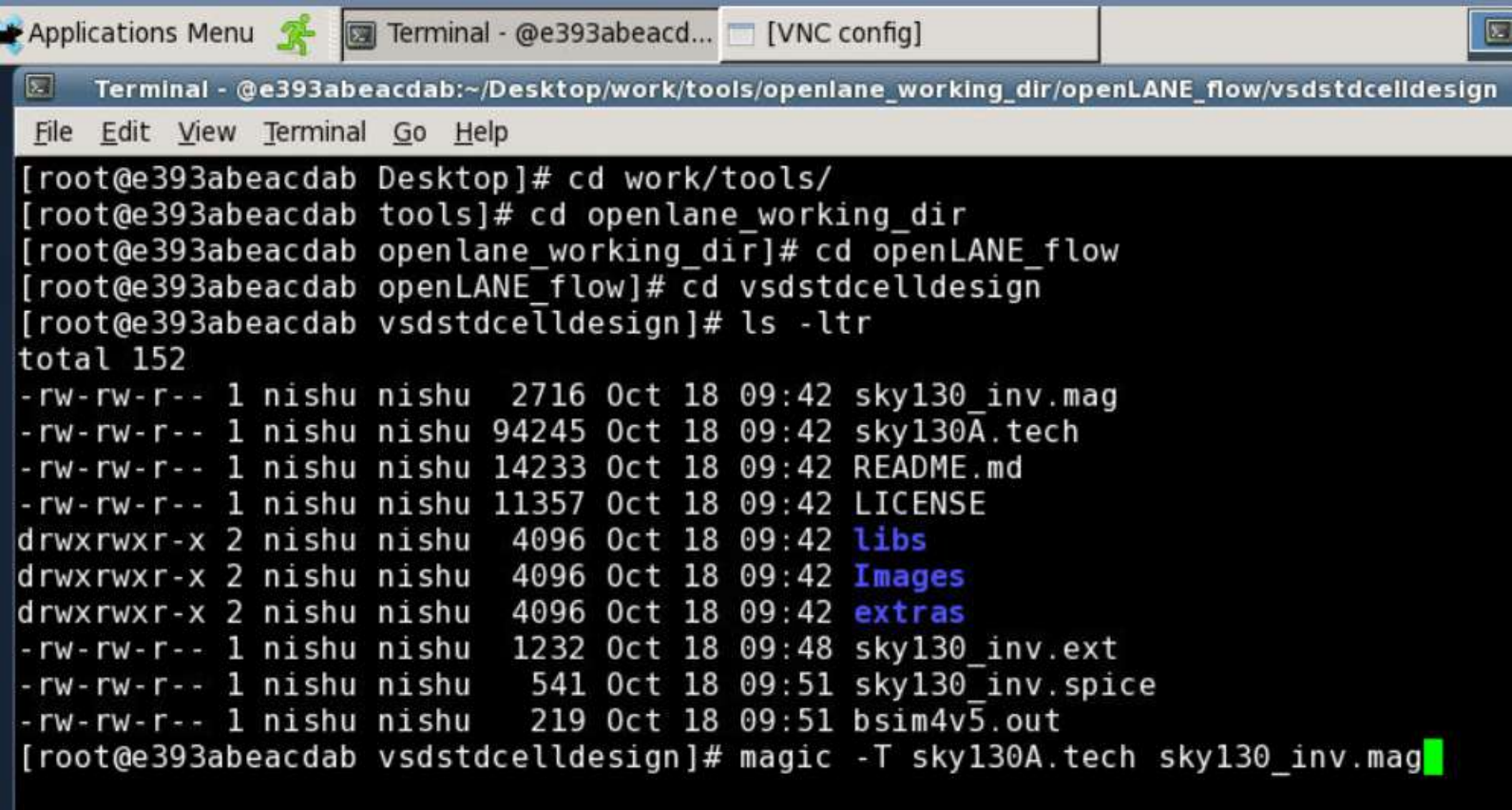
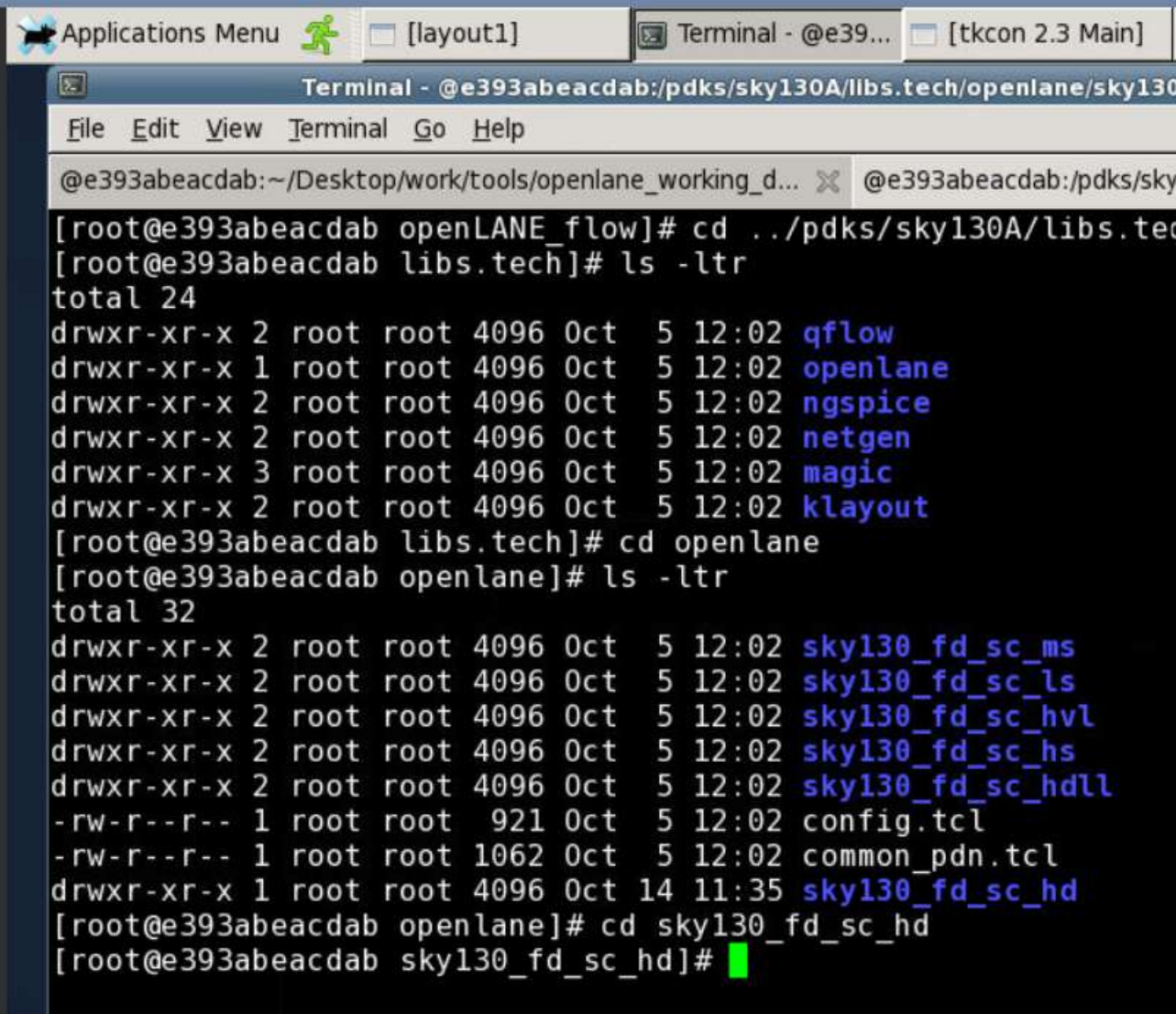
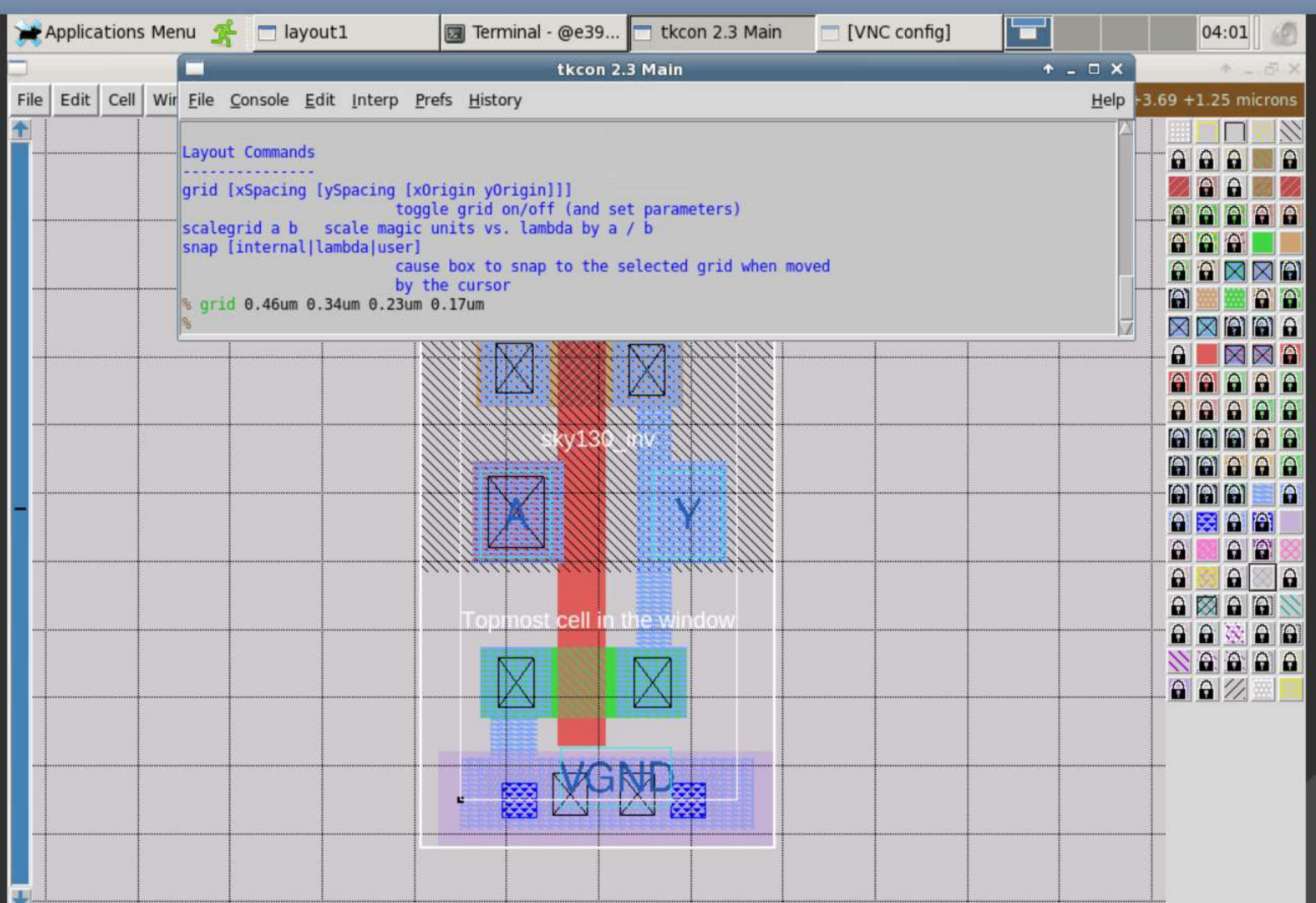
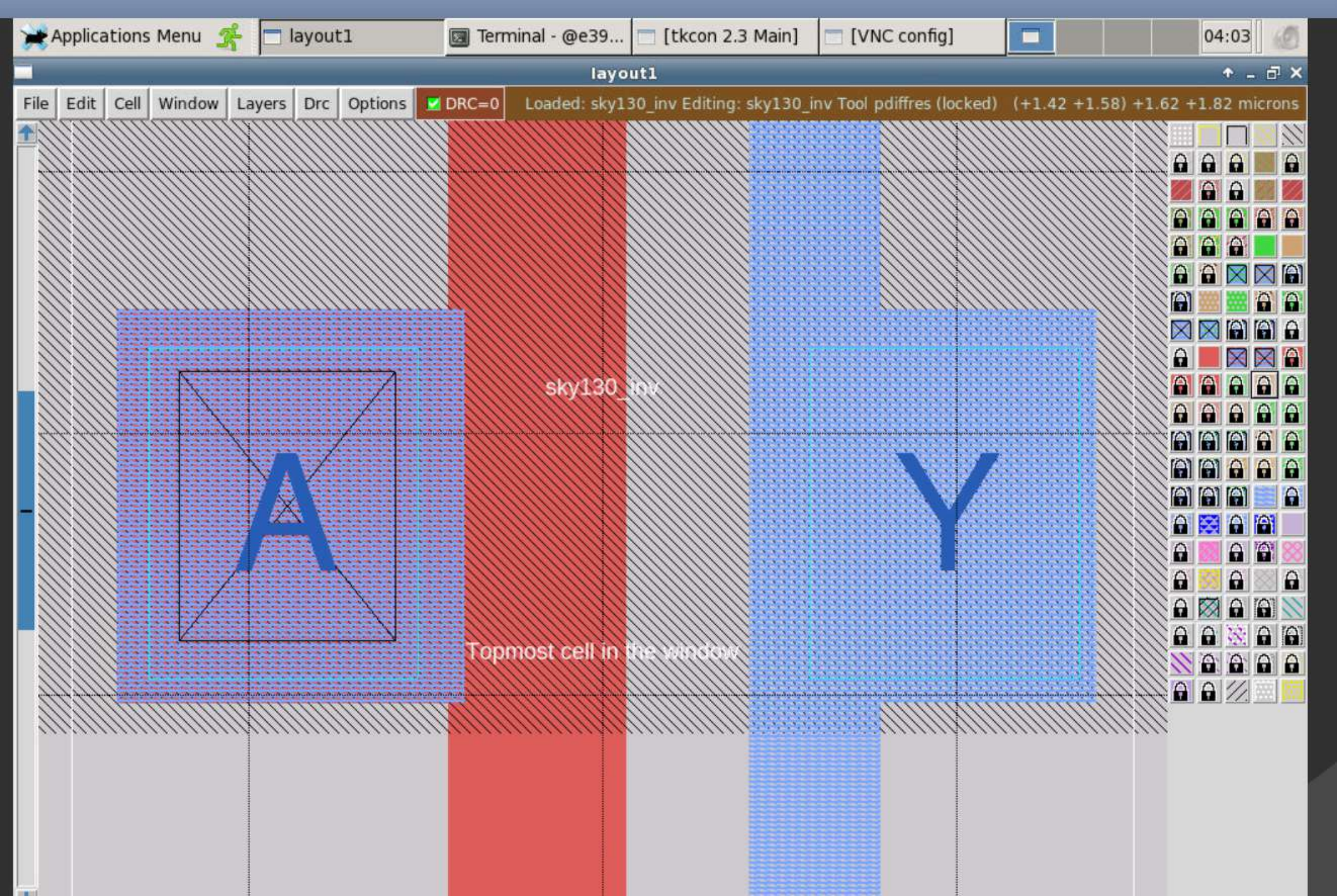

Applications Menu
Terminal - @e393abeacd...
[VNC config]
Terminal - @e393abeacdab:~/Desktop/work/tools/openlane_working_dir/openLANE_flow/vsdstdcelldesign
