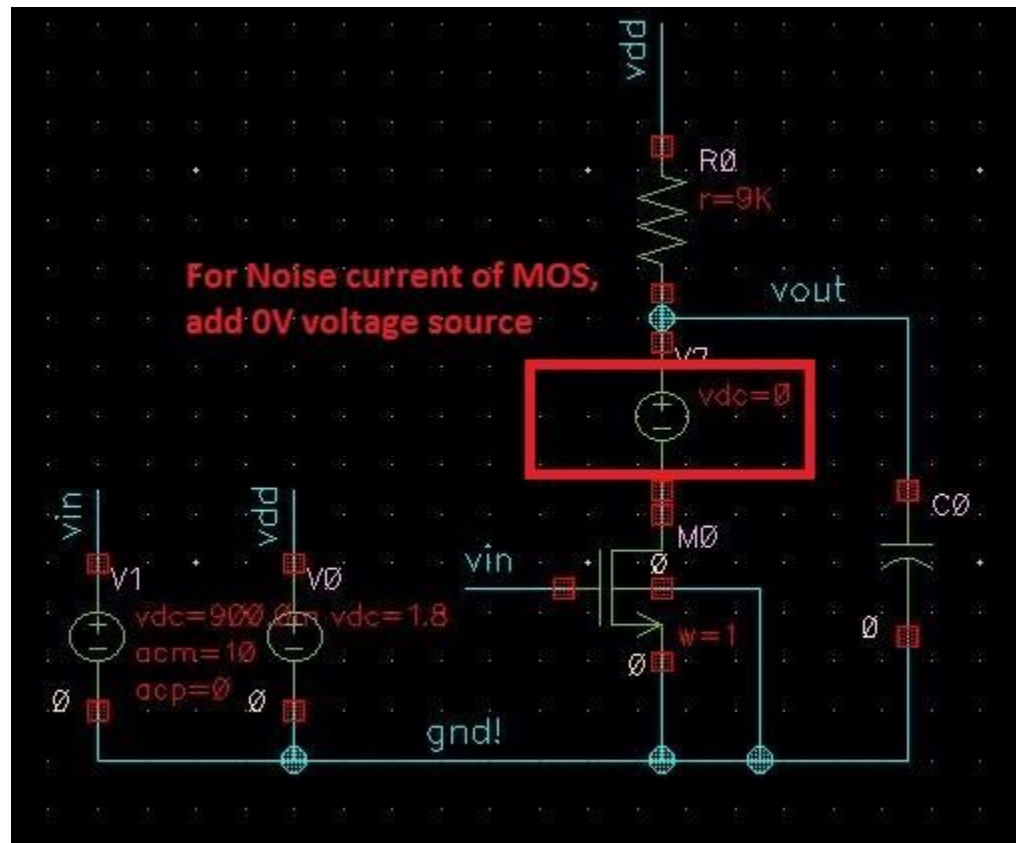


EE618  
CMOS ANALOG IC DESIGN

# Noise Simulation In cadence Spectre

# Set up the circuit



# Enable/Disable Resistor Noise

Edit Object Properties@vlsi32

☐ system ☒ user ☒ CDF

Browse Reset Instance Labels Display

Property	Value	Display
Library Name	analogLib	off
Cell Name	res	off
View Name	symbol	off
Instance Name	R0	off

