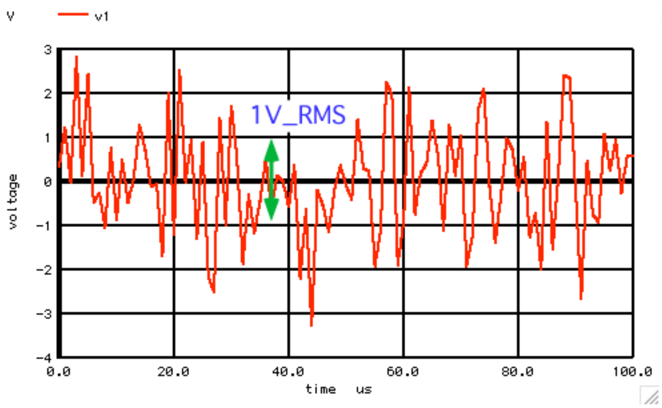
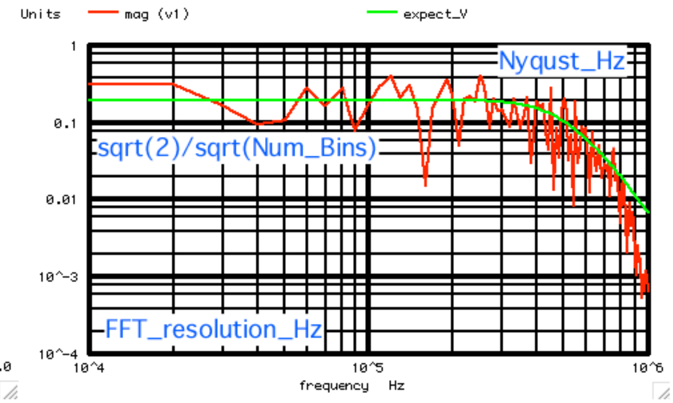
=====================Randomn_Transient_Spice_Simulation=====================================

```
1)  Noise_pk is inconvenient           = Noise_rms is better format
2)  Signal_rms                         = sqrt(2)*Signal_pk
3)  Create a 1V_rms Noise array        = install it as a PWL signal and run
4)  Noise spreads evenly over FFT bins = sqrt(2)/sqrt(Num_Bins)
5)  Num_Bins for FFT                    = Nyqust_Hz/FFT_resolution_Hz
6)  FFT_resolution_Hz                   = 1/total_time_sec
7)  Nyqust_Hz                           = 0.5/Sample_period_sec
```





0) For this version of spice, a 1V_pk_100%_AM signal will produce a carrier signal with a magnitude of one with two 0.5 magnitude sidebands.
1) But using a peak value for noise is inconvenient since it depends on probablity and time. A RMS value to onis is more convenient.
2) When using RMS, remember a rms value is sqrt(2) larger than a peak values. A 1V_pk is measured as a .707V_rms value

```
======================Want_100_1us_steps==============================
Total_Period_s =        0.0001
Bin_Resolutio_Hz =      10000
Sample_Period_s =       1E-06
Nyquist_Hz =            500000
======================Create_PWL_array_and_Index_and_Plot=============
======================Add_1Vrms_Noise_to_PWL_array====================
======================Install_the_PWL_array===========================
======================Run_and_Plot====================================
======================Find_Ave_Rms====================================
Average_level_Expect    0    Average_level -0.00406862
RMS_level_Expect        1    RMS_level      1.05424
======================FFT_and_Plot====================================
FFT_BandWidth_Hz=       1E+06
FFT_resolution_Hz=      10000
======================done============================================
```

3) A random 1V_rms signal can be added to an array and installed as a PWL voltage source.
4) The random 1V_rms signal will get spreed evenly over all the FFT frequency bins.
5) The number of bins is set by Nyqust_Hz/FFT_resolution_Hz.
6) Total sample time defines the minimun frequency of the spectrum or FFT_resolution_Hz.
7) The maximun frequency (Nyqust_Hz) will be visible on the spectrum.

===================MacSpiceCode==

```
Randomn_Transient_Spice_Simulation
*===============Need_A_voltage_Source_to_alter====================="
V1              V1      0       0       dc
.control
set             pensize = 2
echo            "======================Want_100_1us_steps=============================="
let n =         100
let tstep =     1us
let period_t =  n*tstep
let Bin_Hz =    1/period_t
let nyquist =   .5/tstep
echo            "Total_Period_s =       $&period_t"
echo            "Bin_Resolutio_Hz =     $&Bin_Hz"
echo            "Sample_Period_s =      $&tstep"
echo            "Nyquist_Hz =           $&nyquist"
echo            "======================Create_PWL_array_and_Index_and_Plot============="
let pwl_1 =     vector(2*n)*tstep*0.5
let ii =        vector(2*$&n)
echo            "======================Add_1Vrms_Noise_to_PWL_array===================="
let index =     0
repeat          $&n
let             pwl_1[1+2*index] = 1.2*(rnd(127)+rnd(127)+rnd(127)+rnd(127)+rnd(127)+rnd(127)+rnd(127)+rnd(127)-507.5)/102.879
let index =     index + 1
end
echo            "======================Install_the_PWL_array==========================="
alter           @v1[pwl] = pwl_1
echo            "======================Run_and_Plot===================================="
let period_s =  tstep/2
let trans_per = tstep/20
tran            $&trans_per $&period_t   0   $&trans_per
```

```
plot             v1
echo             "======================Find_Ave_Rms==================================="
let averVal =    mean(v1)
let noisAC =     v1 - averVal
let RmsVal =     sqrt(mean(noisAC* noisAC))
echo             "Average_level_Expect   0    Average_level $&averVal "
echo             "RMS_level_Expect       1    RMS_level     $&RmsVal  "
unlet averVal
unlet RmsVal
echo             "======================FFT_and_Plot==================================="
linearize
let              FFT_BandWidth_Hz =      1Meg
let              FFT_resolution_Hz =     10k
echo             "FFT_BandWidth_Hz=      $&FFT_BandWidth_Hz"
echo             "FFT_resolution_Hz=     $&FFT_resolution_Hz"
set              specwindow=             "rectangular"
spec             $&FFT_resolution_Hz     $&FFT_BandWidth_Hz   $&FFT_resolution_Hz     v(v1)
let expect_V =   (sqrt(2)/sqrt(500k/10k))/(1+(frequency/500k)*(frequency/500k)*(frequency/500k)*(frequency/500k)*(frequency/500k))
plot             mag (v1) expect_V loglog
echo             "========================done========================================="
.endc
.end
```

4.4.11_10.55AM
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