Reading the Agilent E4402B Spectrum Analyzer Display

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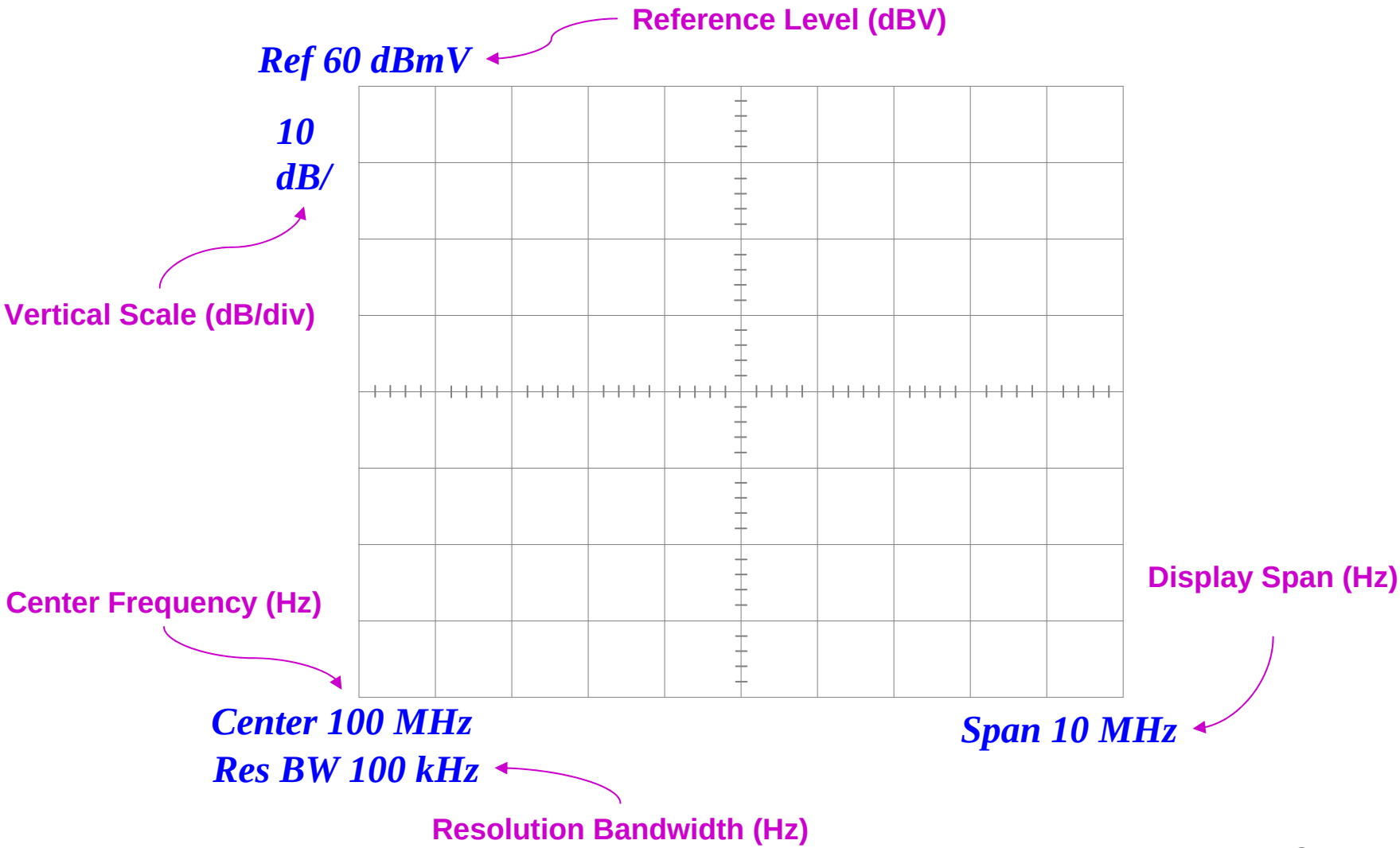
This Tutorial is Meant to Help You Learn to Read a Spectrum Analyzer Display

- Introduce the elements of the display
- Learn to read the frequency of spectral components
- Learn to read the power level of spectral components
- Special note concerning the “DC Spike”
- Learn to adjust the display to show the proper signal spectrum