File Edit View Terminal Go Help
[root@e393abeacdab Desktop]# cd work/tools/
[root@e393abeacdab tools]# cd openlane_working_dir
[root@e393abeacdab openlane_working_dir]# cd openLANE_flow
[root@e393abeacdab openLANE_flow]# cd vsdstdcelldesign
[root@e393abeacdab vsdstdcelldesign]# ls -ltr
total 152
-rw-rw-r-- 1 nishu nishu 2716 Oct 18 09:42 sky130_inv.mag
-rw-rw-r-- 1 nishu nishu 94245 Oct 18 09:42 sky130A.tech
-rw-rw-r-- 1 nishu nishu 14233 Oct 18 09:42 README.md
-rw-rw-r-- 1 nishu nishu 11357 Oct 18 09:42 LICENSE
drwxrwxr-x 2 nishu nishu 4096 Oct 18 09:42 libs
drwxrwxr-x 2 nishu nishu 4096 Oct 18 09:42 Images
drwxrwxr-x 2 nishu nishu 4096 Oct 18 09:42 extras
-rw-rw-r-- 1 nishu nishu 1232 Oct 18 09:48 sky130_inv.ext
-rw-rw-r-- 1 nishu nishu   541 Oct 18 09:51 sky130_inv.spice
-rw-rw-r-- 1 nishu nishu   219 Oct 18 09:51 bsim4v5.out
[root@e393abeacdab vsdstdcelldesign]# magic -T sky130A.tech sky130_inv.mag


Applications Menu
[layout1]
Terminal - @e39...
