Techplots generation for gm/Id Methodology using Cadence Virtuoso

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Creating New Library/Cellview

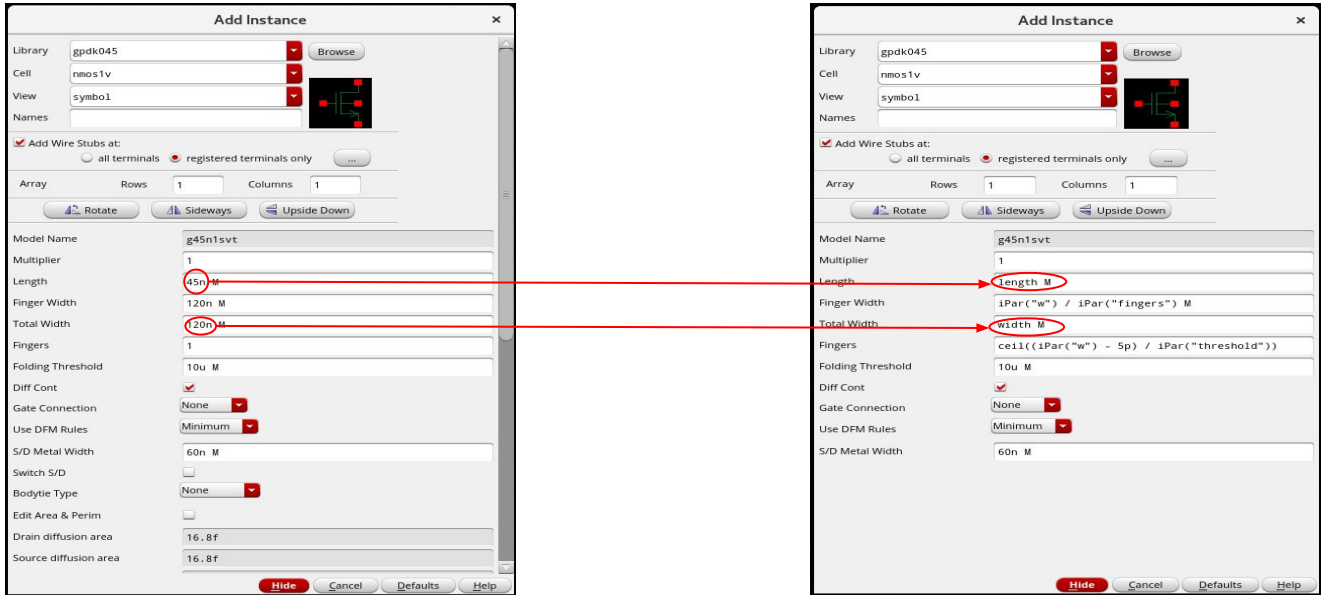
- Follow this document to create a new schematic

  (Lecture-9) VL502_Lab_Simulation_Exercise_Tutorial.pdf

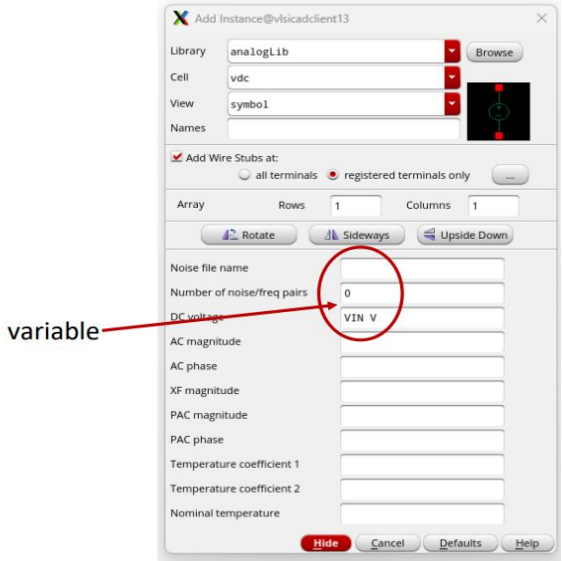
- While creating the Library attach the pdks that you are going to work with
- If you're working in a pre-existing library by creating a new cellview you can add the necessary pdks in the ADE L by clicking this icon 

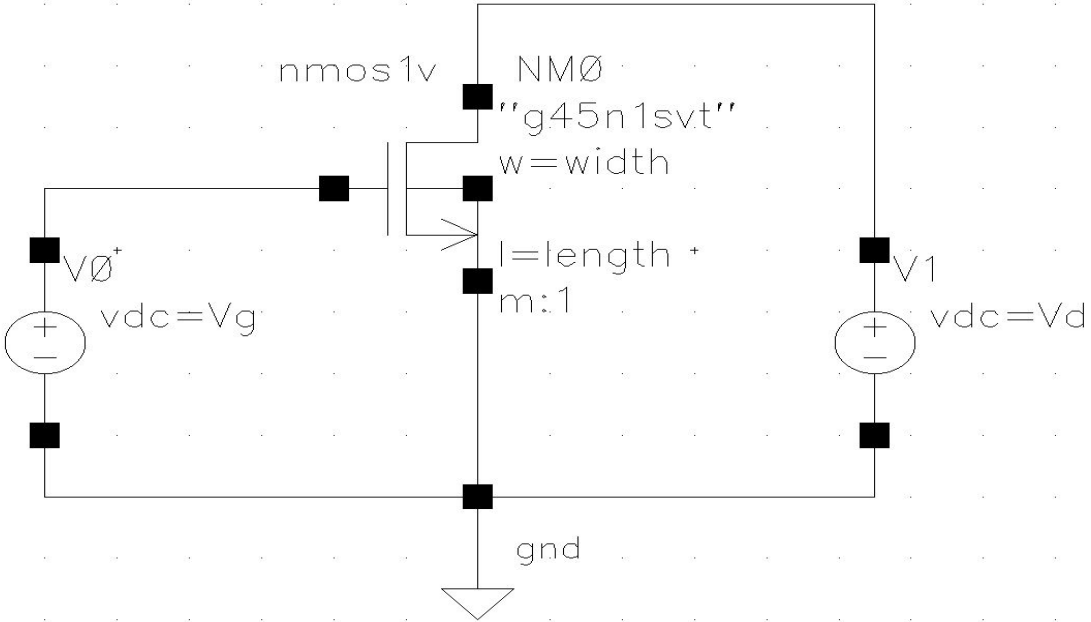
Creating New Schematic

- To make the schematic click i to add the necessary circuit elements.
- While selecting the nmos/pmos make the length and width of nmos/pmos as variables respectively



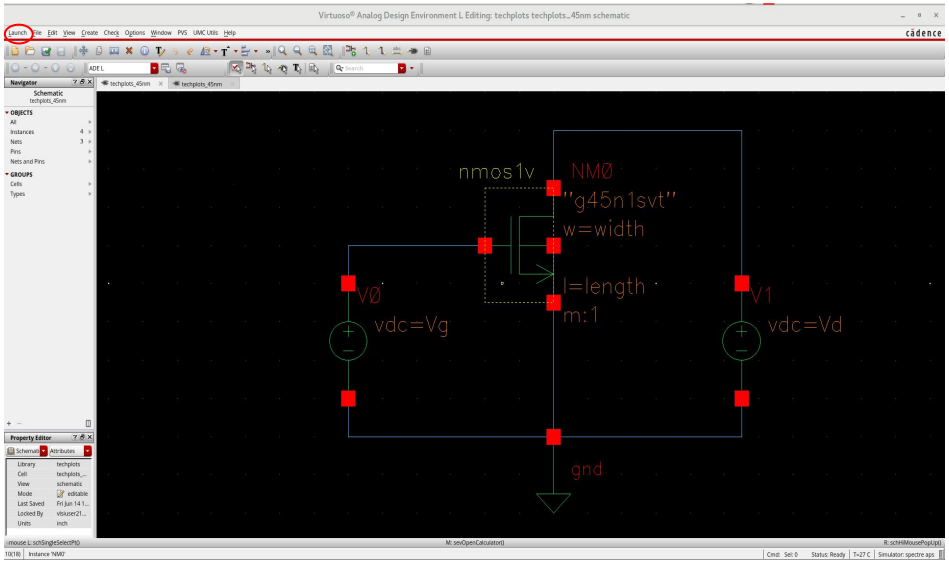
- And also instantiate the necessary DC voltage and ground ,make the DC voltages as variables.



