



```

let i = 0
let vpwr = 0
repeat $&num
let i = i + 1
let vpwr = vpwr + (mag(OUT1S[i])*mag(OUT1S[i]))/num
end
let vrms1 = sqrt(vpwr)
echo INPUT RMS = $&vrms1

```

INPUT RMS = 0.706863

=====**Spectrum\_and\_Plot\_The\_Cosine**=====

Set total time to 1 second. Bin resolution = 1Hz  
Set sample rate to .1m Nyquist = 5KHz

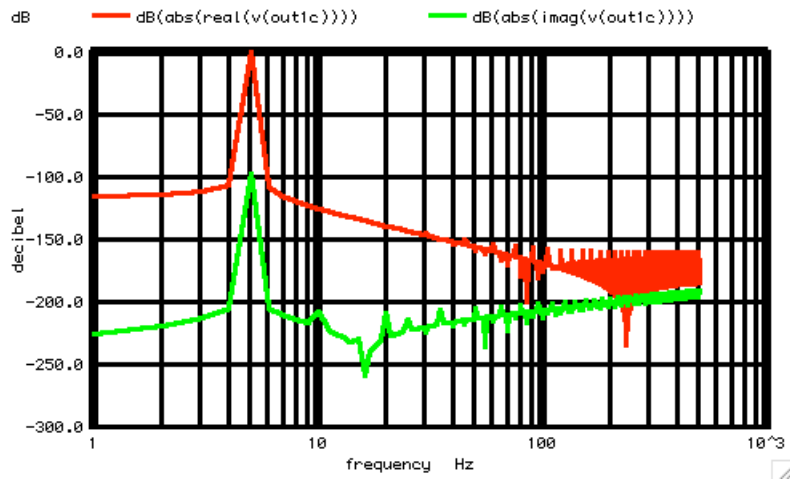
Setting Spectrum max frequency to 500

```

*=====Find_Cosine_Spectrum=====
linearize
*SPEC FSTART FSTOP FSTEP VECTOR
spec 1 500 1 v(out1c)
set pensize = 3
plot dB(abs(real(v(out1c)))) dB(abs(imag(v(out1c)))) xlog

```

Log or dB scale plots cannot plot anything less than zero.  
So negative values need to be **absolute** valued.



=====**Print\_Out\_Some\_Spectrum\_Values**=====

The spectrum can to be printed out to show all the values.

```

*=====Print_Cosine_Spectrum=====
foreach ii 1 2 3 4 5 6 7
let i = $ii - 1
let fr= frequency[i]
let vfftr = real(v(out1c)[i])
let vffti = imag(v(out1c)[i])
echo index= $&i freq= $&fr real= $&vfftr imag= $&vffti
end

```

But one can get at all important details by using the **foreach** on the frequency array and the output array. The following is the MacSpice Printout.

```

index = 0 freq = 1 real = -1.76235E-06 imag = -4.67344E-12
index = 1 freq = 2 real = -2.01374E-06 imag = -1.06821E-11
index = 2 freq = 3 real = -2.64221E-06 imag = -2.10302E-11

```

```

index = 3 freq = 4 real = -4.69524E-06 imag = -4.98467E-11
index = 4 freq = 5 real = 1 imag = 1.32779E-05
index = 5 freq = 6 real = 3.83675E-06 imag = 6.11724E-11
index = 6 freq = 7 real = 1.75709E-06 imag = 3.27082E-11

```

Notice index zero starts at 1Hz.  
The total time of 1sec sets the FFT Bin\_Width to 1Hz.

A **foreach** can step through particular frequencies.

A **unity gain 5Hz Cosine** come out as **one** at freq = 5.

Note there is no DC (frequency=0) term.  
This avoids some loglog plotting problems.

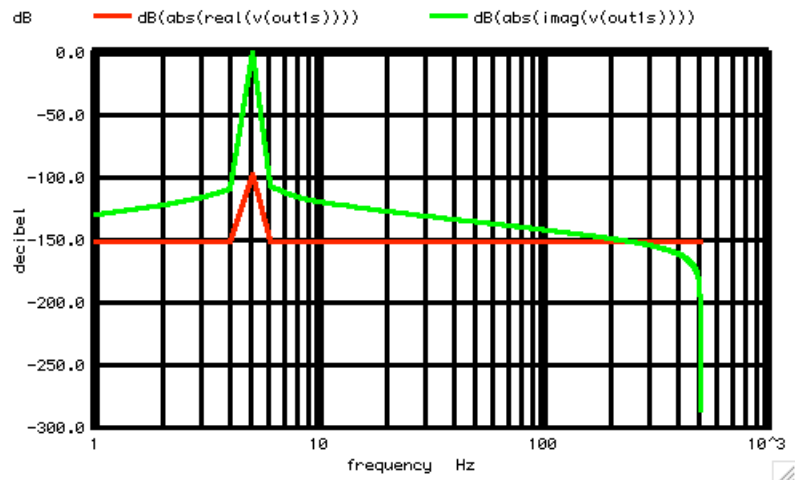
=====Now\_Spectrum\_and\_Plot\_The\_Sine=====

Need to rerun to fill array out1s.

```

*====ReRun_Simulation=====
run
*====Find_Sine_Spectrum=====
linearize
set specwindow= "none"
spec 1 500 1 v(out1s)
set pensize = 3
plot dB(abs(real(v(out1s)))) dB(abs(imag(v(out1s)))) xlog
*=====

```



=====Print\_Out\_Some\_Spectrum\_Values=====

Because the dynamic range of the signal is so high,  
the dB scale is used and the real or imaginary values  
can go negative. The **absolute** value function can avoid  
plot problems.

```

*====Print_Sine_Spectrum=====
foreach ii 1 2 3 4 5 6 7
let i = $ii -1
let fr= frequency[i]
let vfftr = real(v(out1s)[i])
let vffti = imag(v(out1s)[i])
echo index= $i freq= $fr real= $vfftr imag= $vffti
end
*=====

```

A **unity gain 5Hz Sine** comes out as **imaginary one** at freq = 5.

Note there is no DC (frequency=0) term.

The following is the MacSpice Printout.