[tkcon 2.3 Main]
Terminal - @e393abeacdab:/pdks/sky130A/libs.tech/openlane/sky130
File Edit View Terminal Go Help
@e393abeacdab:~/Desktop/work/tools/openlane_working_d...
@e393abeacdab:/pdks/sky
[root@e393abeacdab openLANE_flow]# cd ../pdks/sky130A/libs.tec
[root@e393abeacdab libs.tech]# ls -ltr
total 24
drwxr-xr-x 2 root root 4096 Oct 5 12:02 qflow
drwxr-xr-x 1 root root 4096 Oct 5 12:02 openlane
drwxr-xr-x 2 root root 4096 Oct 5 12:02 ngspice
drwxr-xr-x 2 root root 4096 Oct 5 12:02 netgen
drwxr-xr-x 3 root root 4096 Oct 5 12:02 magic
drwxr-xr-x 2 root root 4096 Oct 5 12:02 klayout
[root@e393abeacdab libs.tech]# cd openlane
[root@e393abeacdab openlane]# ls -ltr
total 32
drwxr-xr-x 2 root root 4096 Oct 5 12:02 sky130_fd_sc_ms
drwxr-xr-x 2 root root 4096 Oct 5 12:02 sky130_fd_sc_ls
drwxr-xr-x 2 root root 4096 Oct 5 12:02 sky130_fd_sc_hvl
drwxr-xr-x 2 root root 4096 Oct 5 12:02 sky130_fd_sc_hs
drwxr-xr-x 2 root root 4096 Oct 5 12:02 sky130_fd_sc_hdll
-rw-r--r-- 1 root root 921 Oct 5 12:02 config.tcl
-rw-r--r-- 1 root root 1062 Oct 5 12:02 common_pdn.tcl
drwxr-xr-x 1 root root 4096 Oct 14 11:35 sky130_fd_sc_hd
[root@e393abeacdab openlane]# cd sky130_fd_sc_hd
[root@e393abeacdab sky130_fd_sc_hd]#

```
li1 X 0.23 0.46
li1 Y 0.17 0.34
met1 X 0.17 0.34
met1 Y 0.17 0.34
met2 X 0.23 0.46
met2 Y 0.23 0.46
met3 X 0.34 0.68
met3 Y 0.34 0.68
met4 X 0.46 0.92
met4 Y 0.46 0.92
met5 X 1.70 3.40
met5 Y 1.70 3.40
(END)
```

```
File  Console  Edit  Interp  Prefs  History

Magic 8.3 revision 37 - Compiled on Mon Jul 20 03:07:05 UTC 2020.
Starting magic under Tcl interpreter
Using Tk console window
Using TrueColor, VisualID 0x169 depth 16
Input style vendorimport: scaleFactor=2, multiplier=2
Processing system .magicrc file
New windows will not have a title caption.
New windows will not have scroll bars.
New windows will not have a border.
Repainting console in magic layout window colors
handling file entry sky130_inv.mag extension .mag
Using technology "sky130A", version 20200508
Root cell box:
          width x height  (   llx,  lly  ), (   urx,  ury  )  area (units^2)

microns:    0.01 x 0.01    (  0.00,  0.00 ), (  0.01,  0.01 )  0.00
lambda:        1 x 1       (     0,  0    ), (     1,  1    )  1
Main console display active (Tcl8.5.7 / Tk8.5.7)
% box
Root cell box:
          width x height  (   llx,  lly  ), (   urx,  ury  )  area (units^2)

microns:    0.01 x 0.01    (  0.89,  1.45 ), (  0.90,  1.46 )  0.00
lambda:        1 x 1       (    89,  145  ), (    90,  146  )  1
% what
Selected subcell(s):
    Instance "Topmost cell in the window" of cell "sky130_inv"
% grid
% help grid

Global Commands
---------------

Layout Commands
---------------
grid [xSpacing [ySpacing [xOrigin yOrigin]]]
                      toggle grid on/off (and set parameters)
scalegrid a b   scale magic units vs. lambda by a / b
snap [internal|lambda|user]
                      cause box to snap to the selected grid when moved
                      by the cursor
%
```


Applications Menu
layout1
Terminal - @e39...
