuration has been built with 6 Bitel RF filters.

All test results met the requirements and presented on the plots 186-221.

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Title: Test on 2.4 GHz Band Outdoor WiFi (802.11b/g) Wireless Base Station

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Frequency MHz	Rate Mbps	Modulation mode	Output 1 PSD [dBm]	Output 2 PSD [dBm]	Output 3 PSD [dBm]	Limit [dBm]	Margin [dB] Output 1	Plot number	Margin [dB] Output 2	Plot number	Margin [dB] Output 3	Plot number
2412	1	802.11b	-2.42	-2.65	-4.68	8	10.42	186	10.65	192	12.68	198
	6	802.11g	-5.60	-4.91	-4.96	8	13.60	187	12.91	193	12.96	199
2437	1	802.11b	-2.65	-2.94	-2.92	8	10.65	188	10.94	194	10.92	200
	6	802.11g	-5.03	-5.25	-5.02	8	13.03	189	13.25	195	13.02	201
2462	1	802.11b	-3.34	-3.74	-2.51	8	11.34	190	11.74	196	10.51	202
	6	802.11g	-4.77	-4.82	-4.52	8	12.77	191	12.82	197	12.52	203

Table 13.
PSD (Outputs 1-3) test results.

Frequency MHz	Rate Mbps	Modulation mode	Output 4 PSD [dBm]	Output 5 PSD [dBm]	Output 6 PSD [dBm]	Limit [dBm]	Margin [dB] Output 4	Plot number	Margin [dB] Output 5	Plot number	Margin [dB] Output 6	Plot number
2412	1	802.11b	-3.17	-3.77	-3.46	8	11.17	204	11.77	210	11.46	216
	6	802.11g	-5.40	-5.14	-5.16	8	13.40	205	13.14	211	13.16	217
2437	1	802.11b	-3.71	-2.84	-2.80	8	11.71	206	10.84	212	10.80	218
	6	802.11g	-4.33	-4.53	-4.67	8	12.33	207	12.53	213	12.67	219
2462	1	802.11b	-4.14	-2.87	-3.37	8	12.14	208	10.87	214	11.37	220
	6	802.11g	-5.41	-5.04	-5.32	8	13.41	209	13.04	215	13.32	221

Table 14.
PSD (Outputs 4-6) test results.

Frequency MHz	Rate Mbps	Modulation mode	Limit [dBm]	Calculated Combined (max) Output *, PSD [dBm]	Margin [dB]
2412	1	802.11b	8	4.49	3.51
	6	802.11g	8	2.59	5.41
2437	1	802.11b	8	4.82	3.18
	6	802.11g	8	2.99	5.01
2462	1	802.11b	8	4.49	3.51
	6	802.11g	8	2.81	5.19

Table 15.
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. (-2.42) dBm = 0.57mW; (-2.65) dBm = 0.54mW; (-4.68) dBm = 0.34mW; (-3.17) dBm = 0.48mW; (-3.77) dBm = 0.42mW; (-3.46) dBm = 0.45 mW
2. $0.57+0.54+0.34+0.48+0.42+0.45=2.81$ [mW]
3. 2.39 mW = 4.49 dBm