Add Delete Modify

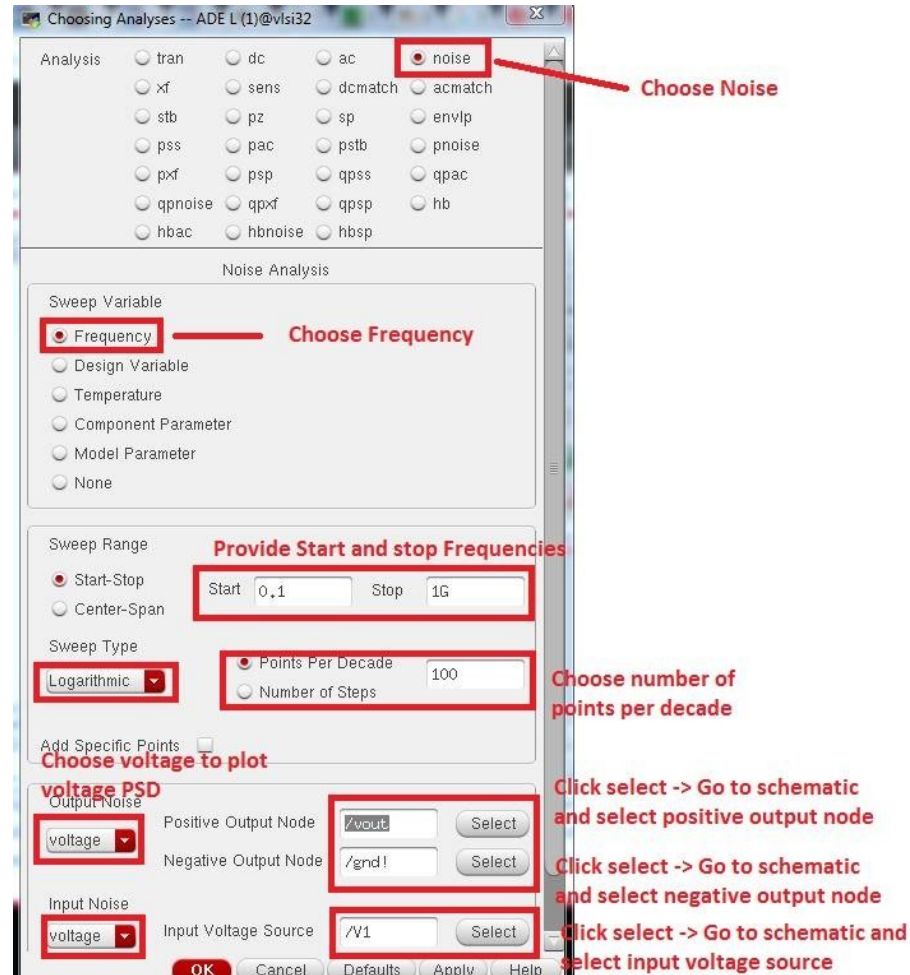
CDF Parameter	Value	Display
Model name		off
Resistance	9K Ohms	off
Length		off
Width		off
Multiplier		off
Scale factor		off
Temp rise from ambient		off
Temperature coefficient 1		off
Temperature coefficient 2		off
Resistance Form		off
Generate noise?	yes	off
Capacitance		off