- Customized for the Agilent E4402B Spectrum Analyzer

Basic Spectrum Analyzer Display

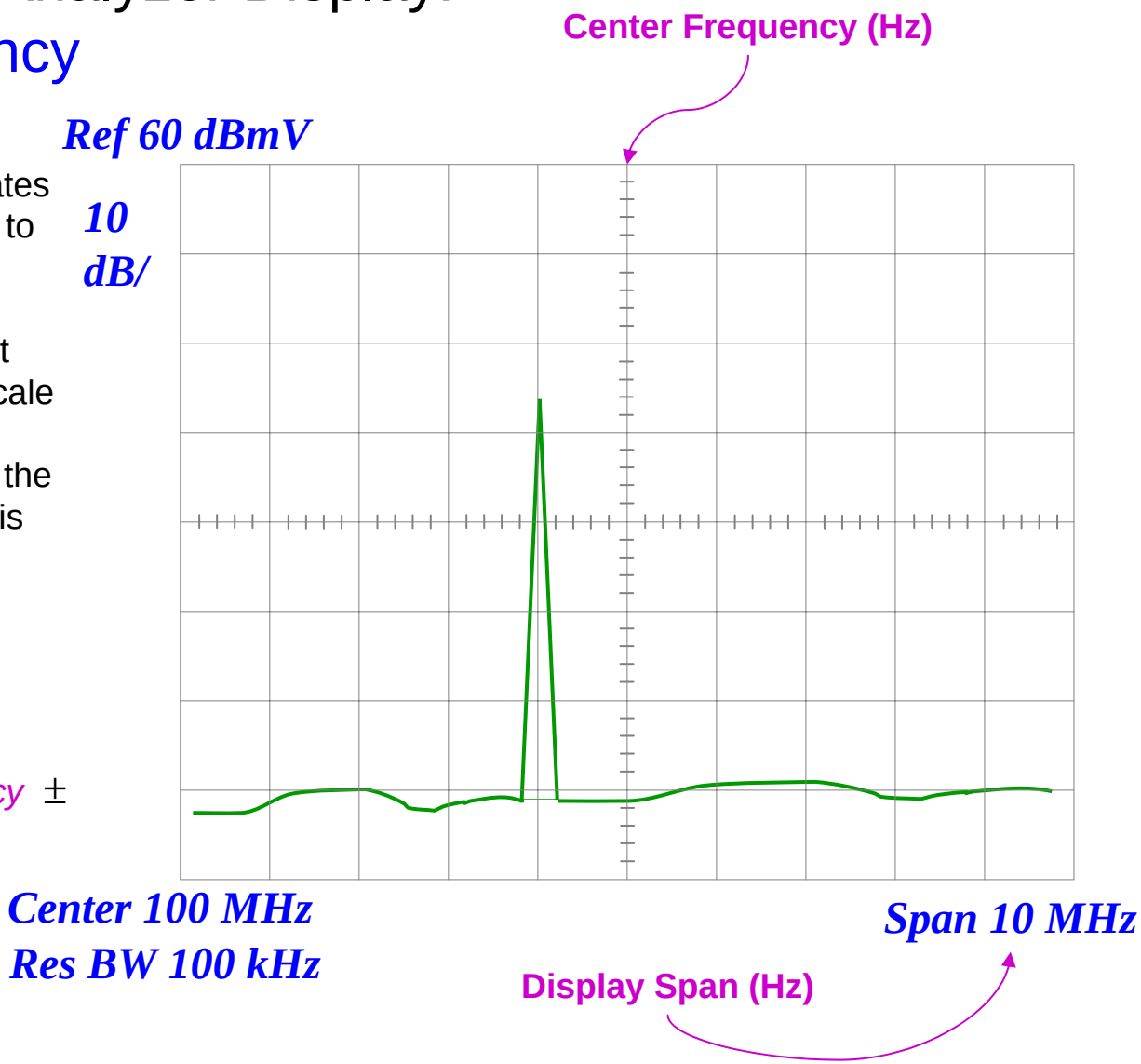
Display Elements



Basic Spectrum Analyzer Display:
Reading Frequency

The *Center Frequency* indicates the frequency corresponding to the center vertical line of the display. All frequencies are read from this reference point according to the horizontal scale (span/div). The *Span* setting gives the frequency range of the entire display. The span/div is the Span divided by 10, or 1 MHz for the display settings shown. Thus, the signal's frequency is at 99 MHz.