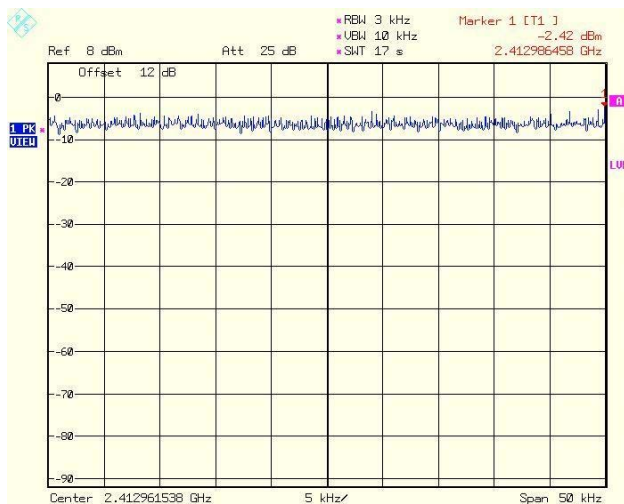
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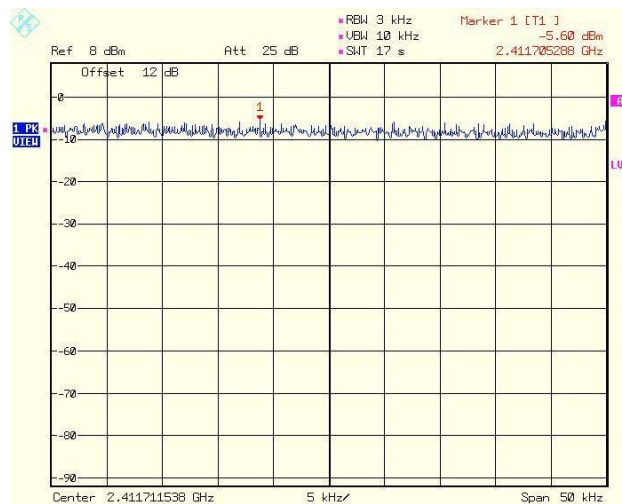
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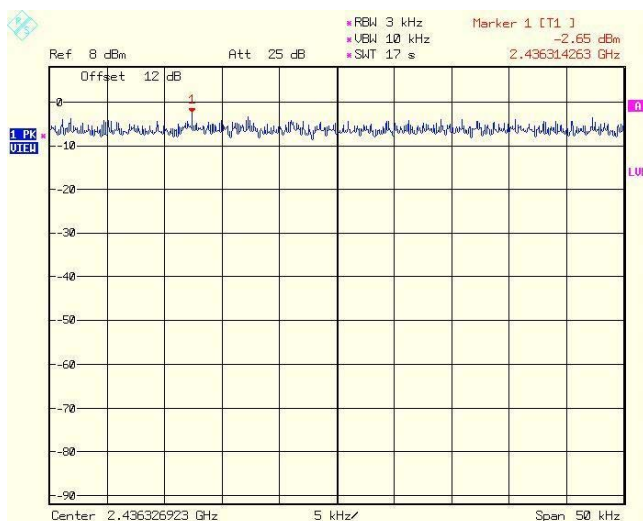
Plot # 186. Transmitter output 1. Peak Power Spectral Density.

Low frequency. 1Mbps rate.



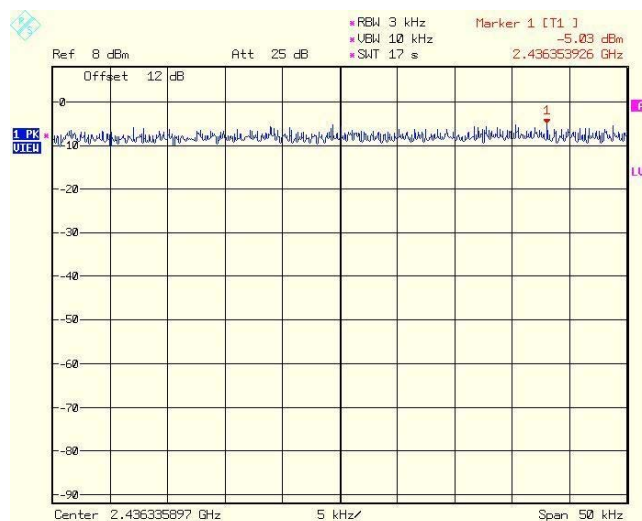
Plot # 187. Transmitter output 1. Peak Power Spectral Density.

Low frequency. 6Mbps rate.



Plot # 188. Transmitter output 1. Peak Power Spectral Density.

Middle frequency. 1Mbps rate.



Plot # 189. Transmitter output 1. Peak Power Spectral Density.

Middle frequency. 6Mbps rate.