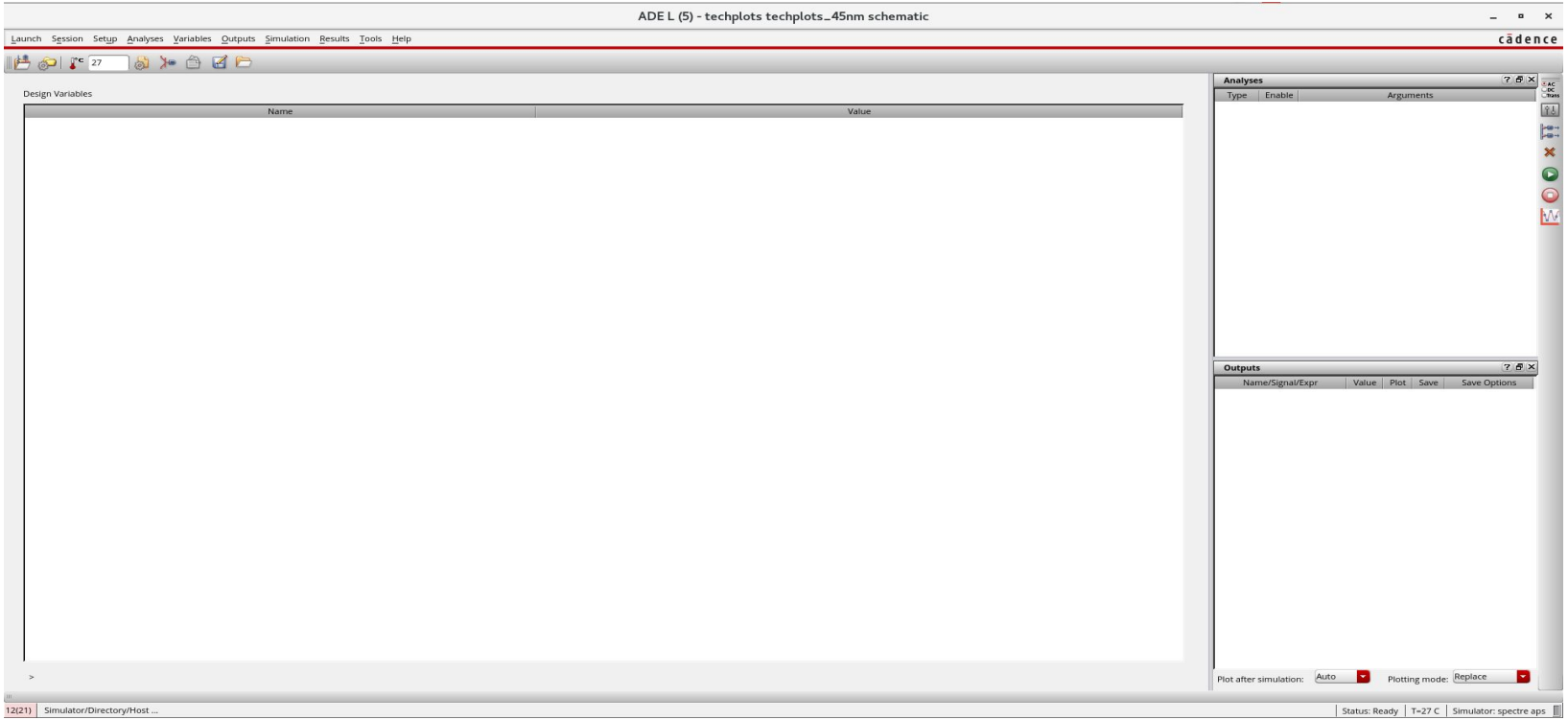

nmos1v
NMØ
"g45n1svt"
w=width
l=length
m:1
VØ
vdc=Vg
V1
vdc=Vd
gnd

Launching ADE L

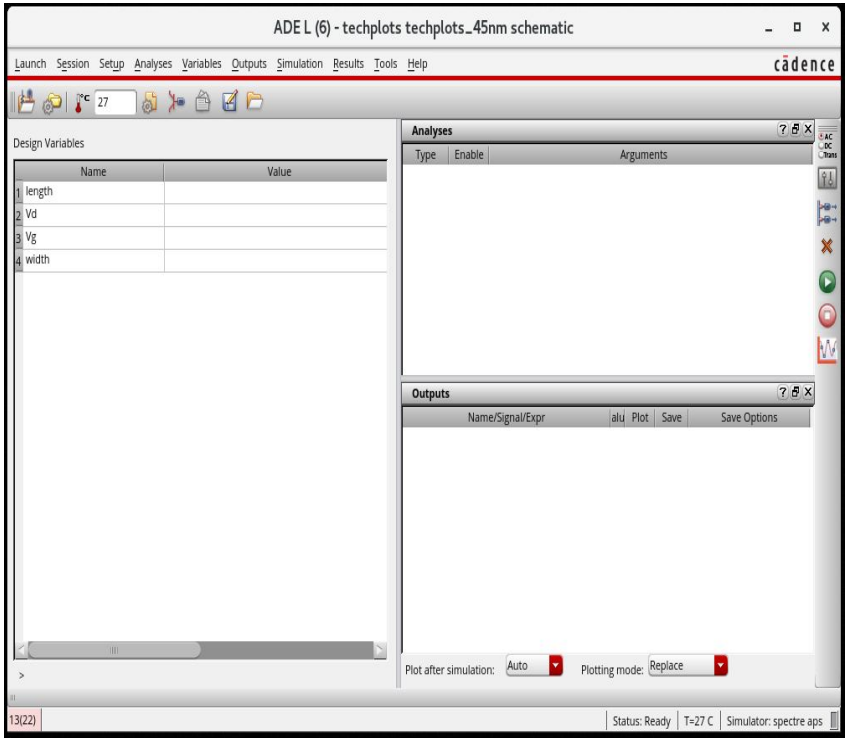
- Click on launch in the schematic editor window and then select ADE L to open the ADE L window.



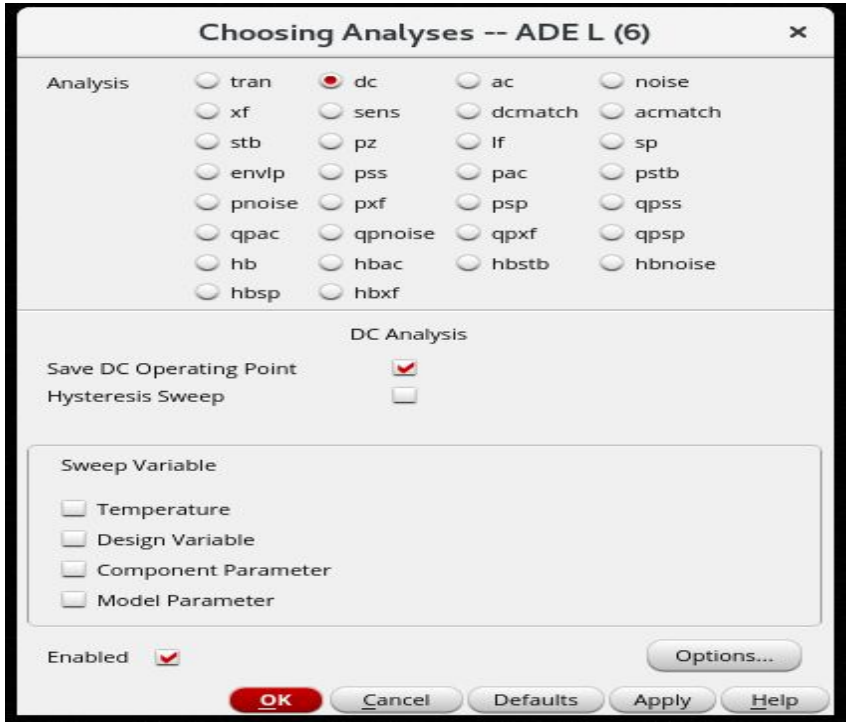
ADE L


ADE L (5) - techplots techplots_45nm schematic
Launch Session Setup Analyses Variables Outputs Simulation Results Tools Help
cadence
Design Variables
Name
Value
Analyses
Type
Enable
Arguments
Outputs
Name/Signal/Expr
Value
Plot
Save
Save Options
Plot after simulation:
Auto
Plotting mode:
Replace
12(21)
Simulator/Directory/Host ...
Status: Ready
T=27 C
Simulator: spectre aps

