Spread_Spectrum

```
* dsauersanjose@aol.com  1/15/09
* www.idea2ic.com
*
*              PM Signal
*
*     Vtime        ^  OUT      ^  VGAIN
*          _____     /_\         /_\
*  VT   _|_    |     _|_         _|_
*     /_    \  |   /_   \ B1    /_   \ Vgain
*    //_\  \ \ |_//_\  \ \     //_\  \
*    \    \//   \    \//      \    \//
*     \___/       \___/        \___/
*       |           |            |
*      _|_         _|_          _|_
*       ///         ///          ///
*
*   Gnd      www.idea2ic.com
*            dsauersanjose@aol.com  4/26/08
*  .tran  TSTEP  TSTOP  TSTART TMAX   ?UIC?
.OPTIONS  GMIN=1e-12    METHOD=trap   ABSTOL=1e-12  TEMP=27 srcsteps = 1  gminsteps = 1
*======== ====== ====== ====== ====== ====== ====== ====== ====== ======
.include                Noise_audio1K.txt
VT        Vtime  0      PWL    ( 0 0 1 1 )
VGAIN     VGAIN  0      DC     1m
BPM       Vmod   0      V  =   V(VGAIN)*V(audio1K)
B1        OUT    0      V =    .9*tanh(100*sin(6.28318530717958623*100000*v(Vtime) + 6.28318530717958623*v(Vmod)))
.tran     .1u    .1m    0      .1u

.control
set       pensize = 2
run
plot      v(out)        v(vmod)  xlimit 0 .1m  title VGAINis1m
linearize
set       specwindow=   "none"
spec      10000         1000k      10000     v(out)
plot      mag(v(out))   loglog  title VGAINis1m ylimit 1m 1

alter     VGAIN          dc = 1000k
run
plot      v(out)        v(vmod)  xlimit 0 .1m  title VGAINis1MEG
linearize
set       specwindow=   "none"
spec      10000          1000k      10000     v(out)
plot      mag(v(out))    loglog  title VGAINis1MEG

set       pensize = 1
.endc
.end
```

