Signal Integrity Commands

.LIN

Calculates linear transfer and noise parameters for a general multi-port network.

```
.LIN [sparcalc [=1|0]] [modelname=modelname] [filename=filename]
+ [format=selem|citi|touchstone|touchstone2] [noisecalc [=1|0]]
+ [gdcalc [=1|0]] [dataformat=ri|ma|db]
+ [listfreq=(freq1 [freq2 ... freqN]|none|all)] [listcount=num]
+ [listfloor=val] [listsources=1|0|yes|no]
```

.STATEYE

Performs Statistical Eye Diagram analysis.

```
.STATEYE T=time_interval Trf=rise_fall_time [Tr=rise_time]
+ [Tf=fall_time] Incident_port=idx1[, idx2, … idxN]
+ Probe_port=idx1[, idx2, … idxN] [Tran_init=n_periods]
+ [V_low=val] [V_high=val] [TD_In=val] [TD_PROBE=val]
+ [T_resolution=n] [V_resolution=n] [VD_range=val]
+ [EDGE=1|2|4|8] [MAX_PATTERN=n] [PATTERN_REPEAT=n]
+ [SAVE_TR=ascii] [LOAD_TR=ascii] [SAVE_DIR=string]
+ [IGNORE_Bits=n] [Tran_Bit_Seg=n]
+ [MODE=EDGE|CONV|TRAN] [XTALK_TYPE = SYNC|ASYNC|DDP|NO|ONLY]
+ [Unfold_Length=n] [TXJITTER_MODE = 1|2]
```

RF Analysis Commands

.ACPHASENOISE

Helps interpret signal and noise quantities as phase variables for accumulated jitter for closed-loop PLL analysis.

```
.ACPHASENOISE output input [interval] carrier=freq
+ [listfreq=(freq1 [freq2 ... freqN]|none|all)][listcount=num]
+ [listfloor=val] [listsources=1|0]
```

.HB

Runs periodic steady state analysis with the single and multitone Harmonic Balance algorithm.

```
.HB TONES=F1[,F2,…,FN] [SUBHARMS=SH] [NHARMS=H1[,H2,…,HN]]
+ [INTMODMAX=n] [SWEEP parameter_sweep]
```

.SN

Runs periodic steady state analysis using the Shooting Newton algorithm.

```
.SN TRES=Tr PERIOD=T [TRINIT=Ti] [MAXTRINITCYCLES=integer]
+ [SWEEP parameter_sweep] [NUMPEROUT=val]
.SN TONE=F1 [TRINIT=Ti] NHARMS=N [MAXTRINITCYCLES=integer]
+ [NUMPEROUT=val] [SWEEP parameter_sweep]
```

.HBOSC / .SNOSC

Performs analysis on autonomous oscillator circuits.

```
.HBOSC TONE=F1 NHARMS=H1
+ PROBENODE=N1,N2,VP [FSPTS=NUM,MIN,MAX]
+ [SWEEP parameter_sweep] [SUBHARMS=I] [STABILITY=-2|-1|0|1|2]
.SNOSC TONE=F1 NHARMS=H1 [TRINIT=Ti]
+ [OSCTONE=N] [MAXTRINITCYCLES=N]
+ [SWEEP parameter_sweep]
```

.PHASENOISE

Interprets signal / noise quantities as phase variables for accumulated jitter in closed-loop PLL analysis.

```
.PHASENOISE output frequency_sweep [method= 0|1|2]
+ [listfreq=(freq1 [freq2 ... freqN]|none|all)] [listcount=num]
+ [listfloor=val] [listsources=1|0] [carrierindex=int]
```

.HBNOISE

Performs cyclo-stationary noise analysis on circuits in a large-signal periodic steady state.

```
.HBNOISE output insrc parameter_sweep [N1, N2, ..., NK,+/-1]
+ [LISTFREQ=(freq1 [freq2 ... freqN]|none|all]) [LISTCOUNT=num]
+ [LISTFLOOR=val] [LISTSOURCES=on|off]
```

.SNNOISE

Runs periodic AC noise analysis on nonautonomous circuits in a large-signal periodic steady state.

```
.SNNOISE output insrc frequency_sweep [N1, +/-1]
+ [LISTFREQ=(freq1 [freq2 ... freqN]|none|all]) [LISTCOUNT=num]
+ [LISTFLOOR=val] [LISTSOURCES=on|off]
```

.HBAC / .SNAC

Runs periodic AC analysis on circuits operating in a large-signal periodic steady state.

```
.HBAC frequency_sweep
.SNAC frequency_sweep
```