Loading variables to ADEL

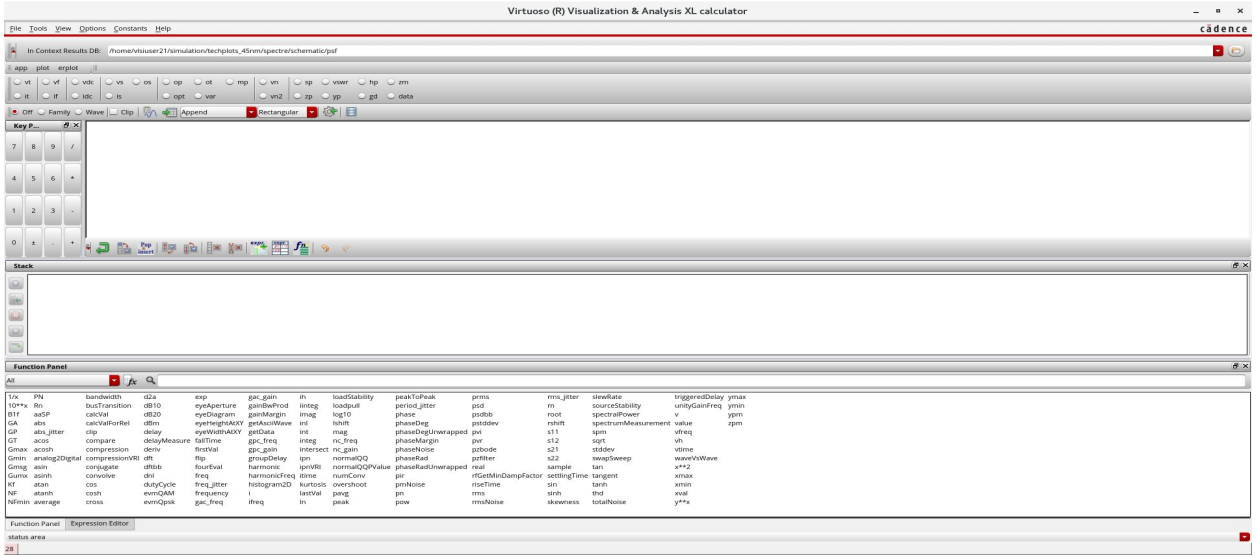


Choosing Analyses

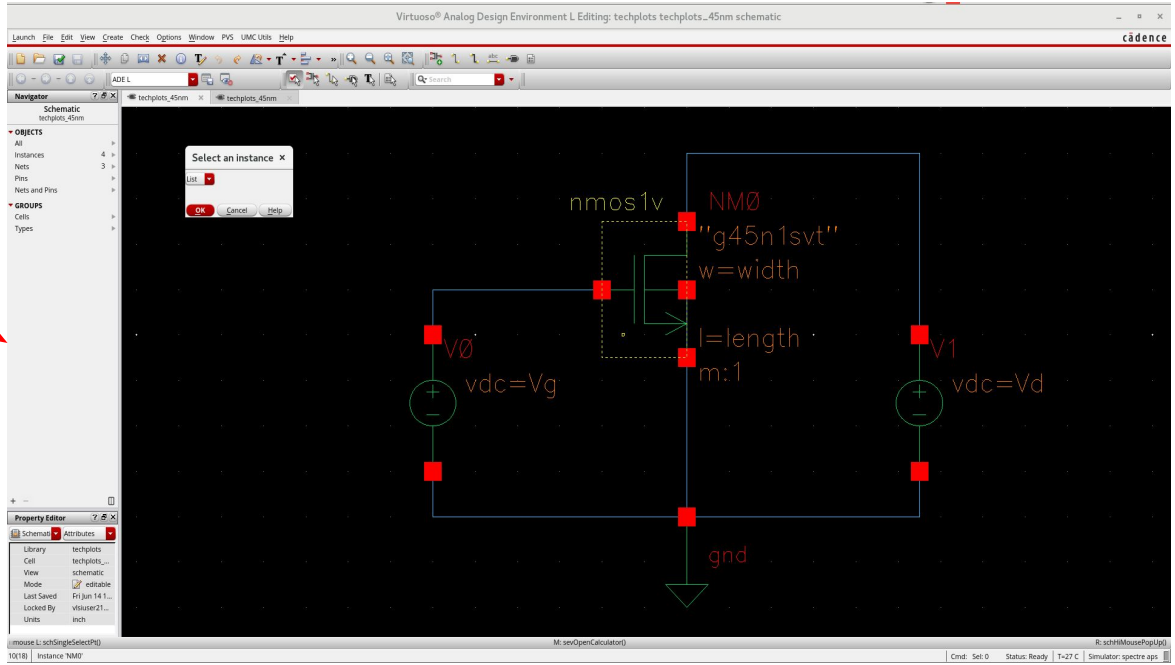


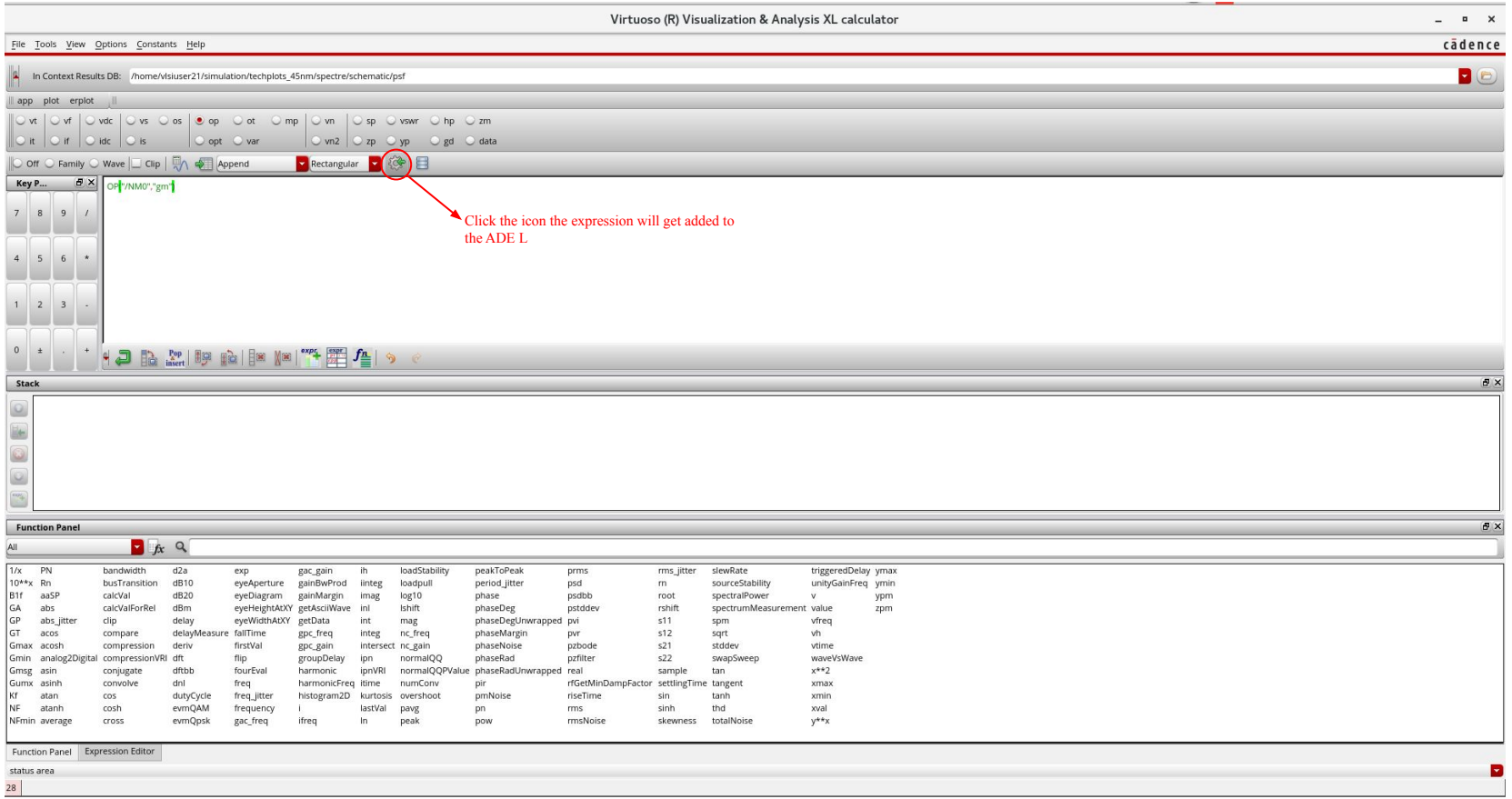
Calculator and Output Expressions

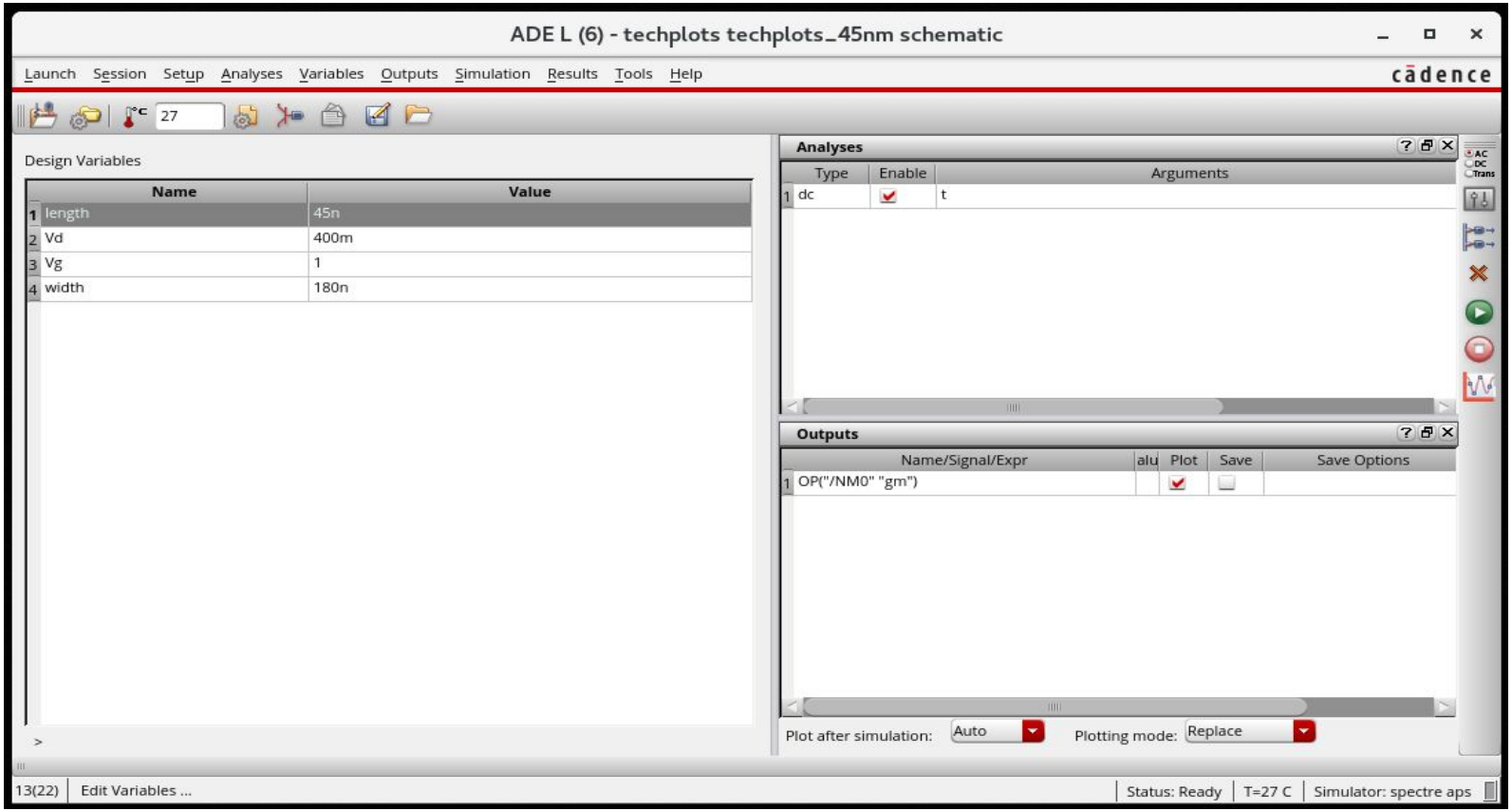
- After choosing the analyses click on the run simulation 
- In the ADE L window click on tools select calculator



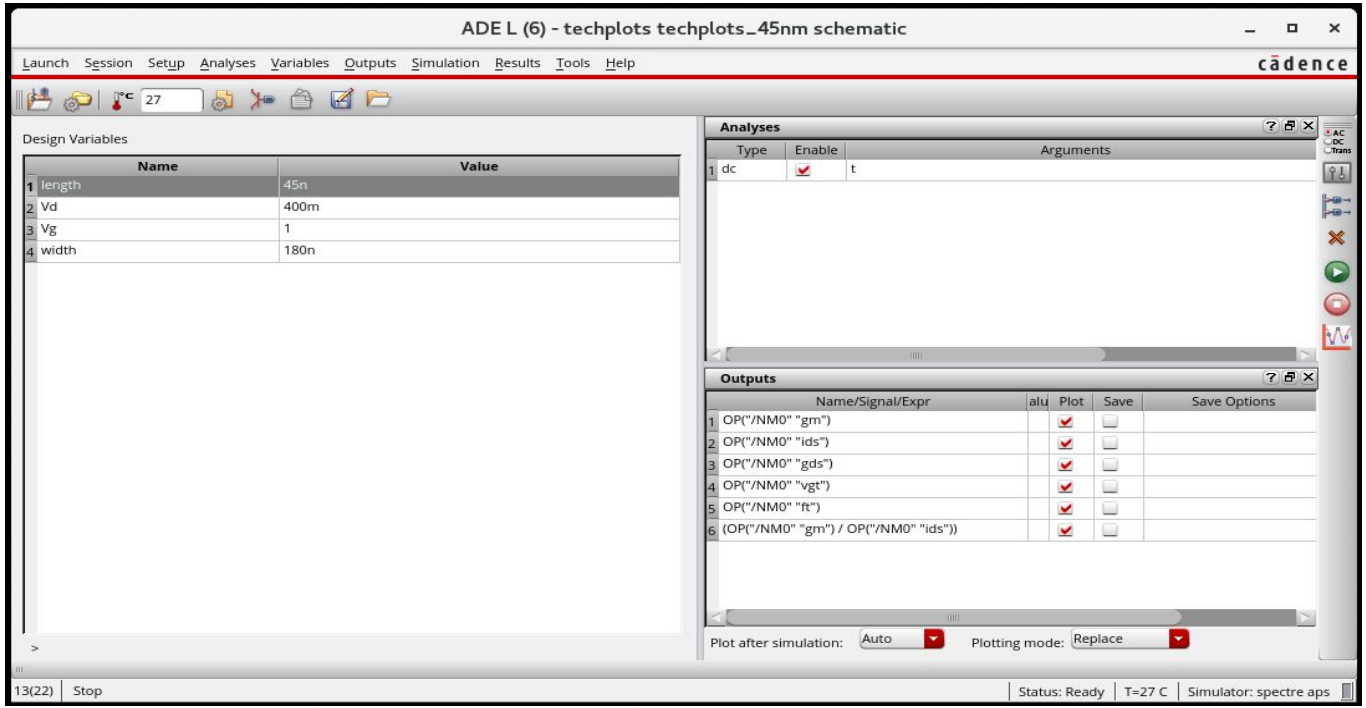
