filename: amsignal.mcd
last edit date:04/25/13 avo

$f_m := 1KHz$ Modulating frequency

$f_c := 12KHz$ Carrier frequency $A_c := 1$ Carrier amplitude

$\mu_{am} := 1$ AM modulation index

$m(t) := \cos\left(2\cdot\pi\cdot f_m\cdot t\right)$ $c(t) := \cos\left(2\cdot\pi\cdot f_c\cdot t\right)$

$s_{dsb}(t) := m(t)\cdot c(t)$

$g(t) := A_c\cdot\left(1 + \mu_{am}\cdot m(t)\right)$ $s_{AM}(t) := A_c\cdot\left(1 + \mu_{am}\cdot m(t)\right)\cdot c(t)$

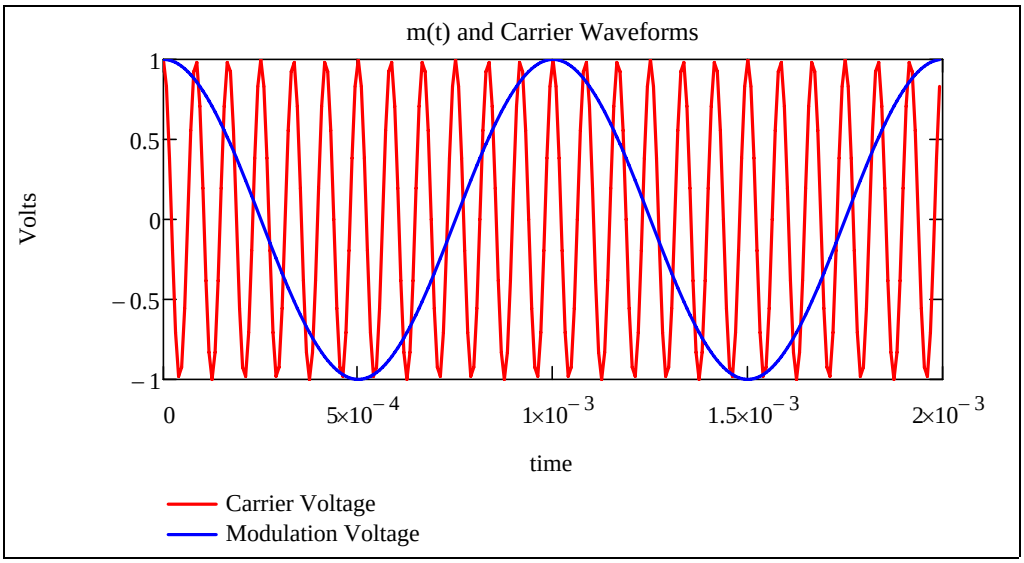
set up time vector, set to power of 2 to ease FFT calculation

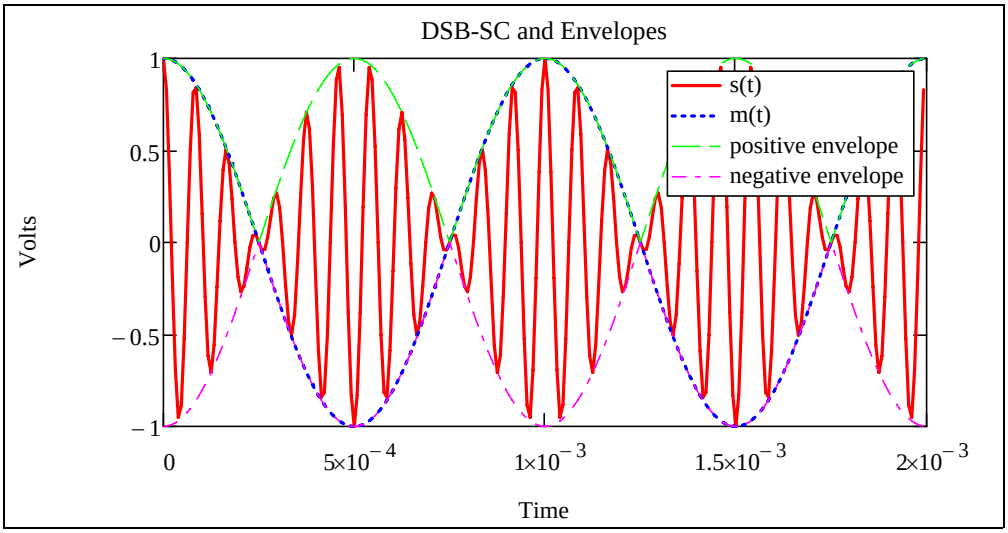
$N := 2^8$ number of points $n := 0 .. N - 1$ $N = 256$