.HBXF / .SNXF

Calculates transfer function from the given source in the circuit to the designated output.

```
.HBXF out_var frequency_sweep
.SNXF out_var frequency_sweep
```

.PTDNOISE

Calculates the noise spectrum and total noise at a point in time.

```
.PTDNOISE output TIME=[val|meas|sweep]
+[TDELTA=time_delta] frequency_sweep
+[listfreq=(freq1 [freq2 ... freqN]|none|all)] [listcount=num]
+[listfloor=val] [listsources=on|off]
```

RF Options

`SIM_ACCURACY=x` Sets and modifies the size of the time steps. The higher the value, the greater the accuracy; the lower the value, the faster the simulation runtime. Default is 1.

`TRANFORHB=n` 1 Forces HB analysis to recognize or ignore specific V/I sources, 0 (default) ignores transient descriptions of V/I sources.

`HBCONTINUE=n` Specifies whether to use the sweep solution from the previous simulation as the initial guess for the present simulation. 0 restarts each simulation in a sweep from the DC solution, 1 (default) uses the previous sweep solution as the initial guess.

`HBSOLVER=n` Specifies a preconditioner for solving nonlinear circuits. 0 invokes the direct solver. 1 (default) invokes the- matrix-free Krylov solver. 2 invokes the two-level hybrid time-frequency domain solver.

`SNACCURACY=n` Sets and modifies the size of the time steps. The higher the value, the greater the accuracy; the lower the value, the faster the simulation runtime. Default is 10.

`SAVESNINIT="filename"` Saves the operating point at the end of SN initialization.

`LOADSNINIT="filename"` Loads the operating point saved at end of SN initialization.

Output Commands

.BIASCHK .MEASURE .PRINT .PROBE

For details about all commands and options, see the *HSPICE ® Reference Manual: Commands and Control Options.*

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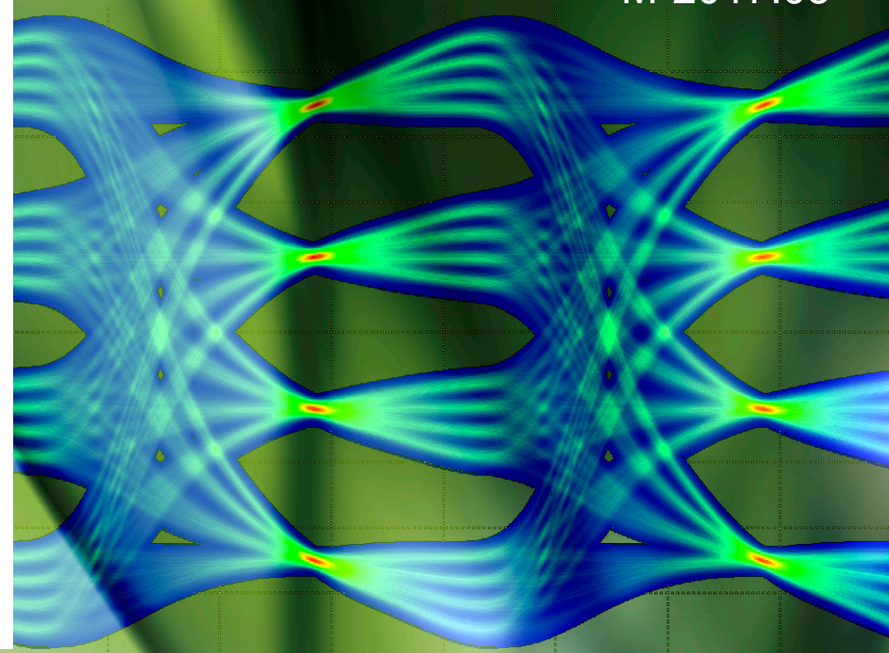
M-2017.03



Invoking HSPICE

Simulation Mode

```
hspice [-i] input_file [-o [output_file]] [-hpp] [-mt #num]
[-gz] [-d] [-case]
[-hdl filename] [-hdlpath pathname] [-vamodel name]
```

Distributed-Processing Mode

```
hspice [-i] input_file [-o [output_file]] -dp [#num]
[-dpconfig [dp_configuration_file]] [-dplocation [NFS|TMP]
[-merge]
```

Measurement Mode

```
hspice -meas measure_file -i wavefile  -o [output_file]
```

Help Mode

```
hspice [-h] [-doc] [-help] [-v]
```

Argument Descriptions

`-i input_file` Specifies the input netlist file name.