tkcon 2.3 Main
[VNC config]
04:01
tkcon 2.3 Main
File Edit Cell Wir
File Console Edit Interp Prefs History
Help
-3.69 +1.25 microns
Layout Commands
grid [xSpacing [ySpacing [xOrigin yOrigin]]]
toggle grid on/off (and set parameters)
scalegrid a b scale magic units vs. lambda by a / b
snap [internal|lambda|user]
cause box to snap to the selected grid when moved
by the cursor
% grid 0.46um 0.34um 0.23um 0.17um
%
sky130_inv
A
Y
Topmost cell in the window
VGND


Applications Menu
layout1
Terminal - @e39...
[tkcon 2.3 Main]
[VNC config]
04:03
layout1
File
Edit
Cell
Window
Layers
Drc
Options
DRC=0
Loaded: sky130_inv Editing: sky130_inv Tool pdiffres (locked) (+1.42 +1.58) +1.62 +1.82 microns
A
sky130_inv
Y
Topmost cell in the window

Applications Menu | layout1 | Terminal - @e39...

tkcon 2

File Console Edit Interp Prefs History

```
microns:    0.01 x 0.01    (  0.00,  0.00 ), (  0.01,  0.01 )  0.00
lambda:        1 x 1       (     0,  0    ), (     1,  1    )  1
Main console display active (Tcl8.5.7 / Tk8.5.7)
% select area
% what
Selected mask layers:
    nwell    ( Topmost cell in the window )
    poly     ( Topmost cell in the window )
    polycont ( Topmost cell in the window )
    locali   ( Topmost cell in the window )
Selected label(s):
    "A" is attached to locali in cell def sky130_inv
% port class input
% port use signal
%
% what
Selected mask layers:
    nwell    ( Topmost cell in the window )
    poly     ( Topmost cell in the window )
    polycont ( Topmost cell in the window )
    locali   ( Topmost cell in the window )
Selected label(s):
    "A" is attached to locali in cell def sky130_inv
% select area
% goto Y
locali
% what
Selected mask layers:
    nwell    ( Topmost cell in the window )
    locali   ( Topmost cell in the window )
Selected label(s):
    "Y" is attached to locali in cell def sky130_inv
% port class output
% port use signal
% what
Selected mask layers:
    nwell    ( Topmost cell in the window )
    locali   ( Topmost cell in the window )
Selected label(s):
    "Y" is attached to locali in cell def sky130_inv
% select area
```

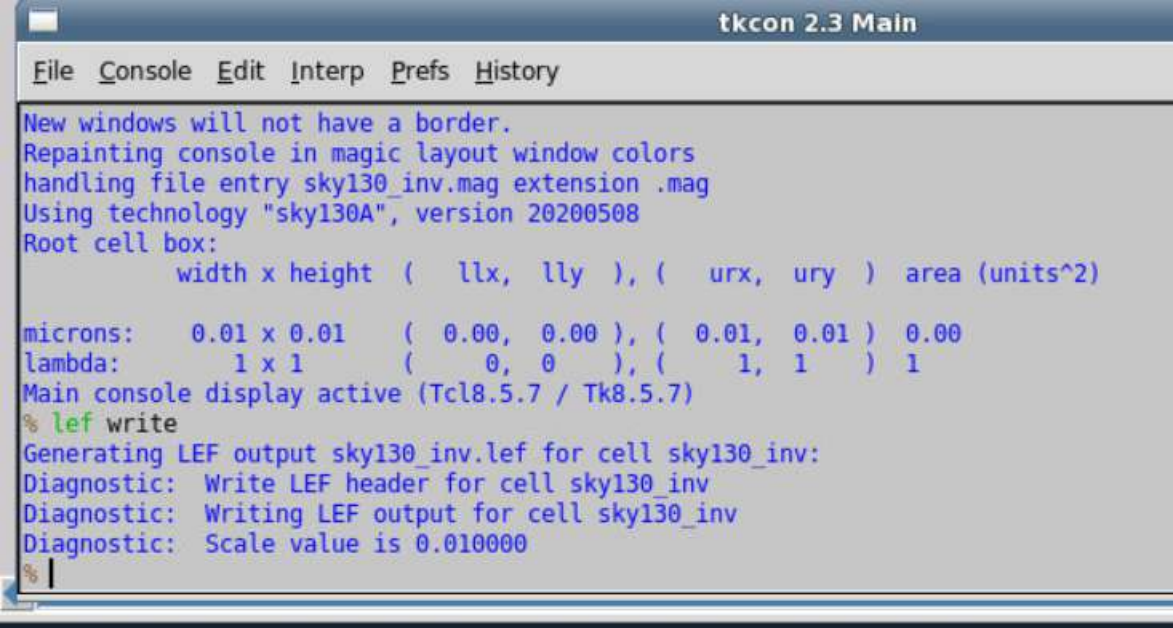
File Console Edit Interp Prefs History

```
    "VPWR" is attached to locali in cell def sky130_inv
% select area
% goto VGND
metal1
% what
Selected mask layers:
    psubdiff ( Topmost cell in the window )
    psubdiffcont ( Topmost cell in the window )
    locali   ( Topmost cell in the window )
    viali    ( Topmost cell in the window )
    metal1   ( Topmost cell in the window )
% port class inout
% port use ground
% what
Selected mask layers:
    psubdiff ( Topmost cell in the window )