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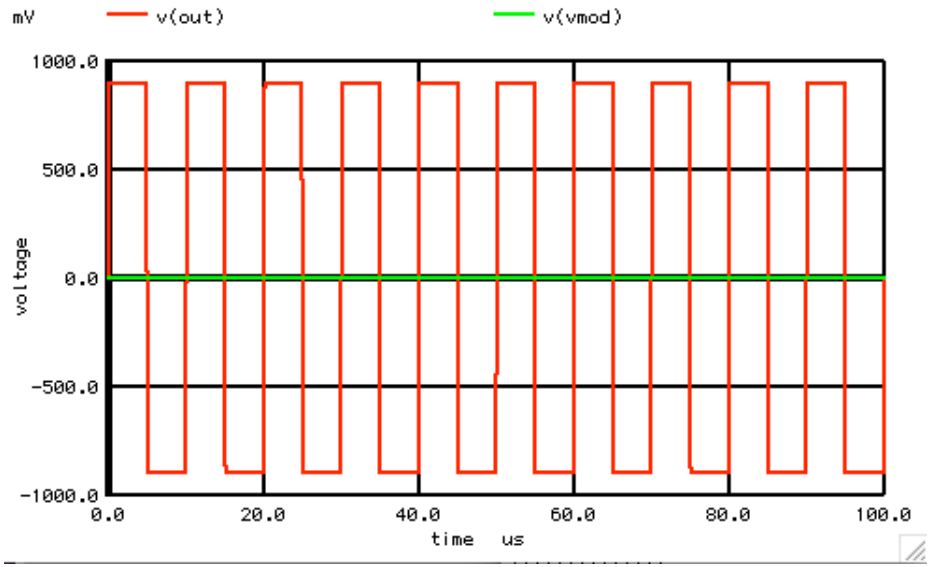
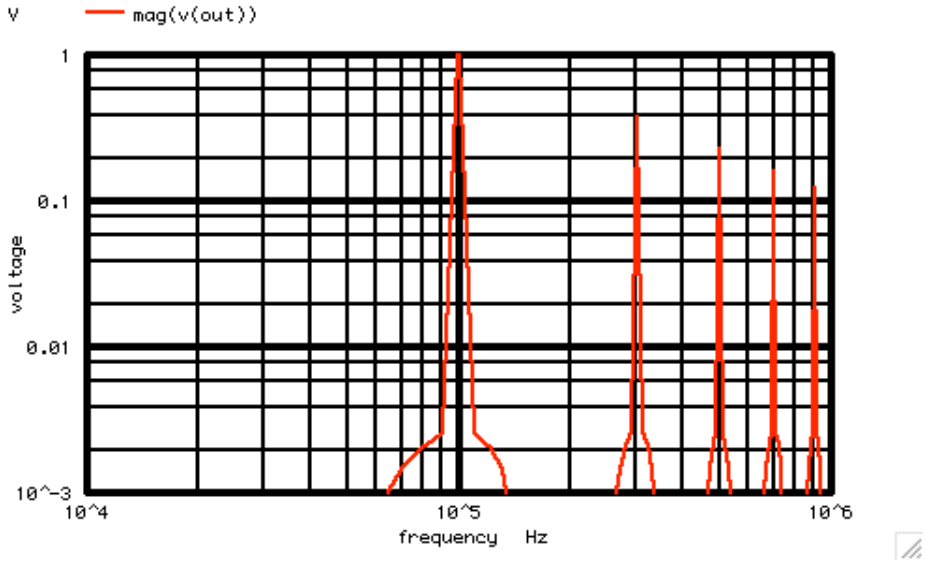
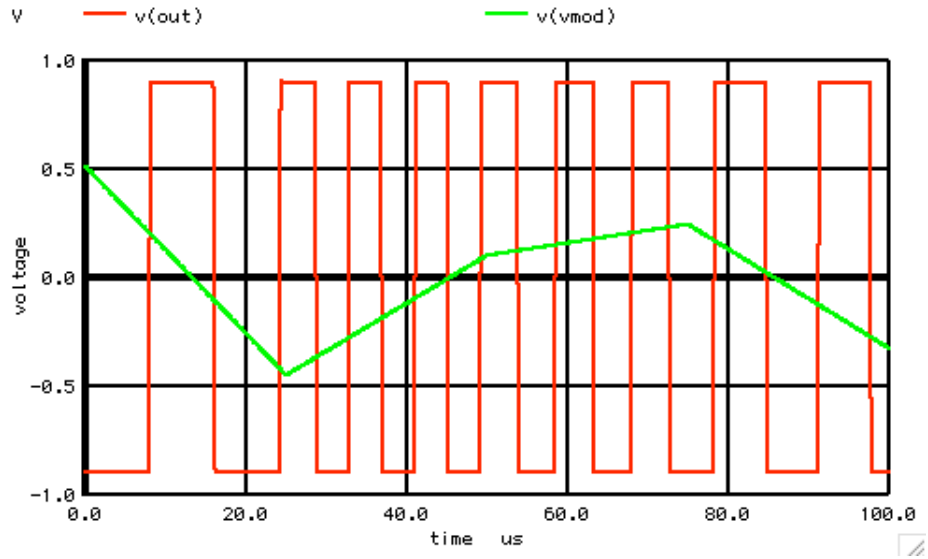
The Square wave (out) is simulated which can be phase modulated by a random signal (vmod).



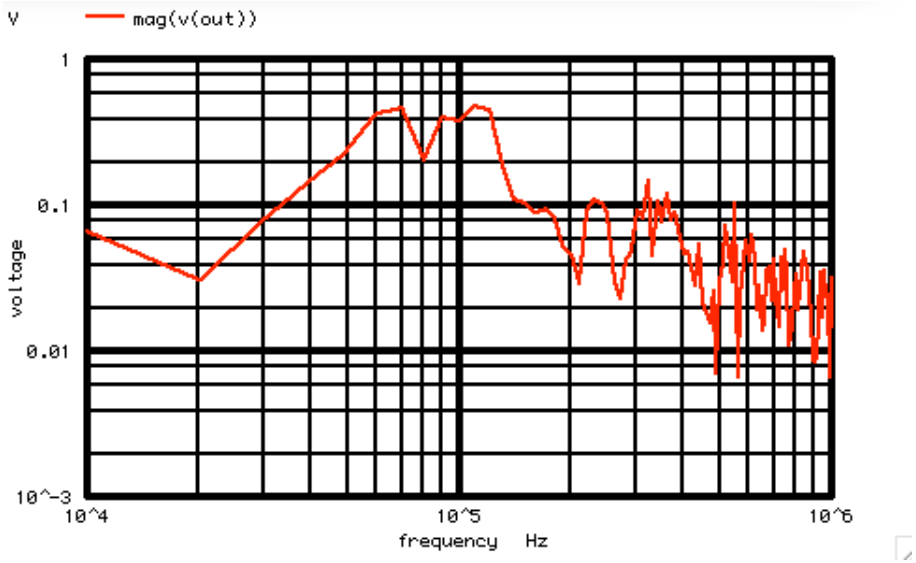
The FFT is taken without using any windowing.



The classical output spectrum is the result.



Next the square wave get phase modulated by a random signal.



The fundamental gets reduced in size and gets spread out. Notice the odd harmonics gets spread out much more.