`-o output_file` Name of the output file. HSPICE appends the extension .lis.

`-hpp` Invokes HSPICE Precision Parallel.

`-mt #num` Invokes multithreading and specifies the number of processors. Works best when -hpp is used.

`-gz` Generates compression output on analysis results for these output types: .tr#, .ac#, .sw#, .ma#, .mt#, .ms#, .mc#, and .print*.

`-d` (UNIX) Displays the content of .st0 files on screen while running HSPICE.

`-case` Enable case sensitivity.

`-hdl filename` Specifies a Verilog-A file.

`-hdlpath pathname` Specifies the search path for Verilog-A files.

`-vamodel name` Specifies the cell name for Verilog-A definitions.

`-dp #num -dpconfig dpconfig_file -dplocation [NFS|TMP]` Invokes distributed processing and specifies number of processes, the configuration file for DP, and the location of the output files.

`-merge` Merge the output files in the distributed-processing mode.

`-meas measure_file` Calculates new measurements from a previous simulation.

`-h` Outputs the command line help message.

`-doc` Opens the PDF documentation set for HSPICE (requires Adobe Acrobat Reader or other PDF document reader).

`-help` Invokes the online help system (requires a Web browser).

`-v` Outputs HSPICE version information.

HSPICE is fully integrated with the Synopsys® Custom Compiler™ Simulation and Analysis Environment (SAE). See the *Custom Compiler™ Simulation and Analysis Environment User Guide*. To use the HSPICE integration to the Cadence® Virtuoso® Analog Design Environment, go to `/$INSTALLDIR/interface/` and follow the README instructions.

Analysis Commands

.AC

Performs AC analyses.

Single / Double Sweep

```
.AC type np fstart fstop
.AC type np fstart fstop [SWEEP var
+ [START=]start [STOP=]stop [STEP=]incr]
.AC type np fstart fstop [SWEEP var type np start stop]
```

Sweep Using Parameters

```
.AC type np fstart fstop [SWEEP DATA=datanm(Nums)]
.AC DATA=datanm
.AC DATA=datanm [SWEEP var [START=]start [STOP=]stop [STEP=]incr]
.AC DATA=datanm [SWEEP var type np start stop]
```

Monte Carlo Analysis

```
.AC type np fstart fstop [SWEEP MONTE=MCcommand]
```

.LSTB

Invokes loop stability analysis.

```
.LSTB [lstbname] mode=[single|diff|comm
+ vsource=[vlstb|vlstbp,vlstbn]
```

.NOISE

Runs noise analysis in frequency domain.

```
.NOISE v(out) vin [interval] [listckt[=1|0]]
+ [listfreq=freq1 [freq2 ... freqN]|none|all]) [listcount=num]
+ [listfloor=val] [listsources=1|0|yes|no]] [listtype=1|0]
```

.ALTER

Reruns a simulation using different parameters and data from a specified sequence or block. The .ALTER block can contain element commands and .AC, .ALIAS, .DATA, .DC, .DEL LIB, .HDL, .IC (initial condition), .INCLUDE, .LIB, .MODEL, .NODESET, .OP, .OPTION, .PARAM, .TEMP, .TF, .TRAN, and .VARIATION commands.

```
.ALTER title_string
```

.DC

Performs DC analyses.

```
.DC var1 START=start1 STOP=stop1 STEP=incr1
```

Parameterized Sweep

```
.DC var1 start1 stop1 incr1 [SWEEP var2 type np start2 stop2]
.DC var1 START=[par_expr1] STOP=[par_expr2] STEP=[par_expr3]
```

Data-Driven Sweep

```
.DC var1 type np start1 stop1 [SWEEP DATA=datanm(Nums)]
.DC DATA=datanm [SWEEP var2 start2 stop2 incr2]
.DC DATA=datanm(Nums)
```

Monte Carlo Analysis

```
.DC var1 start1 stop1 incr1 [SWEEP MONTE=MCcommand]
.DC MONTE=MCcommand
```

.OP

Calculates the operating point of the circuit.

```
.OP format_time format_time... [interpolation]
```

.PARAM

Defines parameters. Parameters are names that have associated numeric values or functions.

```
.PARAM ParamName= RealNumber | 'AlgebraicExpression'
  | DistributionFunction(Arguments) | str('string')
  | OPTxxx (initial_guess, low_limit, upper_limit)
```

Monte Carlo Analysis

```
.PARAM mcVar= UNIF(nominal_val, rel_variation [, multiplier])
  | AUNIF(nominal_val, abs_variation [, multiplier])
  | GAUSS(nominal_val, rel_variation, num_sigmas [, multiplier])
  | AGAUSS(nominal_val, abs_variation, num_sigmas [, multiplier])
  | LIMIT(nominal_val, abs_variation)
```

.STORE

Starts creation of checkpoint files describing a running process during transient analysis.

```
.STORE [file=checkpoint_file] [time=time1]
+ [repeat=checkpoint_interval]
```

.TEMP

Performs temperature analysis at specified temperatures.

```
.TEMP t1 [t2 t3 ...]
```

.TRAN

Performs a transient analysis.