- Click on the op in the calculator window and after the select the instance which is the nmos/pmos to add the necessary operating points to the ADE L



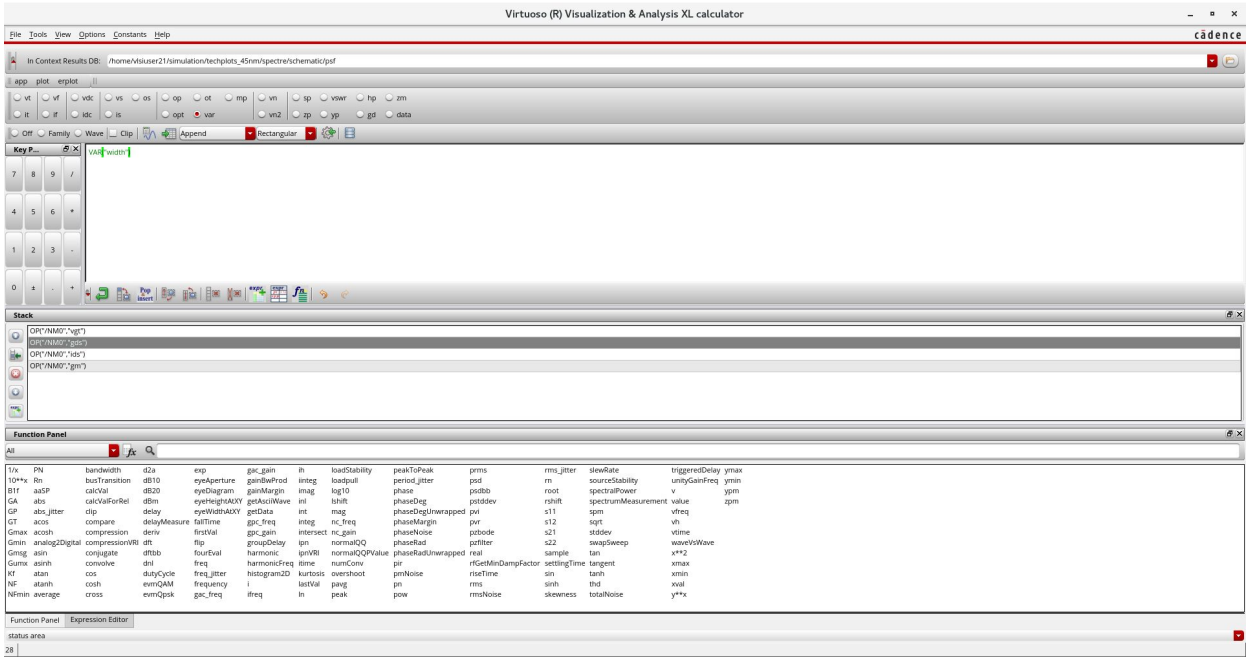

Virtuoso (R) Visualization & Analysis XL calculator
File Tools View Options Constants Help
cadence
In Context Results DB: /home/vlsiuser21/simulation/techplots_45nm/spectre/schematic/psf
app plot erplot
Click the icon the expression will get added to the ADE L
Stack
Function Panel
Function Panel Expression Editor
status area


