ROHDE&SCHWARZ

BROADCASTING DIVISION

Application Note

Reference factor between RF (referenced to sync top level) and VF

Products:

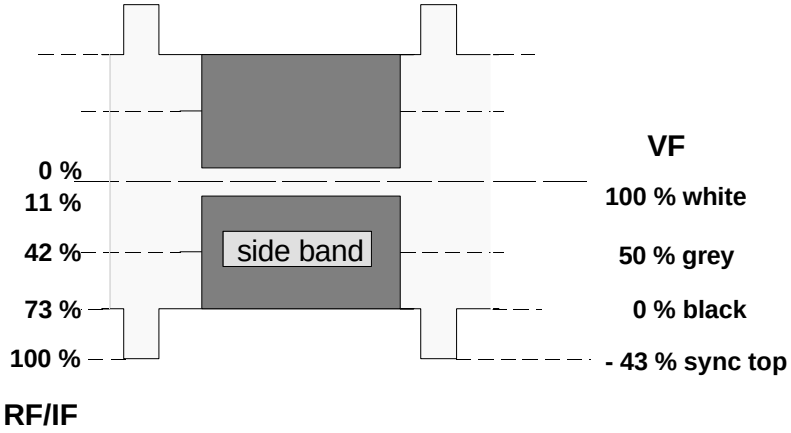
TV Demodulators and Video Analyzers

UAF + EFA 33
VSA + B10

7BM10_0E

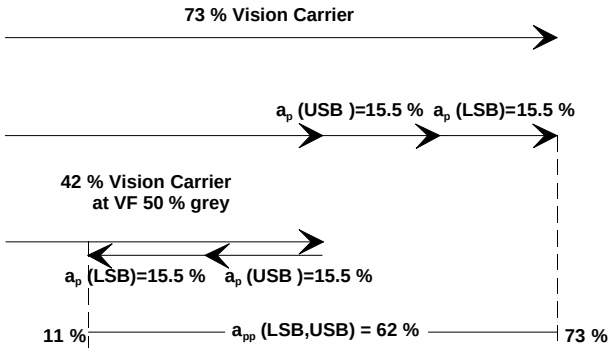
Reference factor between RF (referenced to sync top level) and VF

Let us analyze a modulated signal:



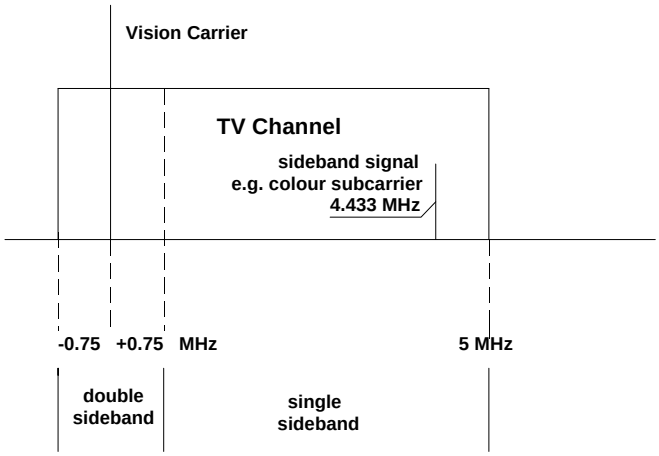
Level Percentages for RF/IF Signal with Reference to VF Signal

Now do the calculation:
The sideband amplitude referenced to U_{pp} (USB , LSB) is a_{pp} (USB , LSB) = 73%-11% = 62%
in case of double sideband modulation,
as we have in VSB frequency range.



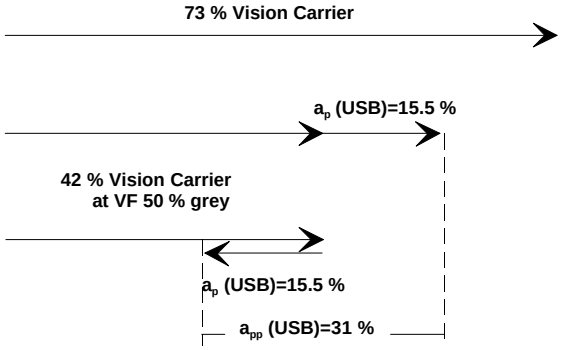
Vector Diagram for Double Sideband Modulation

If we now shift the sideband frequency to more than + 0.75 MHz, we reach the range of the single sideband modulation in the TV channel:



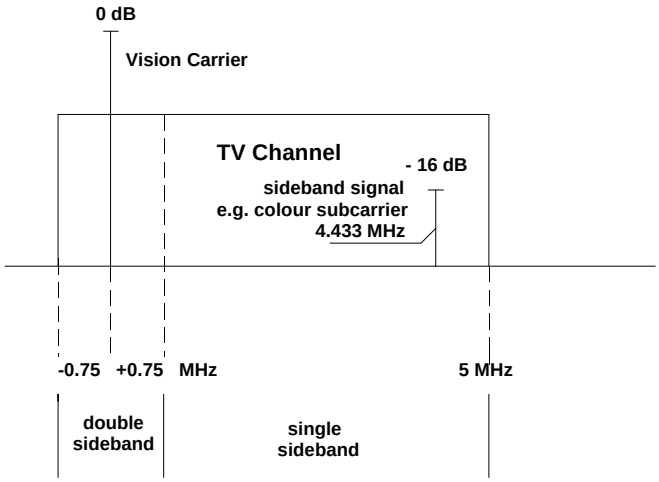
RF TV Channel

Then the vector diagramm changes to the following:



Vector Diagram for Single Sideband Modulation

This shows, that the equvivalent level of a RF sideband for a 100% VF signal (that is 700 mV e.g. White Bar) is a_p (USB) =15.5 % of the vision carrier. As the vector with the level $U_{p\ USB}$ rotates around the peak of the RF carrier 42 % of the vision carrier which represents the 50 % grey level in VF, the resulting related level as percentage is a_{pp} (USB) = 31 %.
The ratio 15.5 % between $U_{p\ USB}$ and the vision carrier defines the level distance between the sideband signal - for instance the colour subcarrier 4.433 MHz - and the vision carrier. If you calculate this distance in dB, you arrive at the famous level value of Δ L = 20 lg (0.155) dB= 16.19 dB.



Levels inside the RF TV Channel

This level distance of -16.19 dB corresponds to a VF sideband signal with U_{pp} = 700 mV. At least we have to consider the conversion factor from U_{pp} to U_{rms}.for the sideband sinewave signal

$$c = 20 \lg (1/(2*\sqrt{2})) = -9.09 \text{ dB}$$

and we arrive at the reference factor V dB between RF (referenced to sync top level) and VF

$$V_{RF} - 16.19 \text{ dB} + 9.03 \text{ dB} = V_{VF}$$

$$\mathbf{V_{RF} = V_{VF} + 7.16\ dB}$$