Single-Point Analysis

```
.TRAN tstep1 tstop1 [START=val] [UIC]
```

Multipoint Analysis

```
.TRAN tstep1 tstop1 [tstep2 tstop2 ... tstepN tstopN]
+ RUNLVL =(time1 runlvl1 time2 runlvl2...timeN runlvlN)
+ [START=val] [UIC] [SWEEP var type np pstart pstop]
```

Monte Carlo Analysis

```
.TRAN tstep1 tstop1 [tstep2 tstop2 ... tstepN tstopN]
+ [START=val] [UIC] [SWEEP MONTE=MCcommand]
```

Data-Driven Sweep

```
.TRAN DATA=datanm
.TRAN DATA=datanm [SWEEP var type np pstart pstop]
.TRAN tstep1 tstop1 [tstep2 tstop2 ... tstepN tstopN]
+ [START=val] [UIC] [SWEEP DATA=datanm(Nums)]
```

Time Window-based Speed/Accuracy Tuning by RUNLVL

```
.TRAN tstep tstop [RUNLVL=(time1 runlvl1...timeN runlvlN)]
```

Circuit Block-based Speed/Accuracy Tuning by RUNLVL

```
.TRAN tstep tstop
+ [INST=inst_exp1 RUNLVL=(time11 runlvl11...time1N runlvl1N)]
+ [SUBCKT=subckt_exp2 RUNLVL=(time21 runlvl21...time2N runlvl2N)]
```

Time Window-based Temperature Setting

```
.TRAN tstep tstop [tempvec=(t1 Temp1 t2 Temp2 t3 Temp3...)
+[tempstep=val]]
```

.TRANNOISE

Activates transient noise analysis to compute the additional noise variables over a standard .TRAN analysis.

```
.TRANNOISE output [METHOD=MC] [SEED=val] [SAMPLES=val] [START=x]
+ [AUTOCORRELATION=0|1|off|on] [FMIN=val] [FMAX=val] [SCALE=val]
+ [PHASENOISE=0|1|2] [JITTER=0|1|2] [REF=srcName] [PSD=0|1]
```

HSPICE Options

```
.OPTION opt1 [opt2 opt3 ...]
```

`opt1 opt2 ...` Specify input control options.

General Options

`ALTCC=n` Enables reading the input netlist once for multiple .ALTER statements. Default is 0.

`LIS_NEW=x` Enables streamlining improvements to the *.lis file. Default is 0.

`SCALE=x` Sets the element scaling factor. Default is 1.

`POSTTOP=n` Outputs instances up to `n` levels deep. Default is 0.

`POSTLVL=n` Limits data written to the waveform file to the level of nodes specified by `n`.

`POST=n` Saves results for viewing by an interactive waveform viewer. Default is 0.

`PROBE=n` Limits post-analysis output to only variables specified in .PROBE and .PRINT statements. Default is 0.

RC Reduction Options

`SIM_LA=name` Starts linear matrix (RC) reduction to the PACT, PI, or LNE algorithm. Default is off.

Transient Options

`AUTOSTOP=n` Stops transient analysis after calculating all TRIG-TARG, FIND-WHEN, and FROM-TO measure functions. Default is 0.

`METHOD=name` Sets numerical integration method for a transient analysis to GEAR, or TRAP (default), or BDF.

`RUNLVL=n` Controls the speed and accuracy trade-off; where `n` can be 1 through 6. The higher the value, the greater the accuracy; the lower the value, the faster the simulation runtime. Default is 3.

Variability and Monte Carlo Analysis

.AC .DC .TRAN .MEASURE .MODEL .PARAM

.ACMATCH

Calculates the effects of variations on the AC transfer function, with one or more outputs.

```
.ACMatch Vm(n1) Vp(n1) Vr(n1) Vi(n1) Vm(n1,n2) Im(Vmeas)
```

.DCMATCH

Calculates the effects of variations on the DC operating point, with one or more outputs.

```
.DCMatch V(n1) V(n1,n2) I(Vmeas)
```