ADE L (6) - techplots techplots_45nm schematic
Launch Session Setup Analyses Variables Outputs Simulation Results Tools Help
cadence
27
Design Variables
Name Value
1 length 45n
2 Vd 400m
3 Vg 1
4 width 180n
Analyses
Type Enable Arguments
1 dc t
Outputs
Name/Signal/Expr alu Plot Save Save Options
1 OP("/NM0" "gm")
Plot after simulation: Auto
Plotting mode: Replace
13(22) Edit Variables ...
Status: Ready T=27 C Simulator: spectre aps

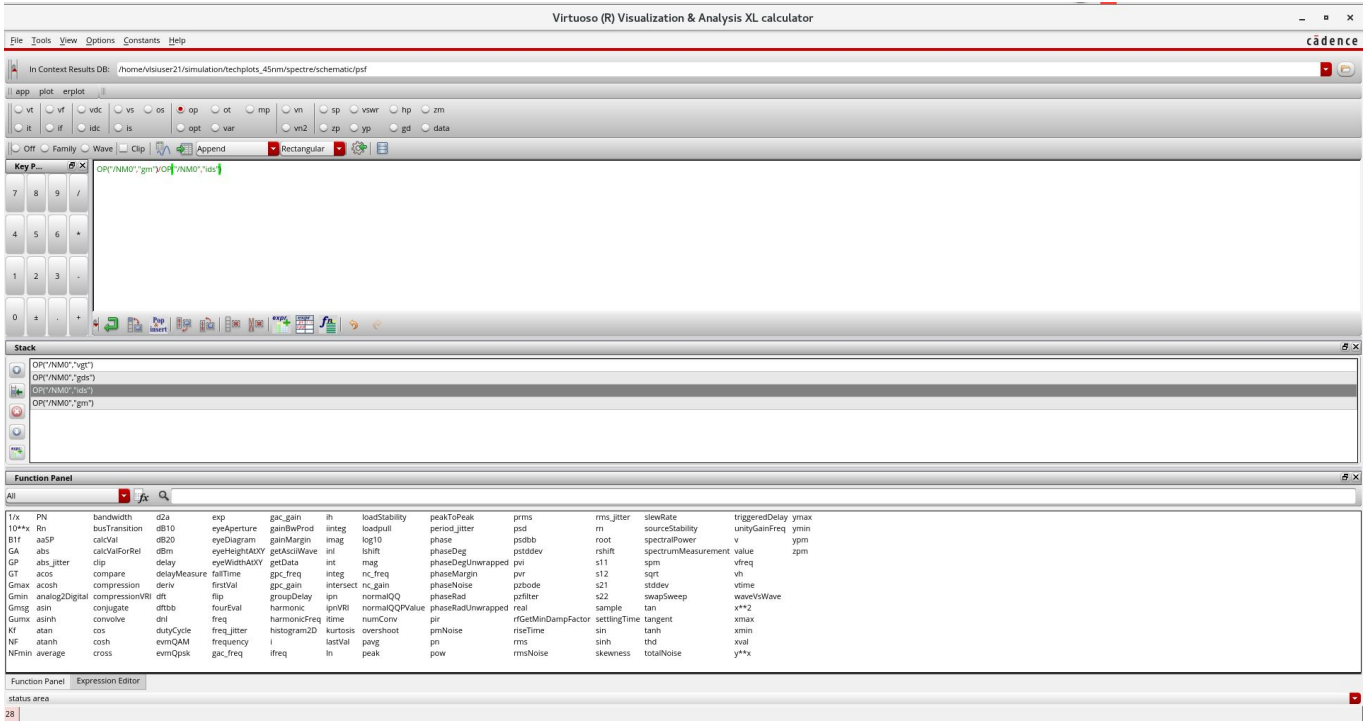
- Following the same steps add the remaining operating points in the ADE L

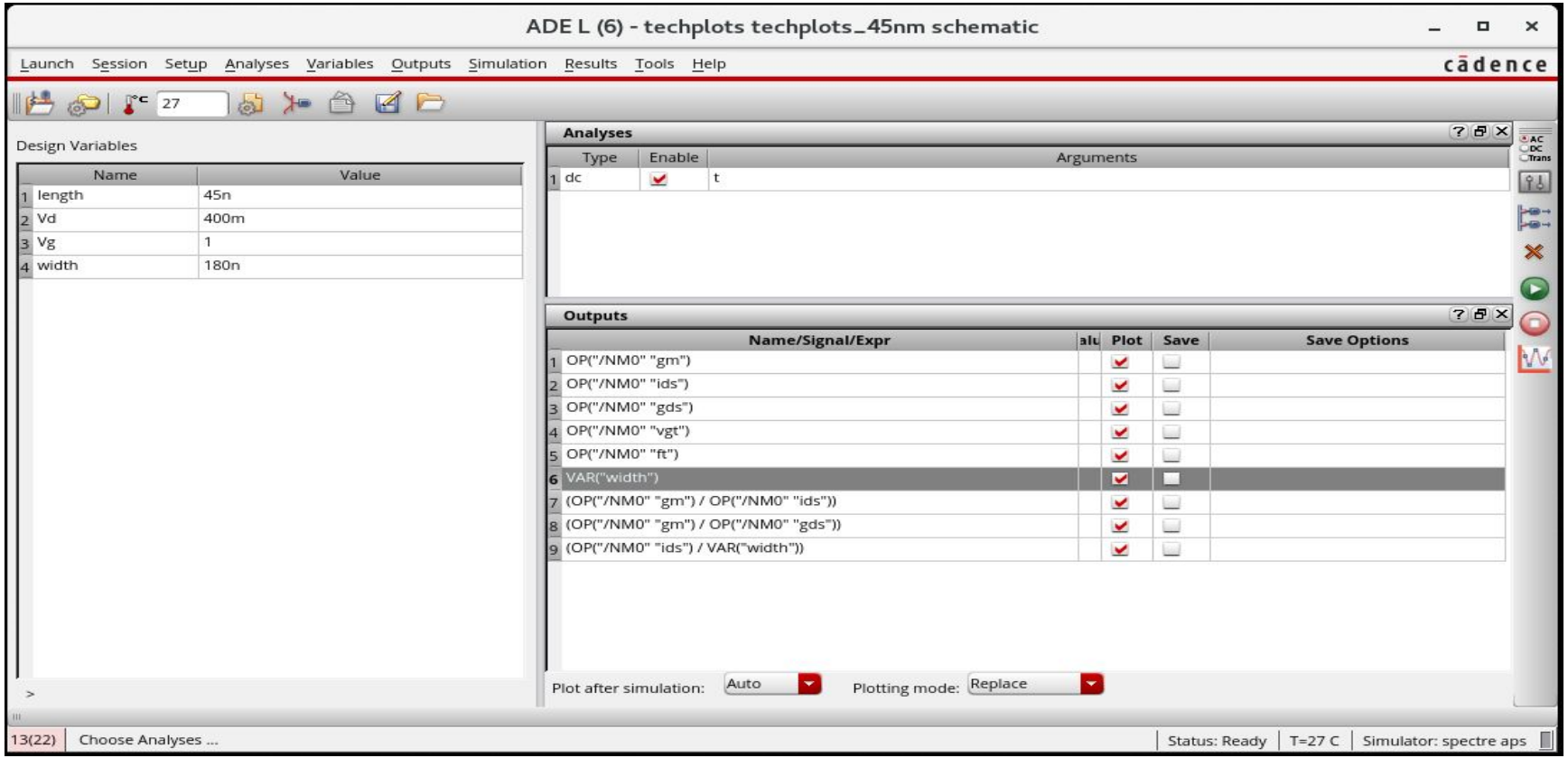


- Click on var in the calculator and the select the nmos as the instance after that select the width in the drop down menu.