OK Cancel Apply Defaults Previous Next Help

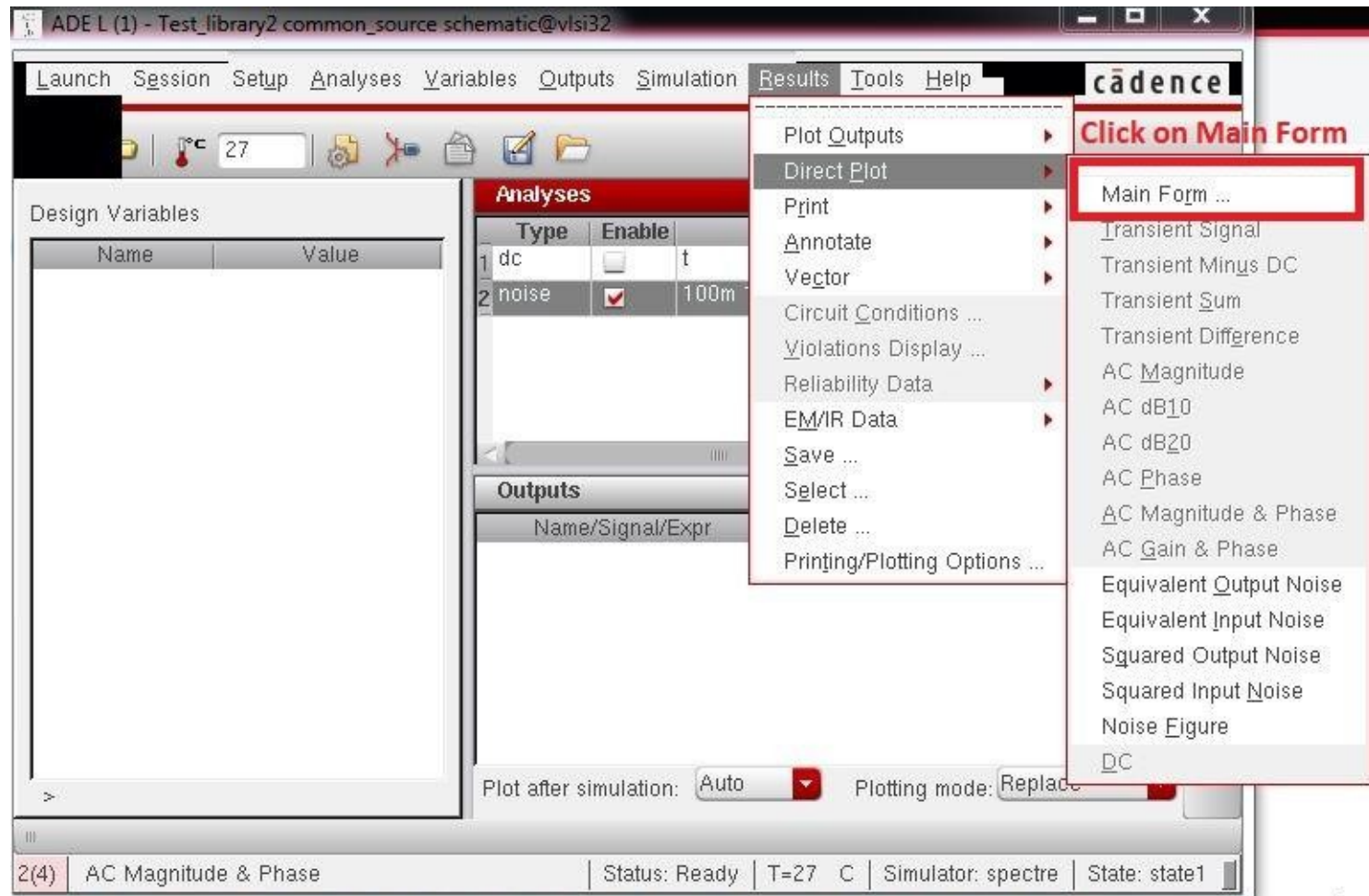
Select Component ->  
Press Q for properties

Click on yes/no to  
enable/disable noise  
contribution

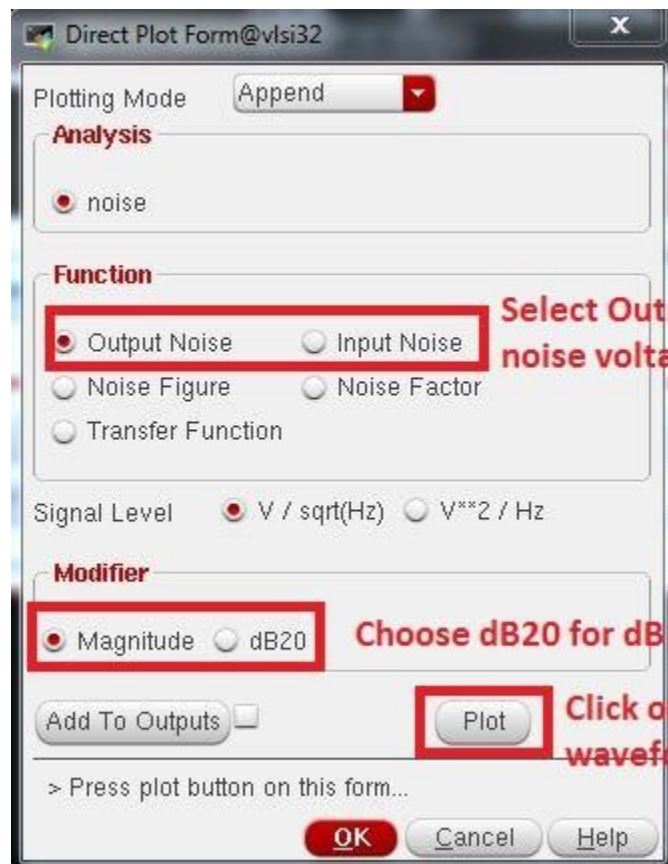
# Analysis Selection in ADE for voltage PSD



# After Running Simulation



# Plotting Options for Voltage PSD



Direct Plot Form@vlsi32

Plotting Mode: Append

**Analysis**

☒ noise

**Function**

☒ Output Noise ☐ Input Noise

☐ Noise Figure ☐ Noise Factor

☐ Transfer Function

Signal Level: ☒ V / sqrt(Hz) ☐ V\*\*2 / Hz

**Modifier**

☒ Magnitude ☐ dB20

Add To Outputs: ☐

Plot

> Press plot button on this form...

