## Spectrum analysis basics application note

Welcome back to Spectrum Analysis Basics series blog! In Part 4, I went on video filtering and averaging track. This time, I'll explain assembled time. The time-gated analysis spectrum allows you to find spectator information about signals that occupy the same part of the frequency spectrum but different in the realm of time. This describes that two or more signals are in the same frequency channel that are active at different times. Using a signal trigger external to coordinate the separation of these signals, you can measure any of the separate signals in time. You can also measure the spectrum of a signal at one time slot within a multiple access time division (TDMA) system and exclude the spectrum of signal interference. Gating time helps you make measurements that are very difficult to make using traditional frequency-domain analysis spectrum. These measures include radio frequency (RF) signals, multiplexed time signals, TDMA signals, and more. Time Gating Method when measurement and game time, you need these four basic items: An external straps trigger signal a gate control or trigger mode (edge or level) A gate delay setting (determine how long after the signal trigger the gate becomes active) A gate length setting (determines how long the gate is on) With these parameters, you can watch the signal during a desired length. Sometimes, the signals they want will coincide with your period of interest. If this is the case, you can use game level, shown in Figure 1. Unfortunately, in most cases, the signal won't perfectly line up with the time you want. For these times, you can use edge trigger with a specified gate backlog and gate length to define the time period at which to measure the signal. Figure 1: Assembled time using trigger level, where the spectrum analyzer only measures the frequency spectrum when the signal is above a certain level. The most common methods make gating times to gated Fast Fourier Transform (FFT), gated local oscillators (LO), and gated videos. Gated FFT Uses the built-in FFT capabilities to analyze signals such as the X-Series Key, the signal analyzer will get data for an FFT start after a selected delay after a trigger. The analyzes calculate an FFT based on the data and displays the results on the pageant, meaning you'll see the spectrum that existed at a particular time of known duration. This is the quick technique when the signal span is more narrow than the FFT width. Tip: To get the maximum possible frequency resolution, select the narrow resolution available bandwidth (RBW) and a capture time that fits in the time period of interest. Gated GOLD with GOLD toys, or gated brooms, you control the voltage ramp generated by a GOLD broom scan generator, shown in Figure 2. Like any signal analyzer, the GOLD ramp up in frequency when the gate is active. When the gate is blocked, the analyzer freezes the voltage from the scan generator, GOLD to stop rising to frequency. Figure 2: Block diagrams in gated Gated Mode Video Many spectrum analysis features many technical analysis features of gated analysis, including the ESA series keys. In this technique, the switch analyzes video voltage cuts during the time periods in which the door is blocked. With the sensors set to peck detection, you then set the sweep time so that the gates occur at least once per display point, or bucket. This allows the pek detector to view real data during this time interval. Otherwise, there will be track points with no data, leaving an incomplete spectrum. The gated video technique, shown in Figure 3, can lead to long sweep times. For example, in the Global System for Mobile Communications (GSM), a full frame lasts 4.615 ms. For an analytical ESA spectrum set to its default value of 401 display points, minimum broom for GSM-gated video gauges from 401 times 4,615 ms, or 1.85s. Some TDMA formats contain sugar liver as long as 90 ms, leading to even more time slippers. Figure 3: Block diagrams of a spectrum analyzer and gated video game time. Conclusion When dealing with overlapped signals, when gating provides a method of analyzing signals that can share a single channel frequency. Faster and more recent gating methods such as gated FFT and gated GOLD are available on key X-Series signal analysis. In Part 5 of Spectrum Basic Analysis, we will go on IFs digital. Find out more in Application Note 150. Spectrum analysis are useful tools for emissions monitoring, RF testing components, and EMI troubleshooting. There are a number of common adjustments available with many modern analyses that can optimize performance for a particular application. In note this application, we will introduce bandwidth resolution (RBW) and video bandwidth (VBW) and how affect measurements. Bandwidth Resolution (RBW) Bandwidth is defined as the frequency alarm that is concentrated in a particular event. For example, the bandwidth of transmission signals is the alarming of the frequency that handles transmissions. The bandwidth of a measure defines the range of frequency that is used for the measurement. In spectrum analysis, the bandwidth resolution (RBW) is defined as the frequency span of the final filter that applies to the input signal. Smaller RBWs provide finished frequency resolution and the ability to differentiate signals that have closer frequency together. Why not use the smaller RBW environment for all measurements? Sweep time. Sweep time is the length of time it takes to sweep the sensors from the beginning to stop the frequency. Here is the equation to govern the sweep speed: In this formula, the meaning of the first factor is the number of frequency selection under SPAN, each step is 1/1 in RBW, to ensure the precision of amplitude measurement. The second factor means that each selection of the time required depends on the smallest value between RBW and video bandwidth (VBW). Usually we are not focused on rumors, the VBW can be set to a value greater than or equal to RBW. The reduced time equation: i.e., the scan time is proportional to SPAN and is inversely proportional to the square of RBW. This means that if the RBWs are reduced by 100 times the scan time will be increased by 10000 times to even the smaller SPAN RBWs also lowered the noise floor, but to extend the sleep time for a given span of frequency. Select a spectrum analyzer that has a large number of RBW settings, especially on the lower frequency end. You may not use 10 Hz RBW often, but it is very useful when you do. Adjustment is easy. Simply adjust the RBW to provide the appropriate balance between speed and resolution for your application. Figure 1 is the measurement of signals separated by 20 kHz. Traces have been collected using RBWs at 30 kHz (blue), 10 kHz (Yellow), and 3 kHz (pink). Observing that while the frequency of these two power signal measurements the same way is completely unchanged, the signal separation is only clear when the RBW is less than the frequency difference between the signals. Figure 1: The Spectrum analyser shows two signals in three different bandwidth resolution (RBW) settings. Forms and form Factor forms and form factors in the RBW filter can also be an important selection as well. Many analyses have an RBW filter that contains a Gaussian shape and a determined form factor to the 3 dB points. The RBW value is the Bandpas frequency to filter 3 dB below the response pik to the filter. Remember that 3 dB is equal to 50% of the maximum. This is also referred to as the Full Width Filters Half Max (FWHM) values. 3 dB Gaussian filter is acceptable for many measures, but for electromagnitive compliance (EMC) related measures, a filter defined in 6 dB can be required. The form factor of a filter is the ratio of the response to two careful values. Typically, the highest attention is measured at 60 dB down. The lower attention value is either or 6 dB down. It's a measure of the sharpness of the filter response. If the report is large, the filter is not very sharp. This indicates that the filter spread out over a large frequency range. If the report is small, this indicates a skin filter shape and cut paper rolls. These aides in reject more out-of-band signals because they don't bleed on.