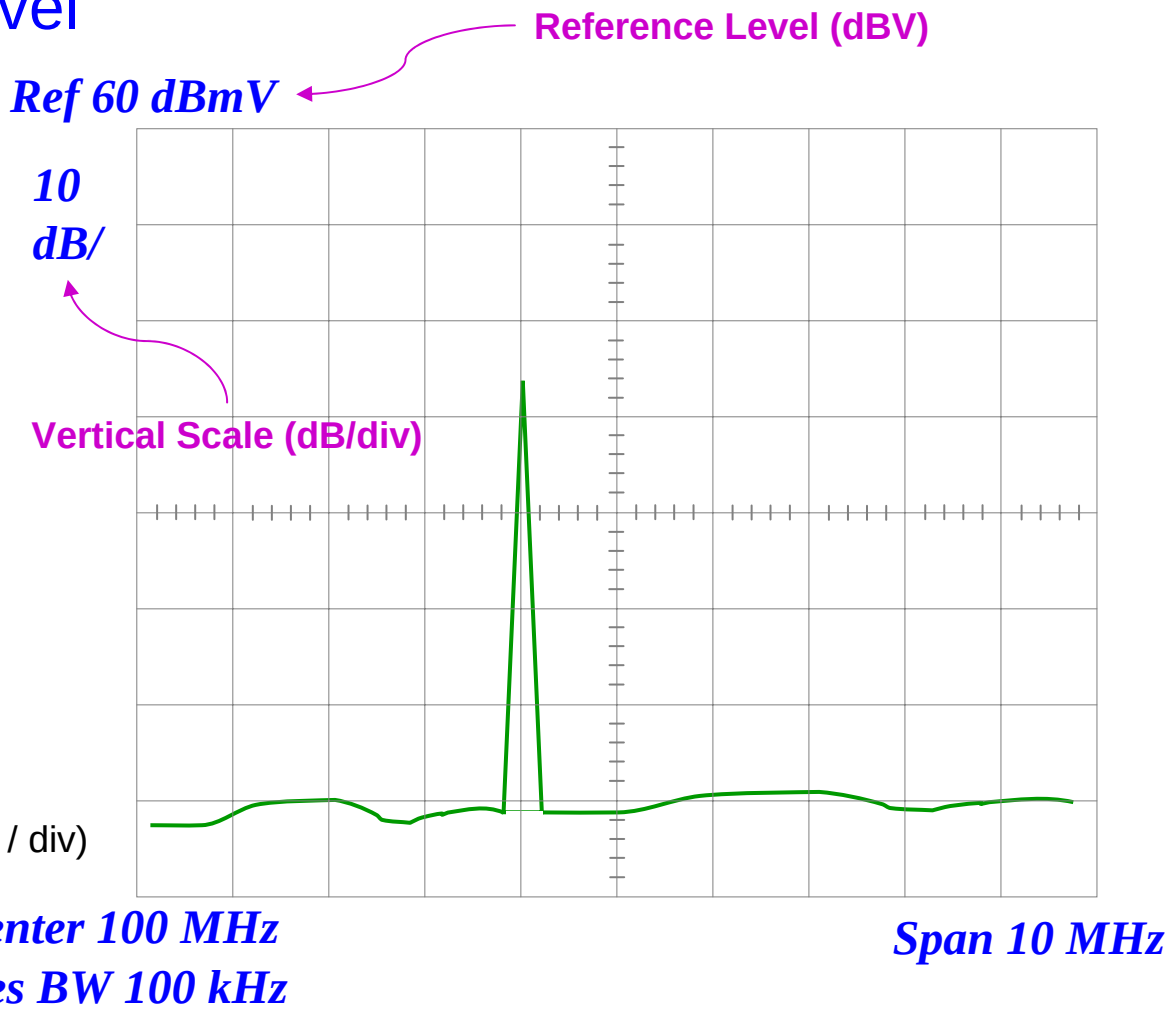
Frequency = *Center Frequency* ± (# div)*(*Span* / div)
= 100 MHz - 1*1 MHz
= 99 MHz