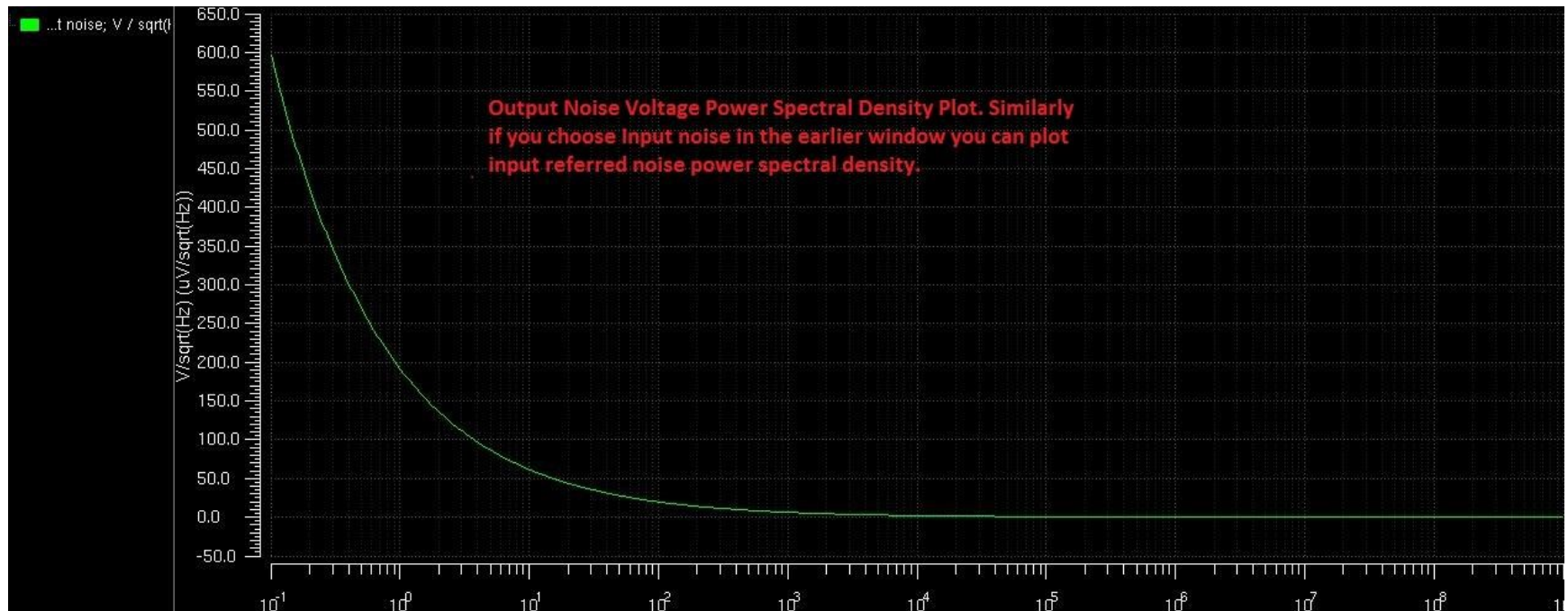
OK Cancel Help

Select Output noise or input noise voltage option to plot PSD

Choose dB20 for dB plot

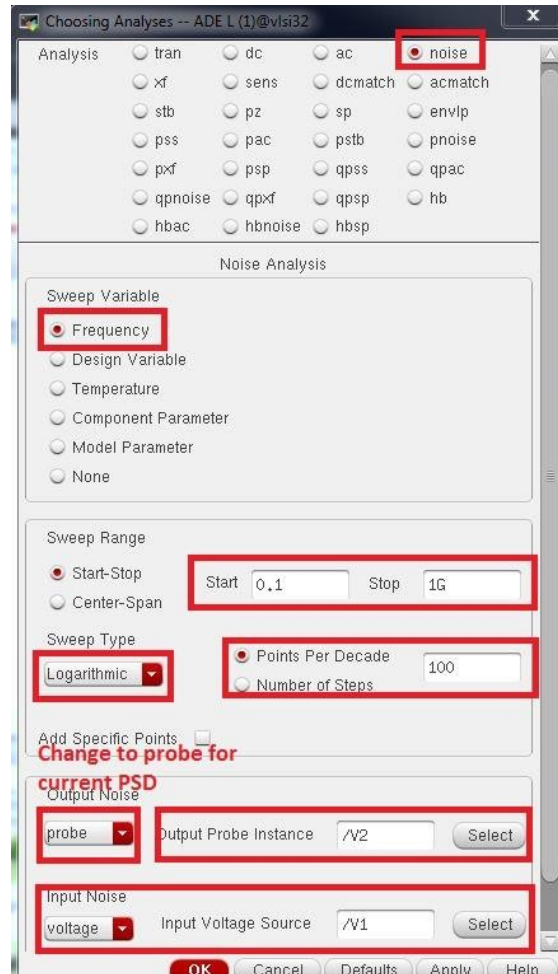
Click on plot and see the waveform viewer