$t_{max} := \frac{2}{f_m}$ display 2 cycles of lowest frequency

$dt := \frac{t_{max}}{N}$ $t_n := dt\cdot n$ create time vector

$$\frac{1}{t_{max}} = 500\,\frac{1}{s}$$



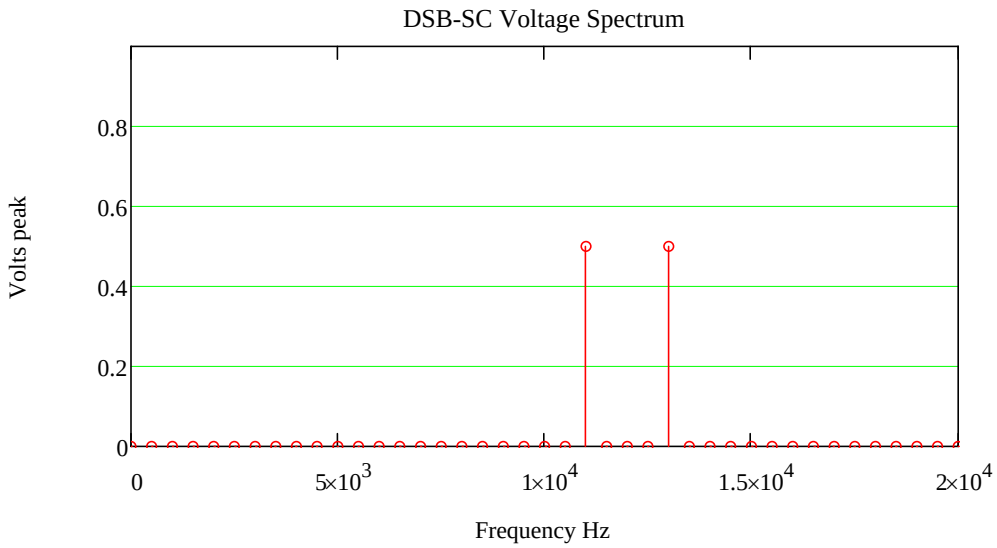


$k := 0 .. \frac{N}{2} - 1$ index for FFT

$DSB := FFT\left(\overrightarrow{s_{dsb}(t)}\right)$ Calculate FFT

$\text{length}\left(\overrightarrow{s_{dsb}(t)}\right) = 256$

$\text{length}(DSB) = 129$



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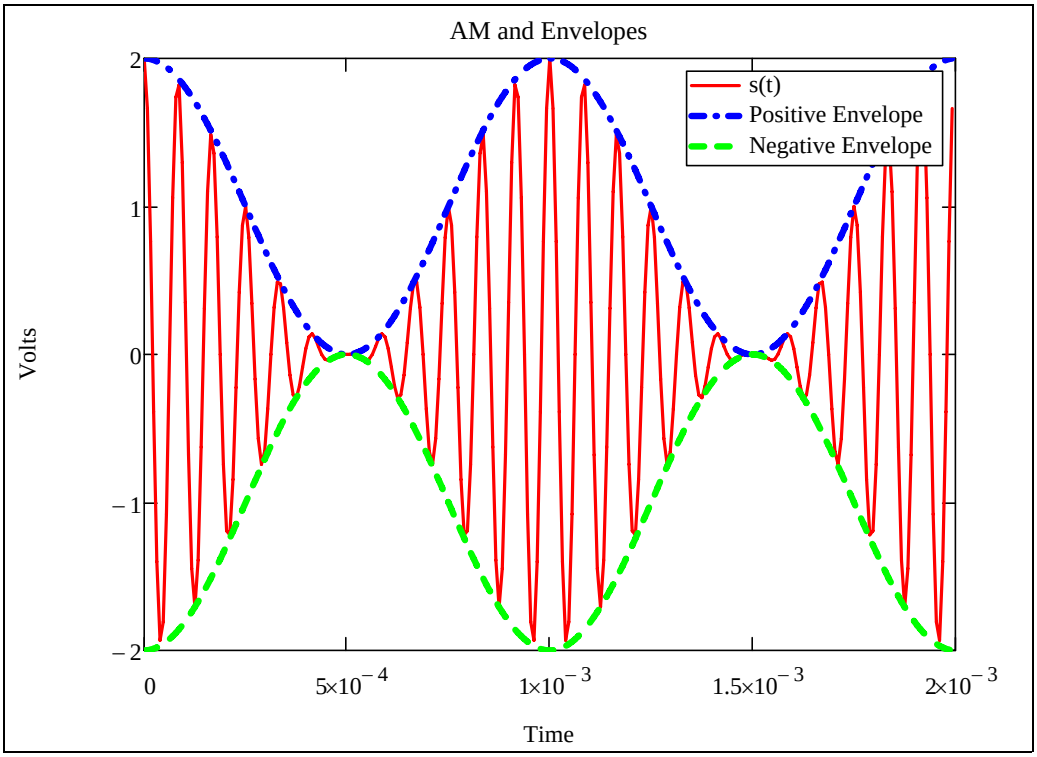
AM Modulation Index: $\mu_{am} = 1$