Basic Spectrum Analyzer Display:
Reading Power Level

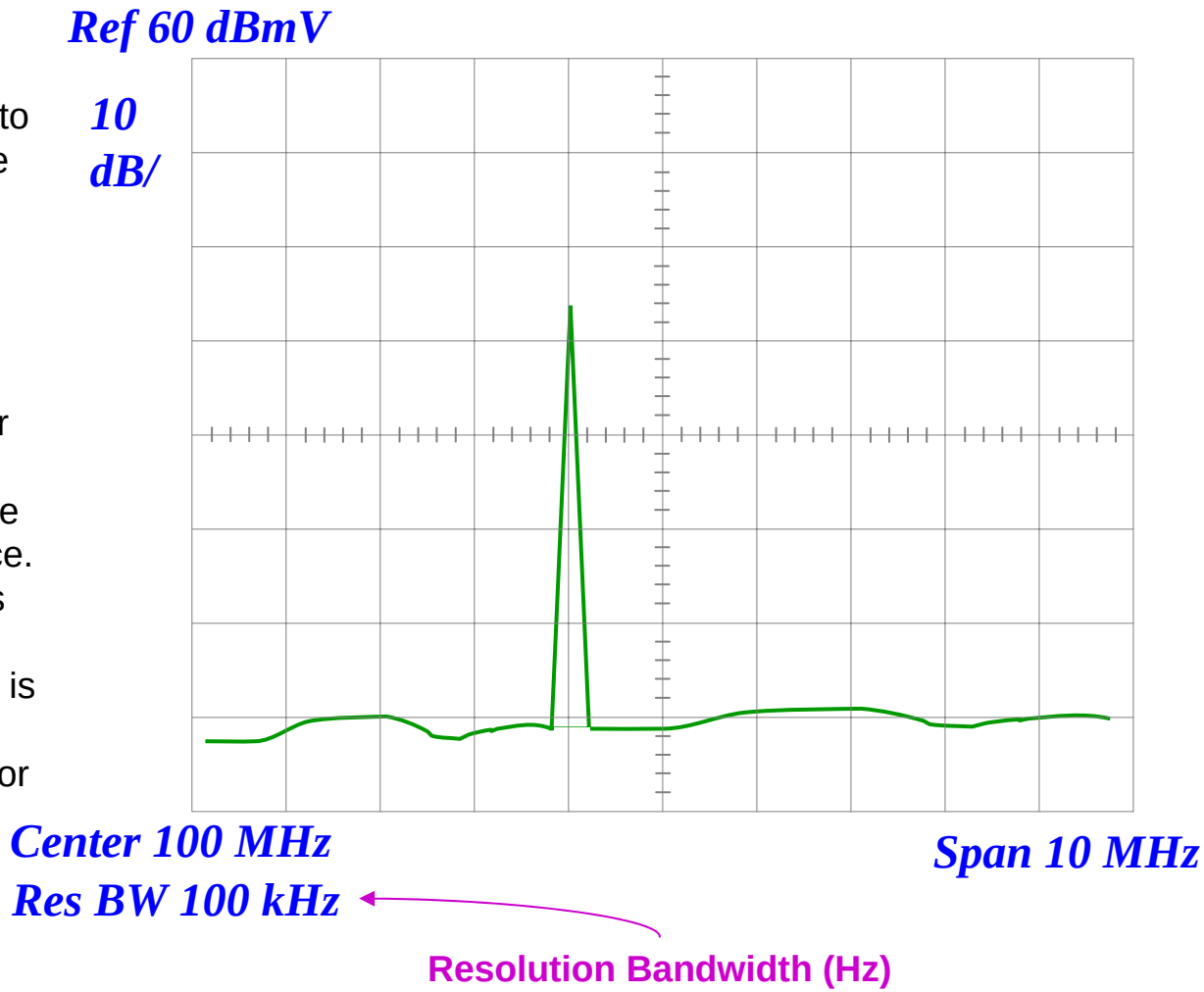
The *Reference Level* identifies the top line power level in dBmVs (or whatever units have been chosen for display). All power levels are read in reference to this level according to the *Vertical Scale* or span/div, which is 10 dB/div here. (Count the divisions down from the top reference line to the peak of the signal.) The peak level of the signal shown is thus +36 dBmV.