# Example Voltage PSD plot





# Analysis Selection in ADE for Current PSD

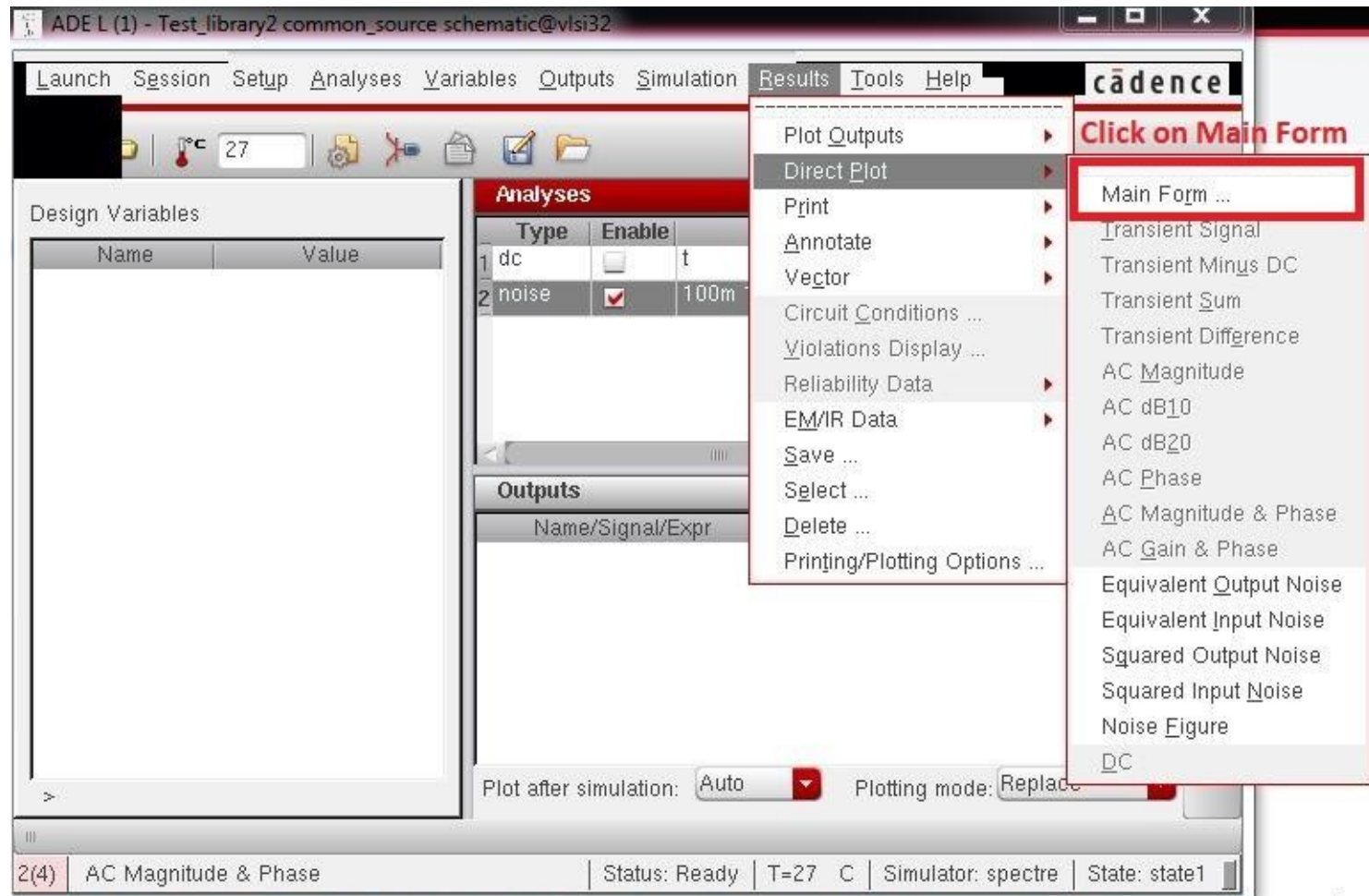


To plot the current PSD  
repeat same as before.

Click on select -> Go to schematic click  
on the 0V voltage source that was  
added



# After Running Simulation



# Plotting Options for Current PSD

Direct Plot Form@vlsi32

Plotting Mode: Append

