

Why Are Video Bandwidth and Rise Time Important?

Among all the parameters to consider in RF design, power measurements remain one of the most important metrics for designers and operators, especially considering today's complex modulation schemes, pulsed communication modes, and increased popularity of wireless devices. To accurately characterize modulated or pulsed signals, an important factor to keep in mind is the video bandwidth (VBW) of the RF power measurement test equipment. VBW describes a sensor's ability to track signal variations of envelope power measurements; envelope power is the amplitude change due to modulation or distortion as a function of time averaged over one or a few cycles of the RF carrier signal – sometimes referred to as peak power. As a result, detecting pulse and peak power measurements correctly relies on the modulating signal's rate of change in amplitude to be less than the sensor's VBW.

Figure 1 below depicts a modulated, pulsed signal. Fast changes in amplitude are occurring because of the pulsed nature of the signal (rise and fall times) and its modulation; rise time is the time it takes a signal to change from a specified low value at the proximal line (10% of the pulse magnitude) to a specified high value at the distal line (90% of the pulse magnitude). If the sensor's VBW is too slow, it will not accurately track the waveform and will manifest itself as a measurement error that affects not only the envelope power and peak envelope power (PEP) readings, but also the accuracy of average power measurements. A detector with adequate VBW for a desired pulse can meticulously track the envelope power, which minimizes erroneous results.

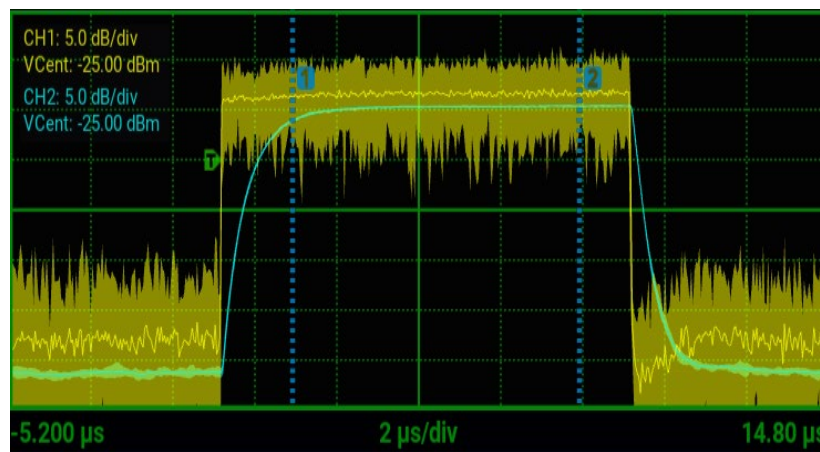


Figure 1: A sensor with limited VBW fails to accurately track a modulated, pulsed signal.

A sensor's VBW is based on the response time of the power measurement circuit (often characterized as a sensor's rise time). VBW and rise time are inversely proportional. A common rule-of-thumb for the relationship between VBW and rise time is:

$$\text{VBW} = 0.35 / \text{Rise Time (the response time of the power measurement circuit)}$$

It is vital to select the right test equipment with adequate VBW for each application to enable accurate and reliable RF power measurements. Today's advanced Wi-Fi chipsets and devices with multiple-input, multiple-output (MIMO) architectures, for example, have channel bandwidths up to 160 MHz. Test instruments like the Boonton [RTP5000 series](#) provide a fast, simple, cost-effective solution, offering the widest VBW on the market at 195 MHz, while the [RTP5008 sensor](#) has 165 MHz of VBW. Therefore, these sensors are the only solution that have sufficient capability for characterizing Wi-Fi signals with 80 MHz and 160 MHz channel bandwidth. To learn more about the RTP5000 series and other high-performance RF and microwave test equipment, visit www.boonton.com.