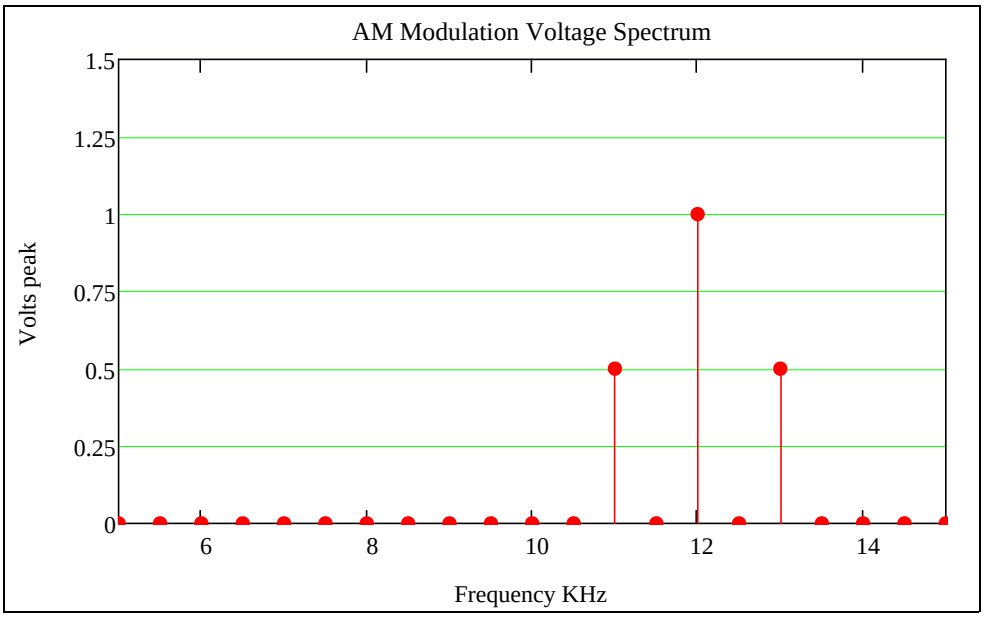


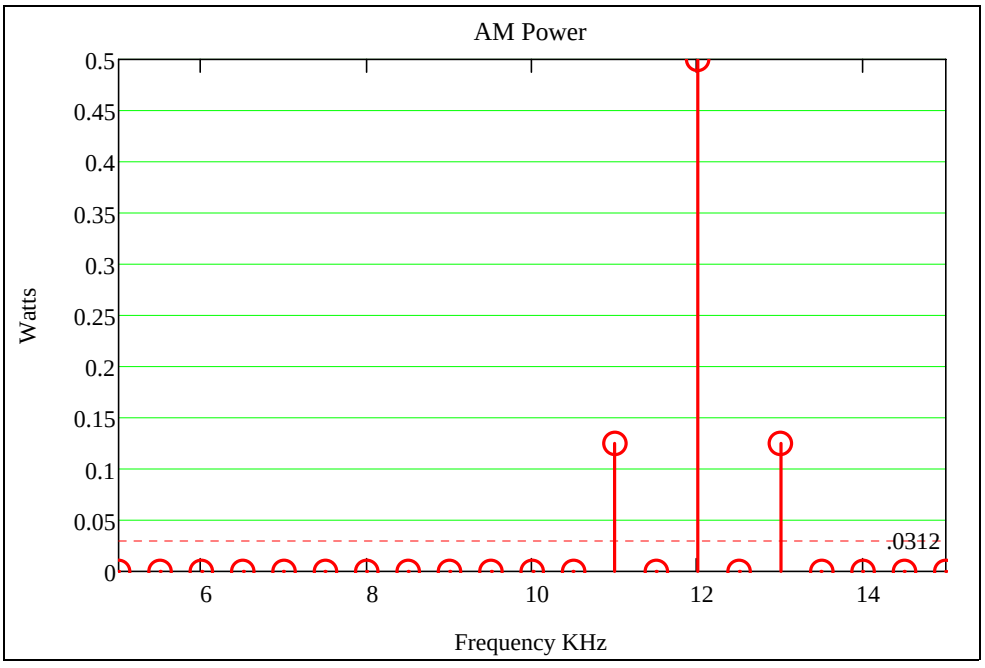
$k := 0 .. \frac{N}{2} - 1$ index for FFT

$\text{length}\left(\overrightarrow{s_{dsb}(t)}\right) = 256$

$AM := \text{FFT}\left(\overrightarrow{s_{AM}(t)}\right)$ Calculate FFT

$\text{length}(DSB) = 129$





$f_m = 1\,KHz$ Modulating frequency

$f_c = 12\,KHz$ Carrier frequency $A_c = 1$ Carrier amplitude

$\mu_{am} = 1$ AM modulation index

$s_{AM}(t) := A_c \cdot \left(1 + \mu_{am} \cdot m(t)\right) \cdot c(t)$

$P_{carrier} := \frac{A_c^{\,2}}{2}$ $P_{carrier} = 0.5$ Watt

$P_{usb} := \frac{A_c^{\,2}}{2} \cdot \left(\frac{\mu_{am}^{\,2}}{4}\right)$ same power in upper and lower sidebands

$2 \cdot P_{usb} = 0.25$

$P_{usb} = P_{lsb}$