**Analysis**

☒ noise

**Function**

☒ Output Noise ☐ Input Noise

☐ Noise Figure ☐ Noise Factor

☐ Transfer Function

**Current PSD options**

Signal Level: ☒ A / sqrt(Hz) ☐ A\*\*2 / Hz

**Modifier**

☒ Magnitude ☐ dB20

**Click plot and check waveform window**

Add To Outputs ☐ **Plot**

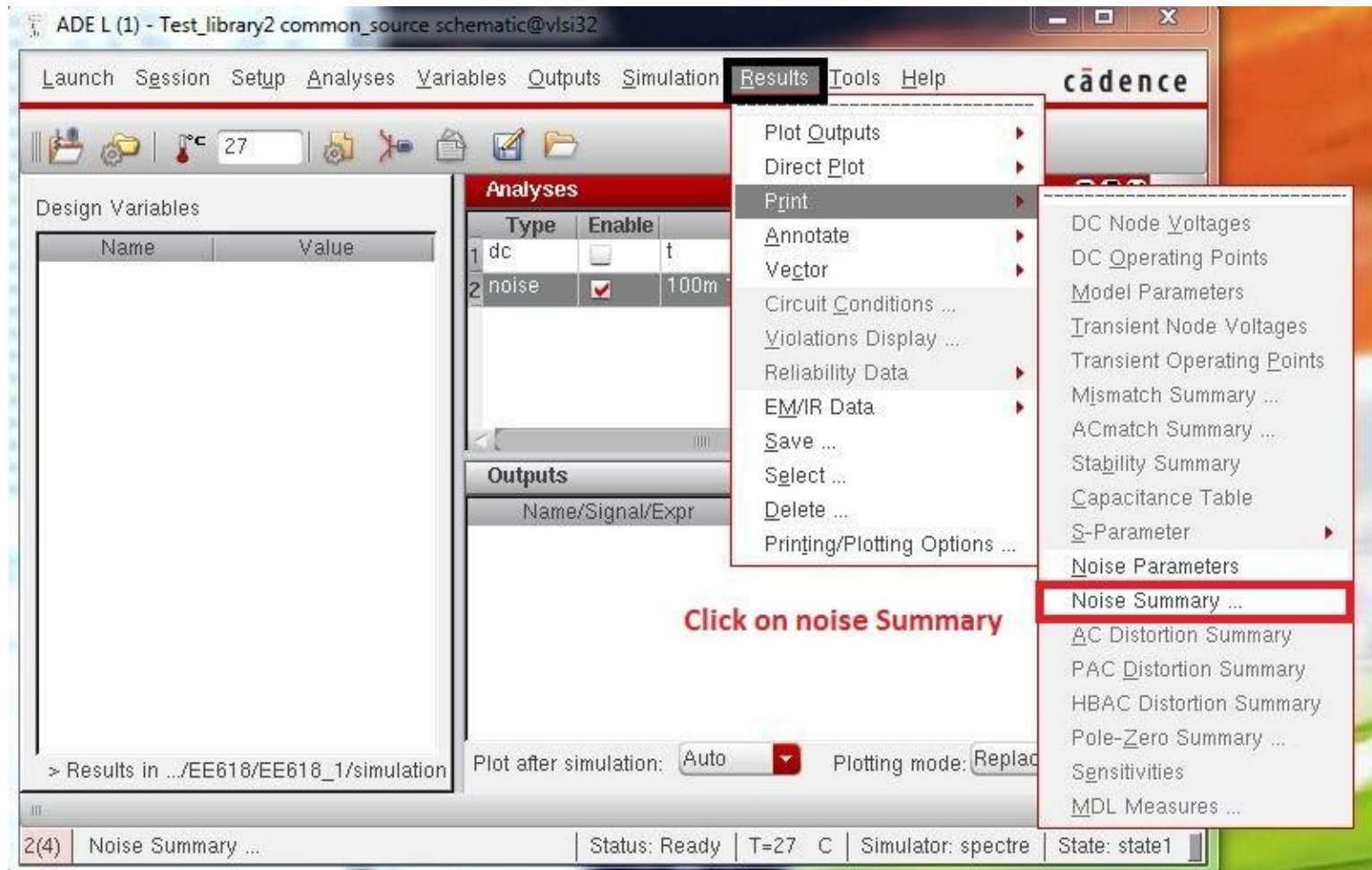
> Press plot button on this form...