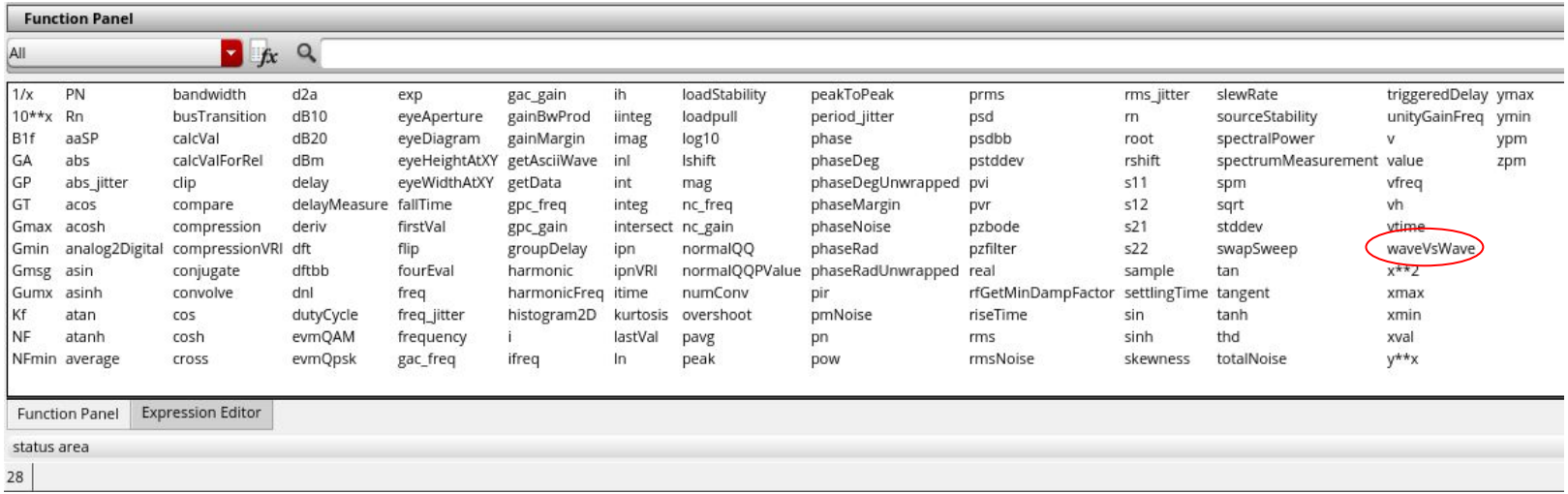


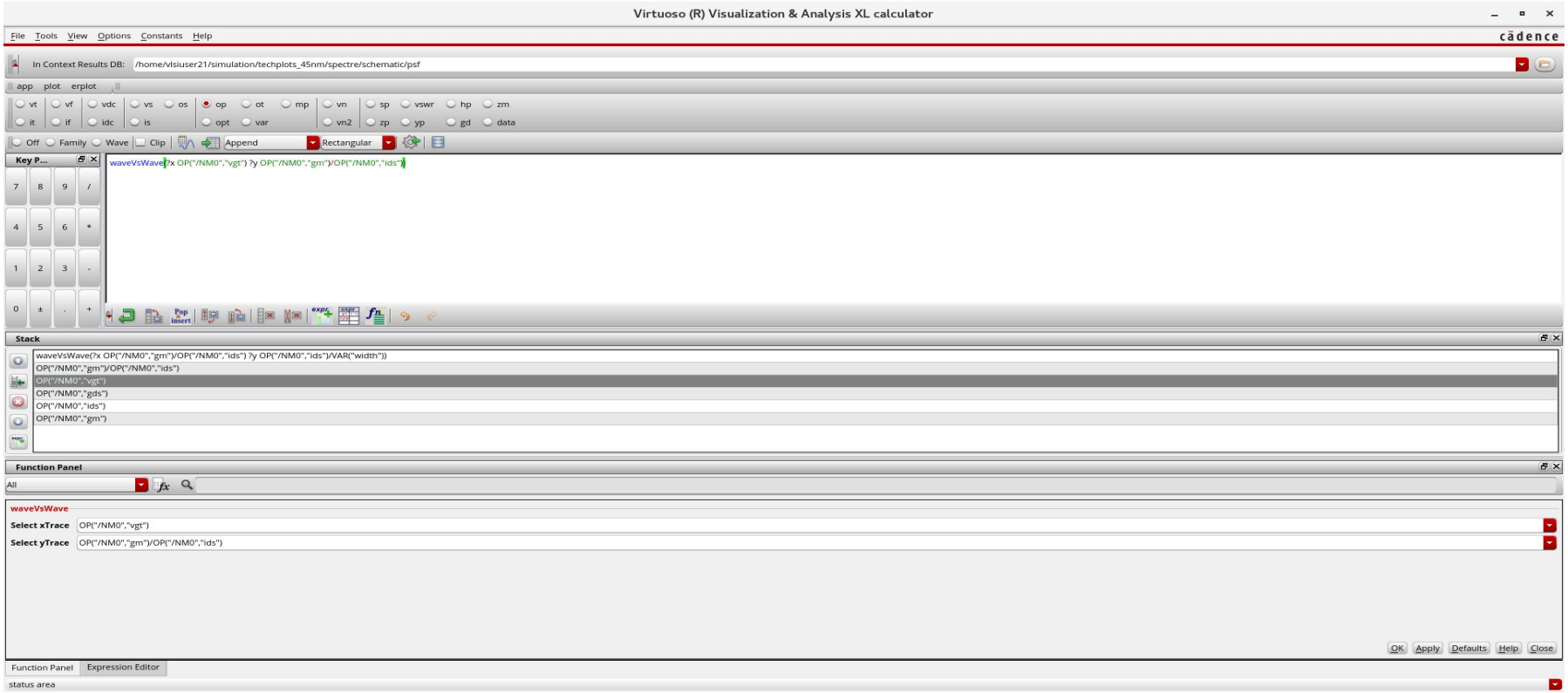
- Make the gm/Id , gm/gds, Id/W expressions in the calculator and add them to the ADE L