    psubdiffcont ( Topmost cell in the window )
    locali   ( Topmost cell in the window )
    viali    ( Topmost cell in the window )
    metal1   ( Topmost cell in the window )
% select area
% goto VPWR
metal1
% what
Selected mask layers:
    nwell    ( Topmost cell in the window )
    nsubdiff ( Topmost cell in the window )
    nsubdiffcont ( Topmost cell in the window )
    poly     ( Topmost cell in the window )
    locali   ( Topmost cell in the window )
    viali    ( Topmost cell in the window )
    metal1   ( Topmost cell in the window )
Selected label(s):
    "VPWR" is attached to metal1 in cell def sky130_inv
% port class inout
% port use power
%
```

File Console Edit Interp Prefs History

```
Invalid layer specification
% select area
% goto VGND
metal1
% what
Selected mask layers:
    nmos     ( Topmost cell in the window )
    ndiff    ( Topmost cell in the window )
    ndiffc   ( Topmost cell in the window )
    psubdiff ( Topmost cell in the window )
    psubdiffcont ( Topmost cell in the window )
    poly     ( Topmost cell in the window )
    locali   ( Topmost cell in the window )
    viali    ( Topmost cell in the window )
    metal1   ( Topmost cell in the window )
Selected label(s):
    "VGND" is attached to metal1 in cell def sky130_inv
% select area
% goto Vpwr
Couldn't find label Vpwr
% goto VPWR
metal1
% what
Selected mask layers:
    nwell    ( Topmost cell in the window )
    pmos     ( Topmost cell in the window )
    pdiff    ( Topmost cell in the window )
    pdiffc   ( Topmost cell in the window )
    nsubdiff ( Topmost cell in the window )
    nsubdiffcont ( Topmost cell in the window )
    poly     ( Topmost cell in the window )
    polycont ( Topmost cell in the window )
    locali   ( Topmost cell in the window )
    viali    ( Topmost cell in the window )
    metal1   ( Topmost cell in the window )
Selected label(s):
    "A" is attached to locali in cell def sky130_inv
    "VPWR" is attached to metal1 in cell def sky130_inv
    "Y" is attached to locali in cell def sky130_inv
% select area
% what
Selected mask layers:
    nwell    ( Topmost cell in the window )
```

```
% select area
% what
Selected mask layers:
    nwell    ( Topmost cell in the window )
    nmos     ( Topmost cell in the window )
    pmos     ( Topmost cell in the window )
    ndiff    ( Topmost cell in the window )
    pdiff    ( Topmost cell in the window )
    ndiffc   ( Topmost cell in the window )
    pdiffc   ( Topmost cell in the window )
    psubdiff ( Topmost cell in the window )
    nsubdiff ( Topmost cell in the window )
    psubdiffcont ( Topmost cell in the window )
    nsubdiffcont ( Topmost cell in the window )
