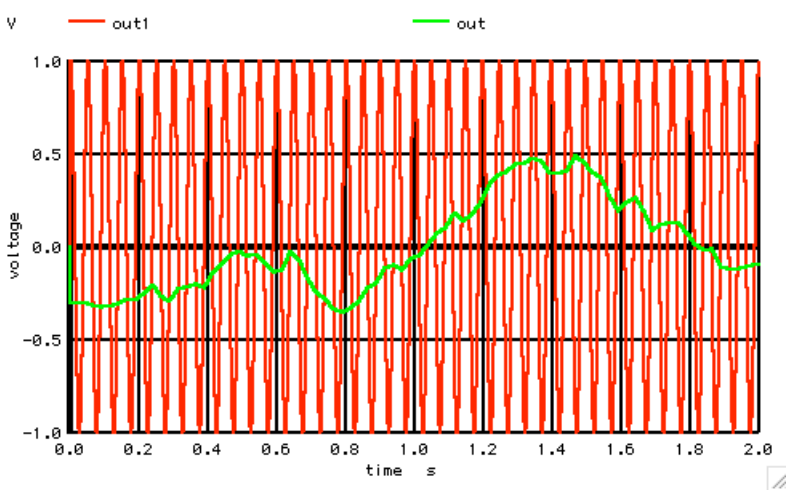
*=======PHASE_MODULATE_USING_JITTER==========

A free running oscillator can export its jitter into a piece wise linear noise file. This can be used to phase modulate a square wave in order to compare spectrums.

```
Use_Jitter_to_PM
*    OUT      Rload
*      _____/\  __
*    _|_       \/  |
*   /   \          |
* /VpwlT\          |
* \     /          _|_
*  \___/          ///
*    |            Gnd
*   _|_
*   ///
*   Gnd
*
* VpwlT OUT 0        PWL( + 0.0005 0.988835 +.....
*=========Include_Noise_File=================================================
.include  PWL_FileJitter.inc
Rload     OUT    0      1k
VT        Vtime  0      PWL    ( 0 0 2 2 ) DC 0
B1        OUT1   0      V =     cos(2*3.14159*20*v(Vtime)+ v(OUT))
B2        OUT2   0      V =     20*u(v(OUT1))-10
*=================================================================
```

The Noise is being applied in a radian magnitude format.

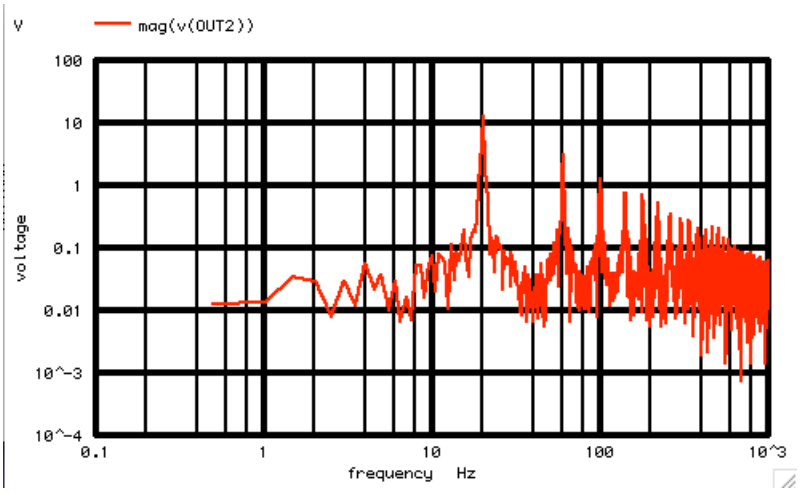
```
*=========Run_Simulation=================================================
*TRAN     TSTEP  TSTOP  TSTART TMAX      ?UIC?
.tran     5u     2      0      5u        UIC
.control
run
set       pensize =     2
plot      out1  out
*=================================================================
```



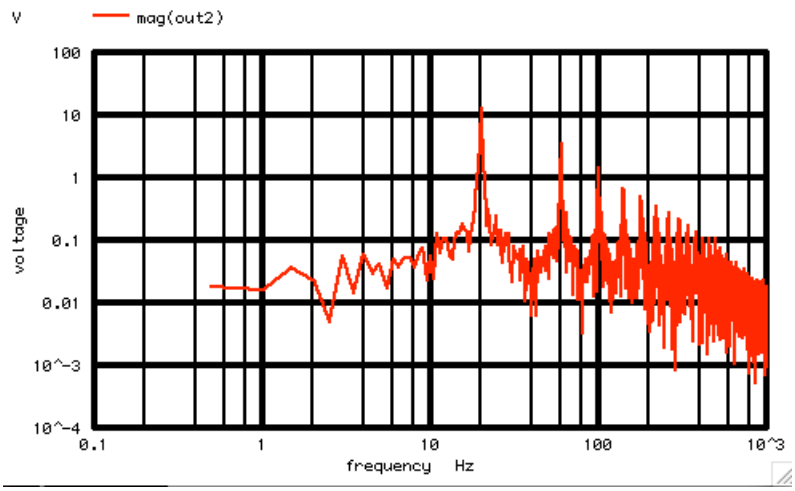
The Noise is applied to a unity gain cosine wave which is then clipped.

```
*===========Find_Spectrum=================================
linearize
set          specwindow =    "rectangular"
*SPEC        FSTART  FSTOP    FSTEP   VECTOR
spec         .5      1000    .5       v(OUT2)
plot         mag(v(OUT2))    loglog
*=========================================================
```

The following is the resulting spectrum when phase modulating a 20Hz with a jitter PWL file.



Below is the spectrum of the free running oscillator which generated the jitter PWL file.



Two very different paths were taken to get to the same spectrum. So things are very close, but not identical.

For a more detailed view of the random noise sidebands, it is possible to estimate where these noise sidebands come from.

```
============Full_Netlist_For_Copy_Paste========================
Use_Jitter_to_PM
*    OUT      Rload
*     _____/\  __
*    _|_      \/  |
*   /   \          |
* /VpwlT\          |
* \     /          |
*   \___/         ///
*     |           Gnd
*     |
*    ///
*    Gnd
*
* VpwlT OUT 0        PWL( + 0.0005 0.988835 +.....
*=========Include_Noise_File==================================================
.include  PWL_FileJitter.inc
Rload     OUT    0      1k
VT        Vtime  0      PWL    ( 0 0 2 2 ) DC 0
B1        OUT1   0      V =     cos(2*3.14159*20*v(Vtime)+ v(OUT))
B2        OUT2   0      V =     20*u(v(OUT1))-10
*=========Run_Simulation=====================================================
```

```
*TRAN     TSTEP  TSTOP  TSTART TMAX      ?UIC?
.tran     5u     2      0      5u        UIC
.control
run
set       pensize =     2
plot      out1  out
*===========Find_Spectrum==================================
linearize
set         specwindow =    "none"
*SPEC       FSTART  FSTOP    FSTEP   VECTOR
spec        .5      1000    .5       v(OUT2)
plot        mag(v(OUT2))    loglog
*=========Wrap_Up=======================================================
.endc
.end
```

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