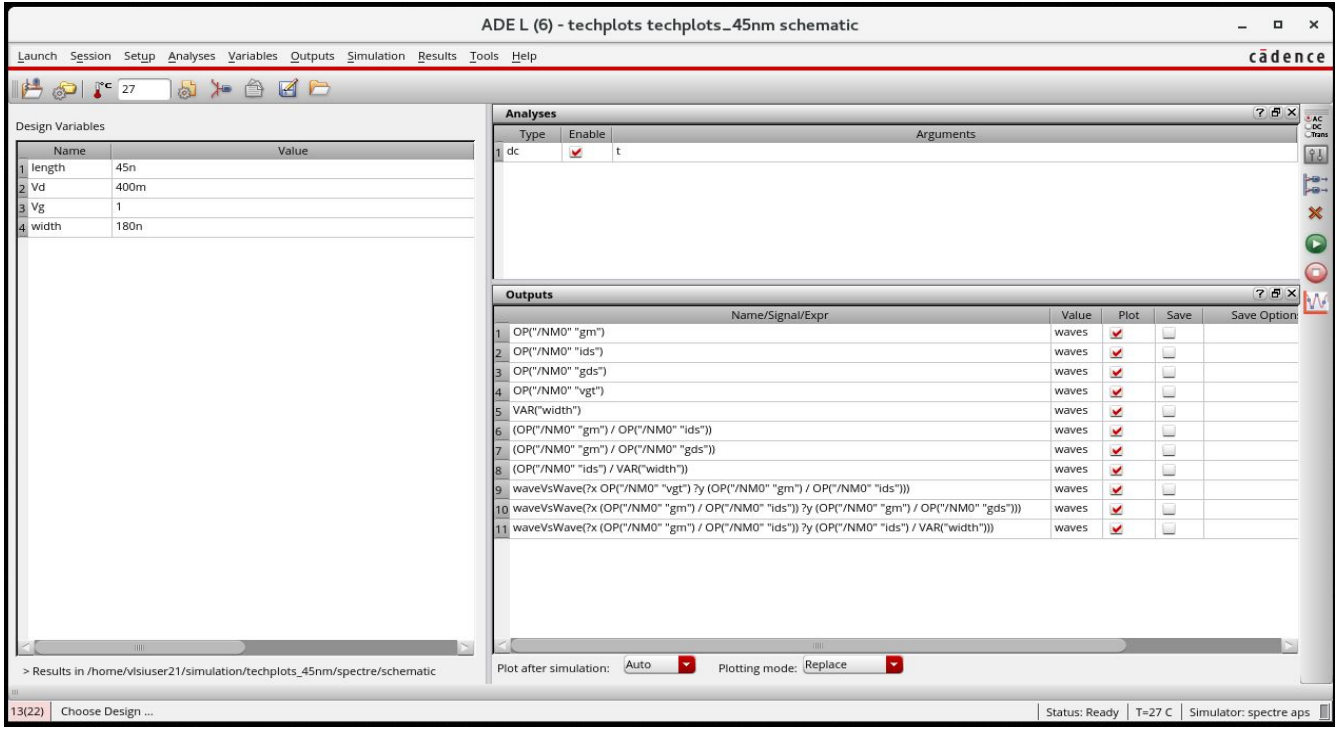

ADE L (6) - techplots techplots_45nm schematic
Launch Session Setup Analyses Variables Outputs Simulation Results Tools Help
cadence
27
Design Variables
Name Value
1 length 45n
2 Vd 400m
3 Vg 1
4 width 180n
Analyses
Type Enable Arguments
1 dc t
Outputs
Name/Signal/Expr Plot Save Save Options
1 OP("/NM0" "gm")
2 OP("/NM0" "ids")
3 OP("/NM0" "gds")
4 OP("/NM0" "vgt")
5 OP("/NM0" "ft")
6 VAR("width")
7 (OP("/NM0" "gm") / OP("/NM0" "ids"))
8 (OP("/NM0" "gm") / OP("/NM0" "gds"))
9 (OP("/NM0" "ids") / VAR("width"))
Plot after simulation: Auto
Plotting mode: Replace
13(22) Choose Analyses ...
Status: Ready T=27 C Simulator: spectre aps

- Click on *waveVswave* in the functional panel in the calculator and fill the xtrace and ytrace with the appropriate expressions to generate the plots.



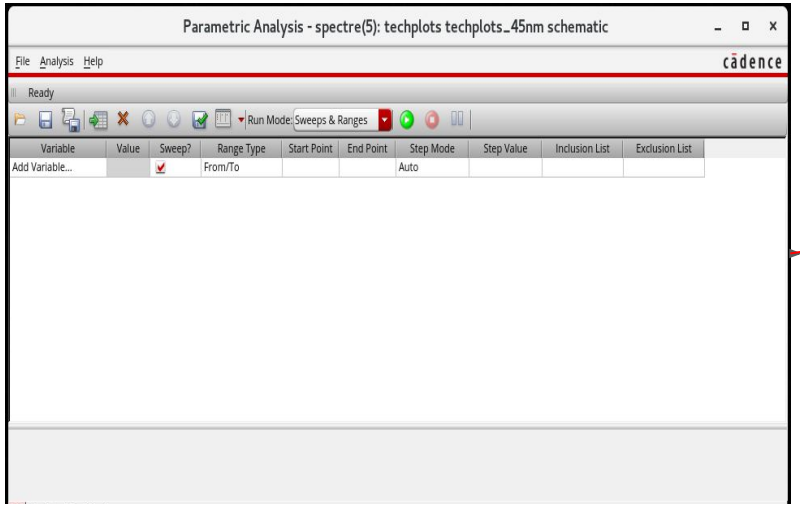

Virtuoso (R) Visualization & Analysis XL calculator
File Tools View Options Constants Help
cadence
In Context Results DB: /home/vlsiuser21/simulation/techplots_45nm/spectre/schematic/psf
app plot erplot
vt vf vdc vs os op ot mp vn sp vswr hp zm
it if idc is opt var vn2 zp yp gd data
Off Family Wave Clip Append Rectangular
Key P...
waveVsWave(?x OP("/NM0","vgt") ?y OP("/NM0","gm")/OP("/NM0","ids"))
Stack
waveVsWave(?x OP("/NM0","gm")/OP("/NM0","ids") ?y OP("/NM0","ids")/VAR("width"))
OP("/NM0","gm")/OP("/NM0","ids")
OP("/NM0","vgt")
OP("/NM0","gds")
OP("/NM0","ids")
OP("/NM0","gm")
Function Panel
All
waveVsWave
Select xTrace OP("/NM0","vgt")
Select yTrace OP("/NM0","gm")/OP("/NM0","ids")
OK Apply Defaults Help Close
Function Panel Expression Editor
status area

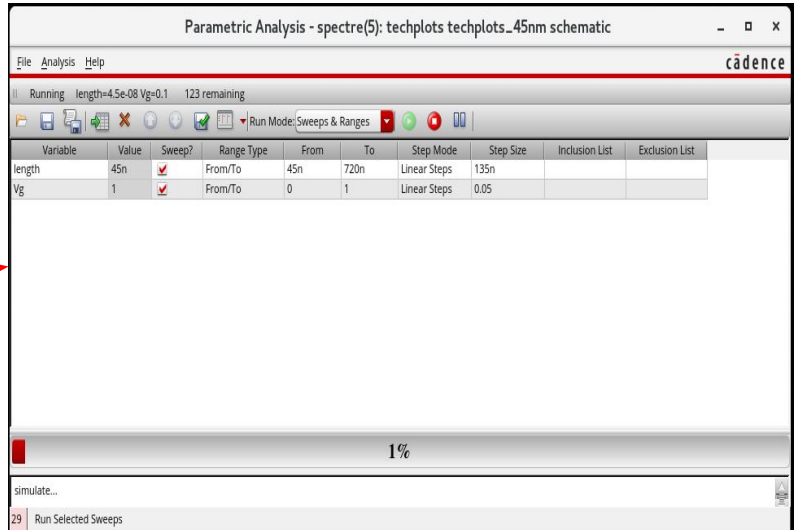
- Now add these expressions to the ADE L



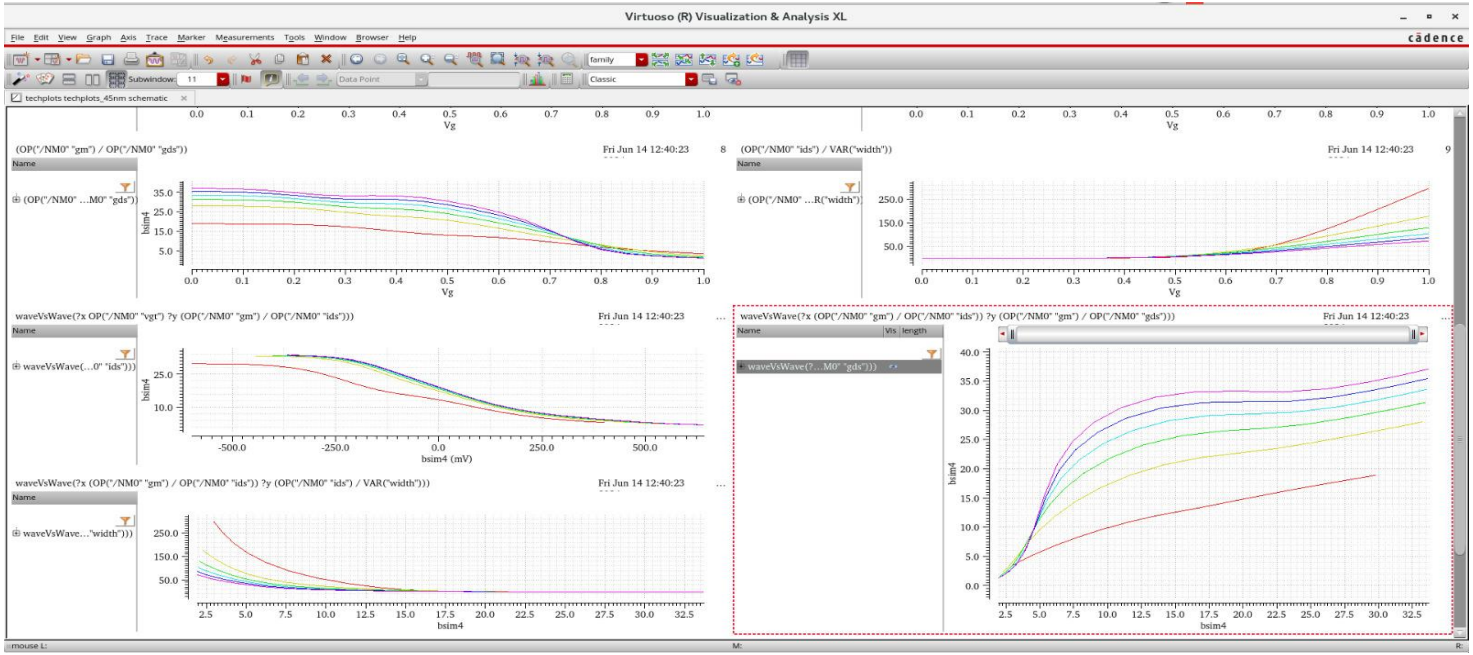
Parametrization

- After adding all the required expressions in the ADE L ,now click on tools in the ADE L and select parametric analysis and parametrize the required Variables and click on run.