Figure 2 shows how the form factors for both the 3 dB and 6 dB points are calculated for a given filter. For morph analyses, 3 and 6 dB form factors are similar, but the 6 DB filter has an appropriate curve and there are higher out-of-band rejections. Factor form @3/60dB=(F6-F1)/(F4-F3) Factor form @6/60dB= (F6-F1) / (F5-F2) Figure 2: Gaussi filter showing 3, 6, and dB 60 points and Frequency Center (Fccy). Phase Noise Another factor affecting the frequency resolution of analyzer is the phase noise. This is observed as a width and increase in the noise amplitude near the center frequency of (fig. 3). It is caused by the random thermal fluctuation of the oscillate used as a distribution reference to the circuit spectrum analyzer. These fluctuations cause phases of the production signal to vary with time, very similar to the jitter of a time-based system. This age can cover up any small signal that may be near the frequency of interest. For significant measurements, choose an instrument with lower noise than the signal source you are measuring. Figure 3: Spectrum analyzes show noise effect phases in an input Video Bandwidth (VBW) another factor that affects the track quality displayed in a spectrum analyzer is the video bandwidth (VBW). Video filtering is a low-domain time-pass filter, math equivalent to mean or medium. The main effect of the VBW filter is to list the track and reduce noise. Strictly speaking, the VBW doesn't change the measurement results. It won't affect the frequency selection, detection pik in the measurement process. The VBW filter is applied after the data has been collected, but before the screen displays the track. As can be seen in Figure 4 below, when the VBW is great, noise makes small observation signals difficult. If we decrease the VBW, the small signal becomes more clear. Figure 2: Smooth effects of random signals and different VBW Conclusion Modern spectrum analyzes offer flexible measurement capabilities. Choose an analyser that provides an RBW RBW/VBW (lower is better), lower noise phase than the signal you are testing. Adjusting the RBW can provide lower floor noise and fine frequency resolution, but the time slippers will increase dramatically. For noise signals, you can lower the VBW to help list the track and make identification signals easier, but this will increase sweep time. If you are making EMI measurements, a formal 6dB filter option is required to increase puck accuracy. accuracy.

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