Power Level = Ref Level –
(# div down)*(Vert Span / div)
= 60 dBmV – 2.4*10 dB
= +36 dBmV



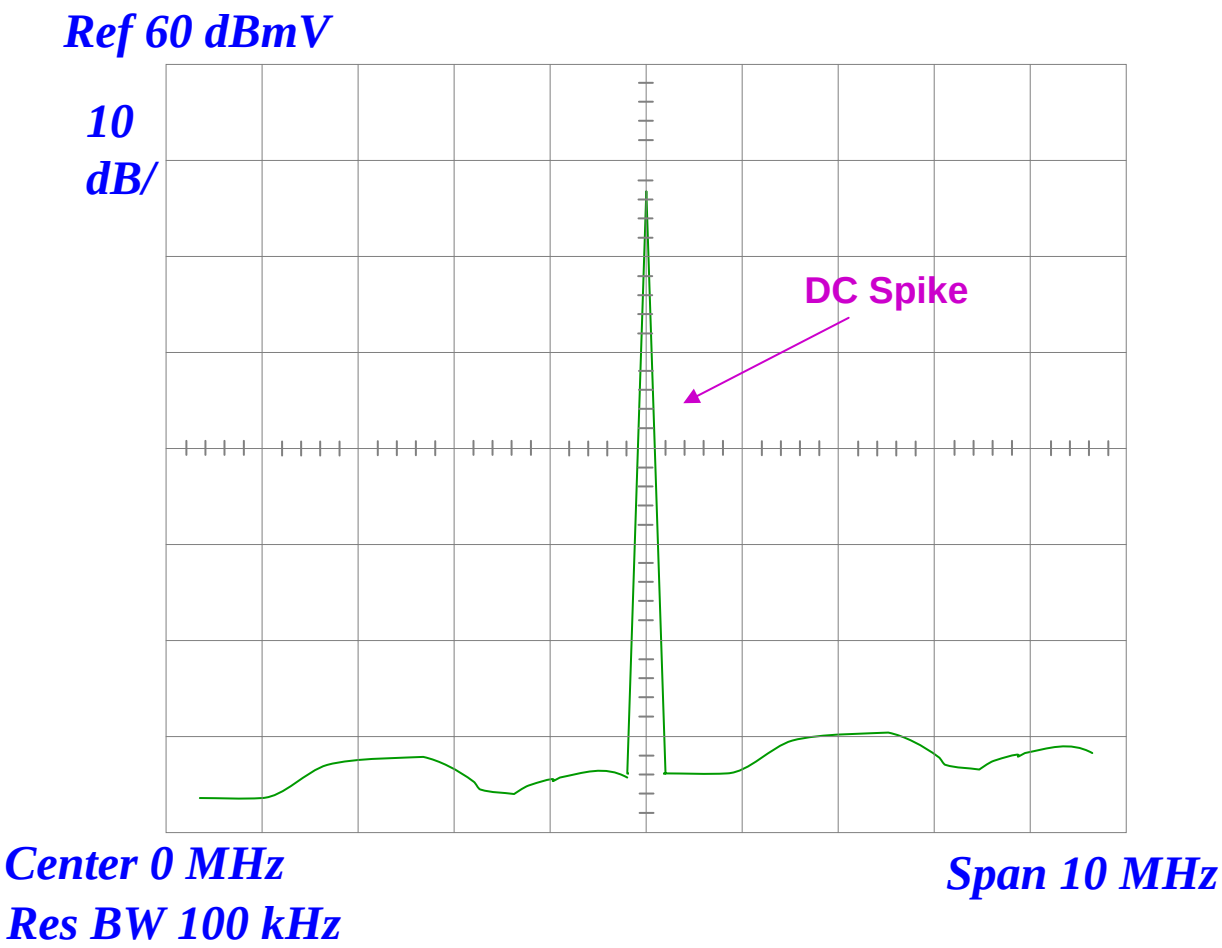
Basic Spectrum Analyzer Display:
Resolution Bandwidth

The resolution bandwidth indicates the bandwidth used to measure the power level. The specific power level corresponding to a specific frequency is the total power integrated over the resolution bandwidth centered at that specific frequency. A narrower resolution bw gives more precision in the display, but the display takes longer to produce. A wider resolution bw reduces precision but allows for faster display sweeps. The E4402B is normally set to automatic resolution BW determination for optimum performance.



