Analysis of Averaging when Measuring Spectral Regrowth

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For FCC compliance, WJ is interested in measuring the difference in average power at two different frequencies in the same resolution bandwidth. The question arises in how to measure the average power difference. Should video filtering or signal averaging be used? The work in this report was done using a FSEB-30 Rohde and Schwarz Spectrum Analyzer.

Figure 1 illustrates the 6 MHz Orthogonal Frequency Division Multiplex (OFDM) spectral mask provided to WJ by their customer measured with a resolution filter bandwidth of 100 kHz and a video filter bandwidth of 100 kHz. The signal has a high peak-to-average ratio and requires averaging to accurately determine the relative level of the powers at the off-channel frequencies.

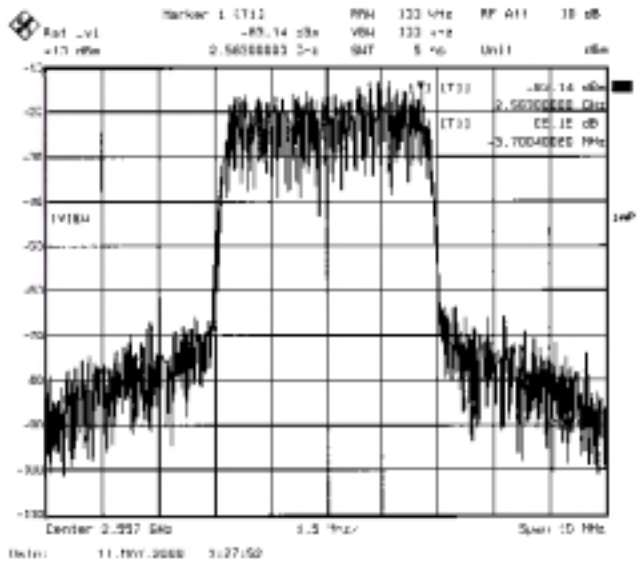

Figure 1. MMDS Spectral Mask (RB=100kHz, VB=100 kHz, Averaging=0).

Averaging the signal can take place through averaging the results of numerous traces or by the use of video filtering. From page 4.152 of the Rohde and Schwarz Spectrum Analyzer Manual:

> The video filters are used to smooth the traces. Small video bandwidths in relation to the resolution bandwidth average out noise peaks pulse-like signals such that only the average value of the signals is displayed.

The signal in Figure 1 was averaged in two ways. Two hundred traces were averaged together (Figure 2) and the video bandwidth filter was set to 100 Hz (Figure 3). Both results are nearly identical. Table 1 lists the data collected at 3 MHz from the channel edge.

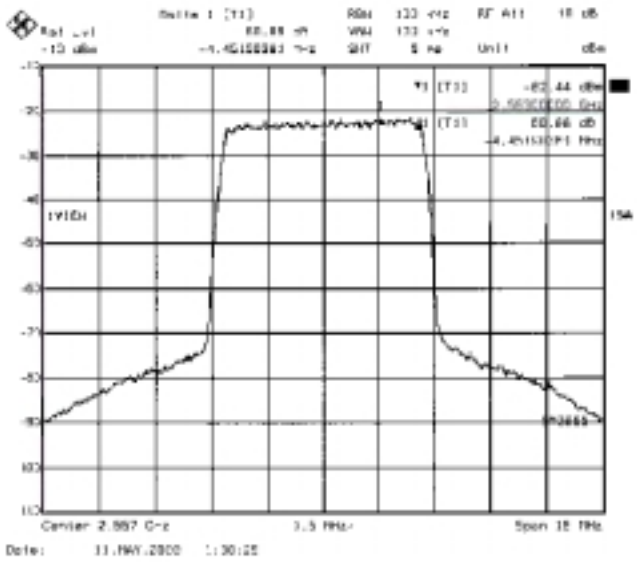

Figure 2. MMDS Spectral Mask (RB=100kHz, VB=100 kHz, Averaging=200).

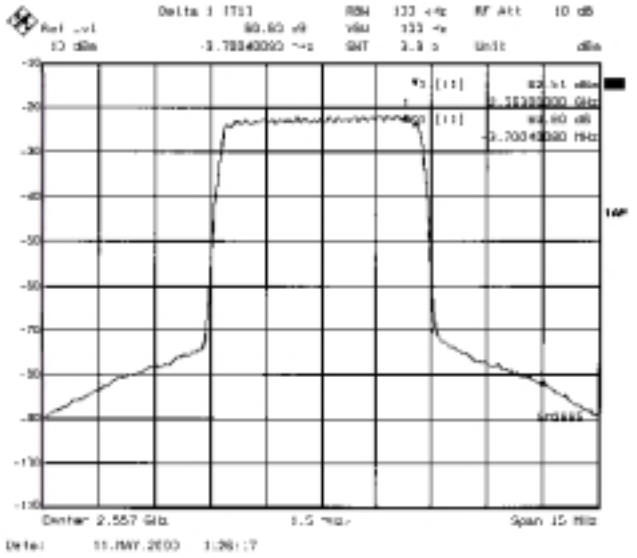

Figure 3. MMDS Spectral Mask (RB=100kHz, VB=100 Hz, Averaging=0).

Table 1. Measurement results (6 MHz Bandwidth Signal, specification –60 dBc)

	RB =100 kHz VB = 100 kHz Averaging = 0	RB =100 kHz VB = 100 kHz Averaging = 200	RB =100 kHz VB = 100 Hz Averaging = 0
Figure	1	2	3
dBc (☞=3 MHz)	-65.15	-60.9	-60.6

The use of a small video bandwidth filter setting (compared to the resolution bandwidth) results in a spectrum that is approximately the same as averaging several hundred waveforms. This is consistent with WJ measured data. Either method will give a good approximation of the average relative power levels of the signal.