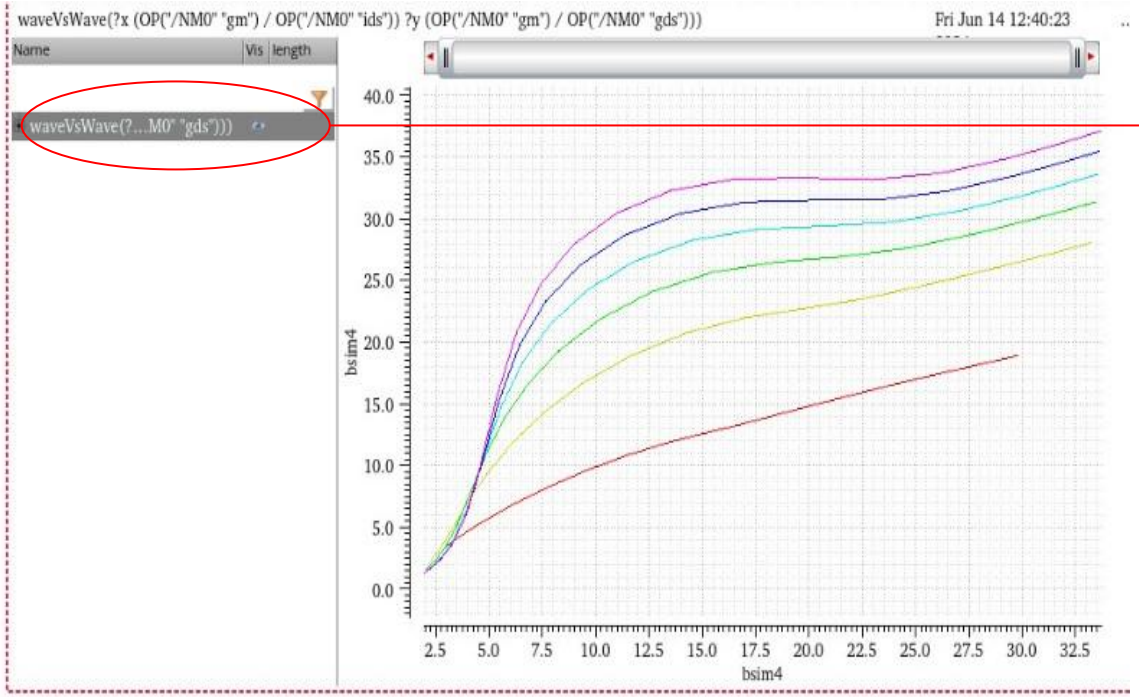




- After the completion of parametrization a new window will gets opened with the plots for the expressions which are there in the ADE L

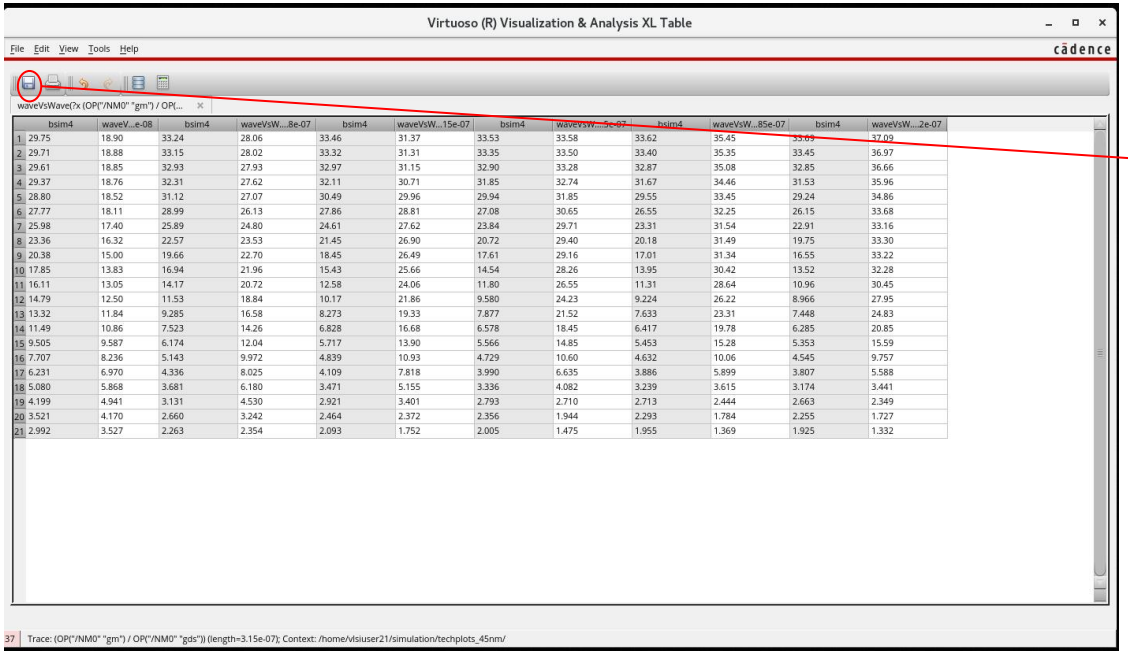


To get the .csv file



Right click on it and then select

move>new table



	bsim4	waveV...e-08	bsim4	waveVsW....8e-07	bsim4	waveVsW...15e-07	bsim4	waveVsW....5e-07	bsim4	waveVsW...85e-07	bsim4	waveVsW....2e-07
1	29.75	18.90	33.24	28.06	33.46	31.37	33.53	33.58	33.62	35.45	33.09	37.09
2	29.71	18.88	33.15	28.02	33.32	31.31	33.35	33.50	33.40	35.35	33.45	36.97
3	29.61	18.85	32.93	27.93	32.97	31.15	32.90	33.28	32.87	35.08	32.85	36.66
4	29.37	18.76	32.31	27.62	32.11	30.71	31.85	32.74	31.67	34.46	31.53	35.96
5	28.80	18.52	31.12	27.07	30.49	29.96	29.94	31.85	29.55	33.45	29.24	34.86
6	27.77	18.11	28.99	26.13	27.86	28.81	27.08	30.65	26.55	32.25	26.15	33.68
7	25.98	17.40	25.89	24.80	24.61	27.62	23.84	29.71	23.31	31.54	22.91	33.16
8	23.36	16.32	22.57	23.53	21.45	26.90	20.72	29.40	20.18	31.49	19.75	33.30
9	20.38	15.00	19.66	22.70	18.45	26.49	17.61	29.16	17.01	31.34	16.55	33.22
10	17.85	13.83	16.94	21.96	15.43	25.66	14.54	28.26	13.95	30.42	13.52	32.28
11	16.11	13.05	14.17	20.72	12.58	24.06	11.80	26.55	11.31	28.64	10.96	30.45
12	14.79	12.50	11.53	18.84	10.17	21.86	9.580	24.23	9.224	26.22	8.966	27.95
13	13.32	11.84	9.285	16.58	8.273	19.33	7.877	21.52	7.633	23.31	7.448	24.83
14	11.49	10.86	7.523	14.26	6.828	16.68	6.578	18.45	6.417	19.78	6.285	20.85
15	9.505	9.587	6.174	12.04	5.717	13.90	5.566	14.85	5.453	15.28	5.353	15.59
16	7.707	8.236	5.143	9.972	4.839	10.93	4.729	10.60	4.632	10.06	4.545	9.757
17	6.231	6.970	4.336	8.025	4.109	7.818	3.990	6.635	3.886	5.899	3.807	5.588
18	5.080	5.868	3.681	6.180	3.471	5.155	3.336	4.082	3.239	3.615	3.174	3.441
19	4.199	4.941	3.131	4.530	2.921	3.401	2.793	2.710	2.713	2.444	2.663	2.349
20	3.521	4.170	2.660	3.242	2.464	2.372	2.356	1.944	2.293	1.784	2.255	1.727
21	2.992	3.527	2.263	2.354	2.093	1.752	2.005	1.475	1.955	1.369	1.925	1.332

Click on save to get .csv file

- This document contains all the plots that are generated using gpdk45nm technology node using Cadence Virtuoso.

  Nmos_45nm.pdf

Thank You