Basic Spectrum Analyzer Display:
The DC Spike

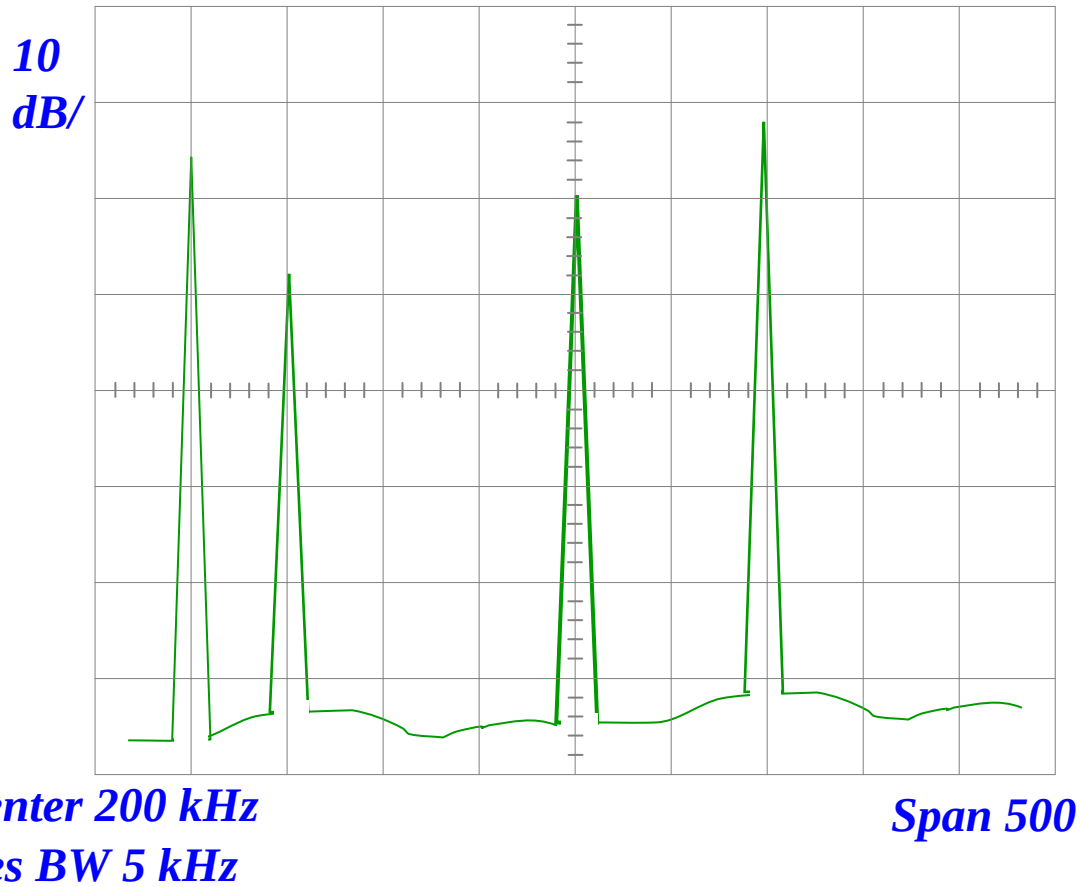
When working with signal spectra, it is important to keep your bearings. We need a reference point, and in the frequency domain, a convenient reference is DC (or f=0 Hz). The spectrum analyzer has a built-in DC reference on its display called the DC spike. It is a large spike in the display at 0 Hz, but it is not associate with your signal, since the SA blocks the DC component of your signal. It is meant to be a reference point in the display. The DC spike is not part of your signal spectrum and should not be included in your spectrum sketches.