OK Cancel Help

# Example Current PSD plot



# For Spot Noise Calculation (After Running simulation)



# Spot noise Settings

Noise Summary@vlsi32

Print the output noise of 'noise' analysis

Type ☒ spot noise ☐ integrated noise

noise unit V

Frequency Spot (Hz) 1M

FILTER

hierarchy level ☐

include instances

exclude instances

TRUNCATE & SORT

truncate by number top 5

sort by ☒ noise contributors ☐ composite noise ☐ device name

Choose unit V or V<sup>2</sup>

Choose frequency at which you need to measure spot noise

To include All noises, click on Include All Types

Number of top noise contributors need to observe



# Spot Noise Result Summary

Results Display Window@vlsi32

Window Expressions Info Help

cādence

Device	Param	Noise Contribution	% Of Total
/M0	fn	2.10922e-07	98.67
/M0	id	2.19064e-08	1.06
/R0	rn	1.08893e-08	0.26
/M0	rs	0	0.00
/M0	rd	0	0.00

Spot Noise Summary (in V/sqrt(Hz)) at 1M Hz Sorted By Noise Contributors

Total Summarized Noise = 2.12336e-07

Total Input Referred Noise = 6.79252e-08

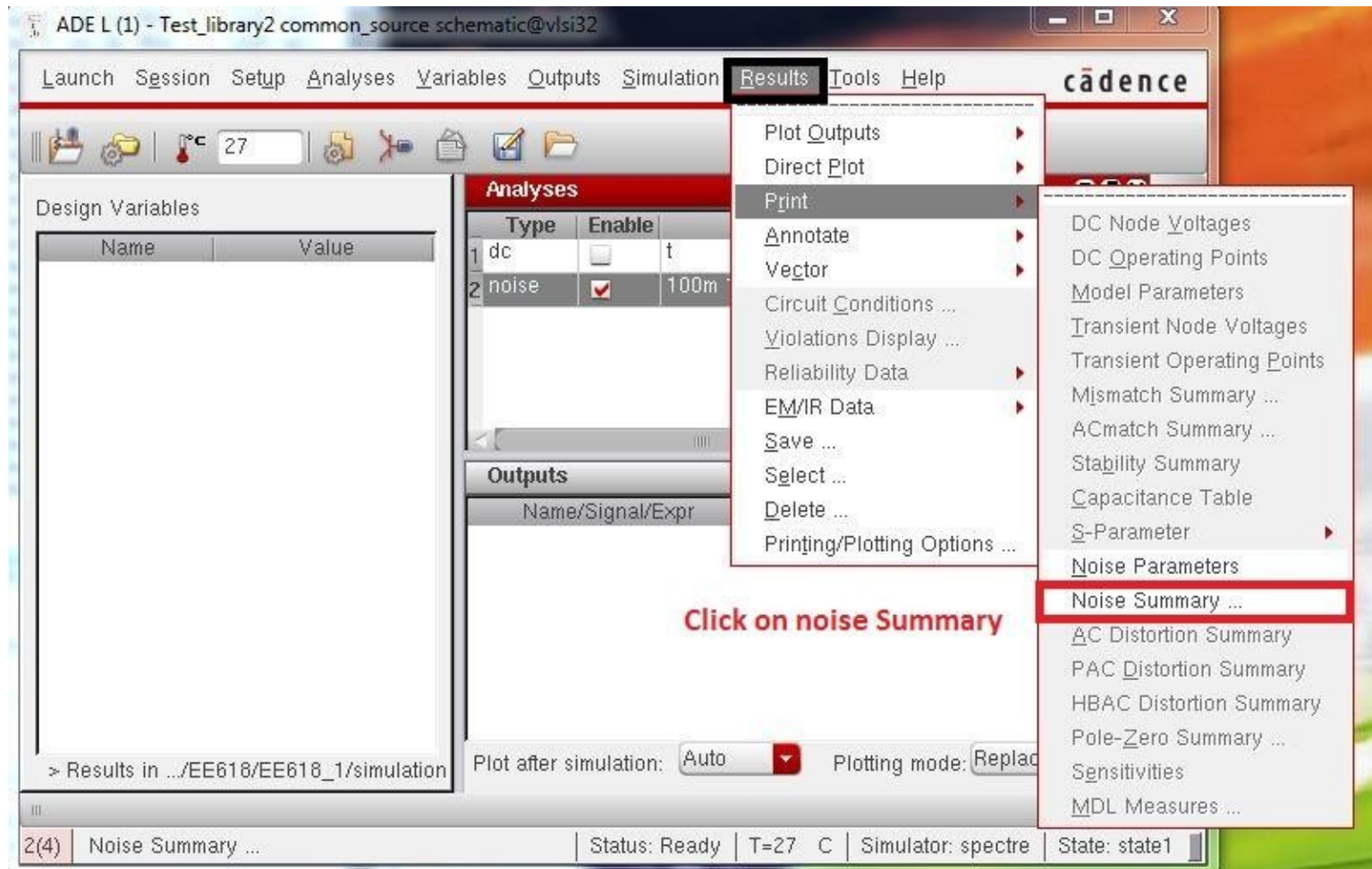
The above noise summary info is for noise data

fn -> Flicker noise, id is thermal noise of MOSFET