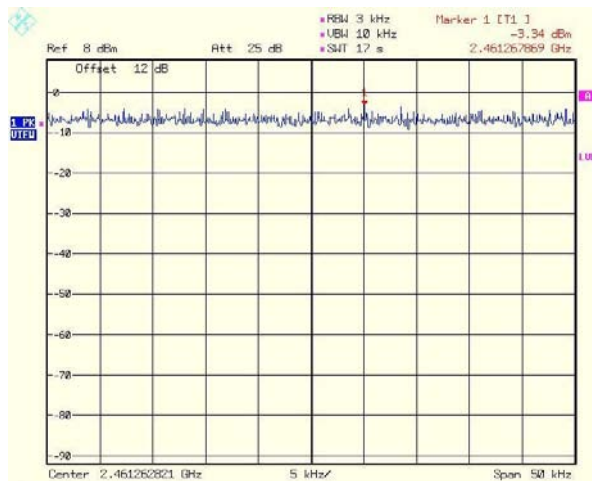
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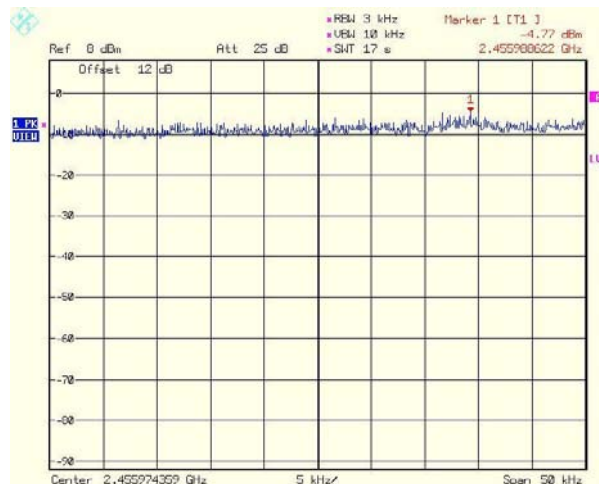
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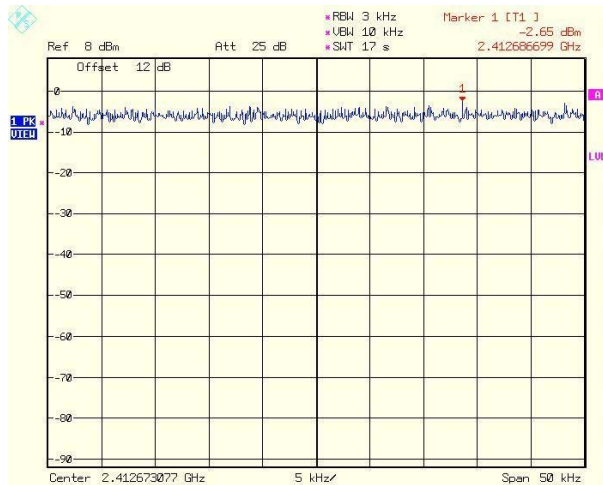
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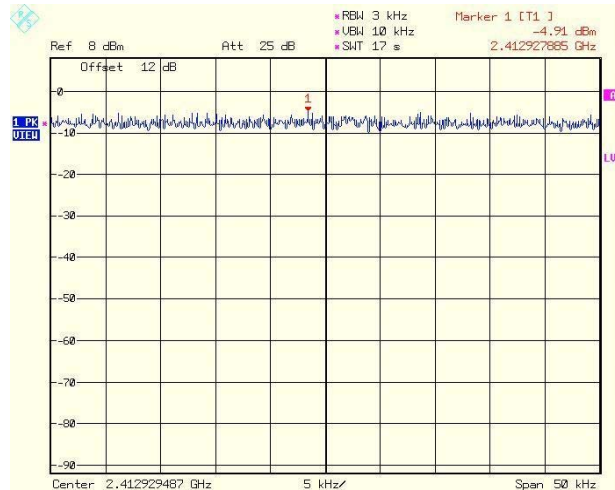
**Plot # 190. Transmitter output 1.
Peak Power Spectral Density.
High frequency. 1Mbps rate.**



**Plot # 191. Transmitter output 1.
Peak Power Spectral Density.
High frequency. 6Mbps rate.**



**Plot # 192. Transmitter output 2.
Peak Power Spectral Density.
Low frequency. 1Mbps rate.**



**Plot # 193. Transmitter output 2.
Peak Power Spectral Density.
Low frequency. 6Mbps rate.**