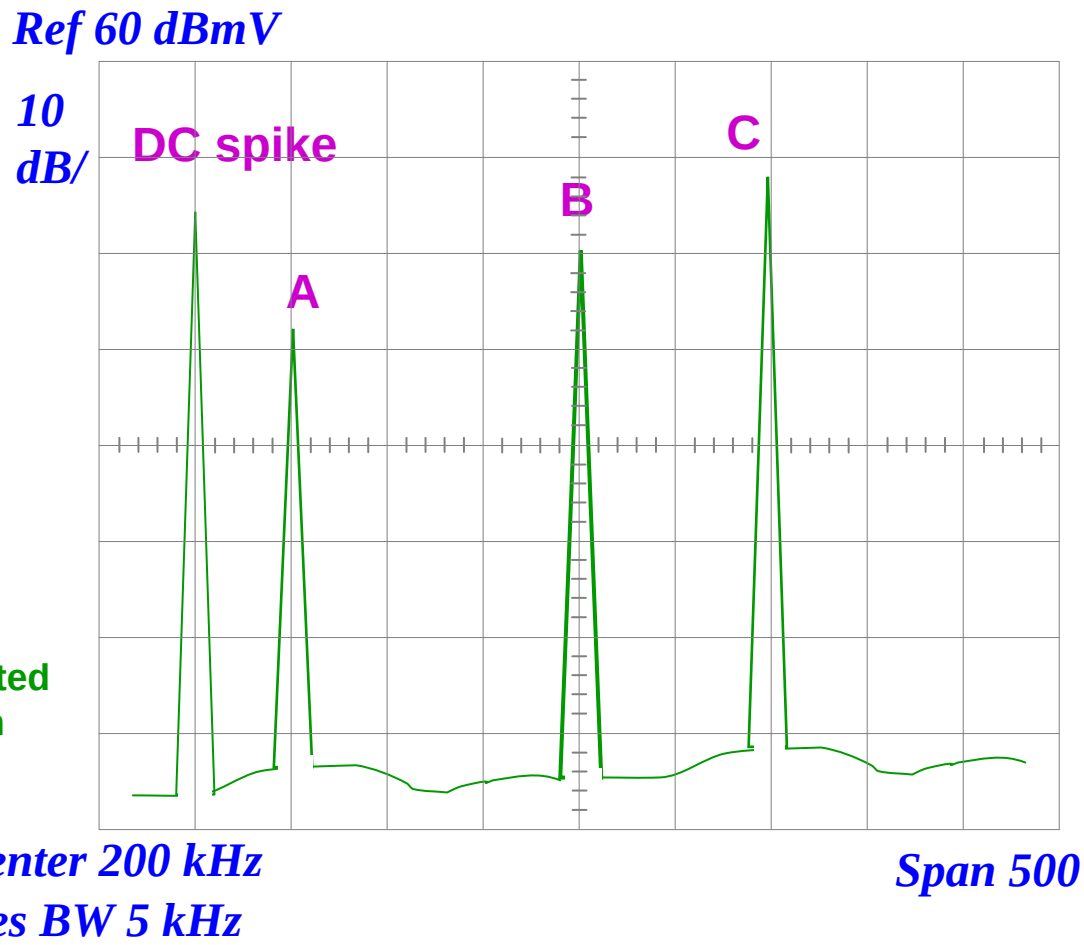
Basic Spectrum Analyzer Display:
Adjusting and Reading the Display

By adjusting the horizontal and vertical span controls, you can control the spectral display. For example, suppose you wish to display the spectral components of a periodic waveform such as a square wave. Adjust the center frequency and span to cover a range of frequencies representing several harmonics of the fundamental frequency of the square wave. Adjust the reference level and vertical span/div to cover the appropriate range of power levels of the spectral components.

Can you read the frequencies and power levels of each of the spectral components shown? The answers are on the following page.



Basic Spectrum Analyzer Display:
Adjusting and Reading the Display



A: 32 dBmV , 50 kHz

B: 42 dBmV , 200 kHz

C: 48 dBmV , 300 kHz

Note: By moving the components on the display to the center graduated scale line, accuracies to better than 0.5 dB can be achieved

Reference Level _____

Center Frequency_____

Vert span/div _____

Horiz span/div _____

Resolution BW _____