rn -> Resistor noise

Total output and input referred noise values

# For Integrated Noise Calculation (After Running simulation)





# Settings for Integrated Noise

Noise Summary@vlsi32

Print the output noise of 'noise' analysis

**To calculate Integrated noise**

Type ☐ spot noise ☒ integrated noise noise unit V

From (Hz) 0.1 To (Hz) 1G

weighting ☒ flat ☐ from weight file **Choose the noise Bandwidth, over which need to integrate**

FILTER

hierarchy level ☒

include instances

exclude instances

TRUNCATE & SORT **Same as before**

truncate by number top 5

sort by ☒ noise contributors ☐ composite noise ☐ device name

# Integrated Noise Result Summary

Results Display Window@vlsi32

Window Expressions Info Help

cadence

Device	Param	Noise Contribution	% Of Total
/M0	fn	0.000883093	97.69
/M0	id	0.000121524	1.85
/R0	rn	6.04078e-05	0.46
/M0	rs	0	0.00
/M0	rd	0	0.00

Integrated Noise Summary (in V) Sorted By Noise Contributors

Total Summarized Noise = 0.00089346

Total Input Referred Noise = 0.000399947

The above noise summary info is for noise data

**Integrated noise (flicker and thermal)**

**Output and Input referred Integrated noise**

**END**