    poly     ( Topmost cell in the window )
    polycont ( Topmost cell in the window )
    locali   ( Topmost cell in the window )
    viali    ( Topmost cell in the window )
    metal1   ( Topmost cell in the window )
Selected label(s):
    "A" is attached to locali in cell def sky130_inv
    "VGND" is attached to metal1 in cell def sky130_inv
    "VPWR" is attached to metal1 in cell def sky130_inv
    "Y" is attached to locali in cell def sky130_inv
% box
Root cell box:
          width x height  (   llx,  lly  ), (   urx,  ury  )  area (units^2)

microns:    1.74 x 3.26    ( -0.18, -0.26 ), (  1.56,  3.00 )  5.67
lambda:      174 x 326     (   -18, -26   ), (   156,  300  )  56724
%
```


tkcon 2.3 Main
File Console Edit Interp Prefs History
New windows will not have a border.
Repainting console in magic layout window colors
handling file entry sky130_inv.mag extension .mag
Using technology "sky130A", version 20200508
Root cell box:
width x height (llx, lly), (urx, ury) area (units^2)
microns: 0.01 x 0.01 (0.00, 0.00), (0.01, 0.01) 0.00
lambda: 1 x 1 (0, 0), (1, 1) 1
Main console display active (Tcl8.5.7 / Tk8.5.7)
% lef write
Generating LEF output sky130_inv.lef for cell sky130_inv:
Diagnostic: Write LEF header for cell sky130_inv
Diagnostic: Writing LEF output for cell sky130_inv
Diagnostic: Scale value is 0.010000
%

```
[root@e393abeacdab vsdstdcelldesign]# magic -T sky130A.tech sky130_inv.mag &
[1] 11920
[root@e393abeacdab vsdstdcelldesign]# ls -ltr
total 160
-rw-rw-r-- 1 nishu nishu  2716 Oct 18 09:42 sky130_inv.mag
-rw-rw-r-- 1 nishu nishu 94245 Oct 18 09:42 sky130A.tech
-rw-rw-r-- 1 nishu nishu 14233 Oct 18 09:42 README.md
-rw-rw-r-- 1 nishu nishu 11357 Oct 18 09:42 LICENSE
drwxrwxr-x 2 nishu nishu  4096 Oct 18 09:42 libs
drwxrwxr-x 2 nishu nishu  4096 Oct 18 09:42 Images
drwxrwxr-x 2 nishu nishu  4096 Oct 18 09:42 extras
-rw-rw-r-- 1 nishu nishu  1232 Oct 18 09:48 sky130_inv.ext
-rw-rw-r-- 1 nishu nishu   541 Oct 18 09:51 sky130_inv.spice
-rw-rw-r-- 1 nishu nishu   219 Oct 18 09:51 bsim4v5.out
-rw-r--r-- 1 root  root   2716 Oct 19 05:39 sky130_vsdinv.mag
-rw-r--r-- 1 root  root   1532 Oct 19 05:41 sky130_inv.lef
[root@e393abeacdab vsdstdcelldesign]#
```

```
  PIN A
    DIRECTION INPUT ;
    USE SIGNAL ;
    ANTENNAGATEAREA 0.165600 ;
    PORT
      LAYER li1 ;
        RECT 0.060 1.180 0.510 1.690 ;
    END
  END A
  PIN Y
    DIRECTION OUTPUT ;
    USE SIGNAL ;
    ANTENNADIFFAREA 0.287800 ;
    PORT
      LAYER li1 ;
        RECT 0.760 1.960 1.100 2.330 ;
        RECT 0.880 1.690 1.050 1.960 ;
        RECT 0.880 1.180 1.330 1.690 ;
        RECT 0.880 0.760 1.050 1.180 ;
        RECT 0.780 0.410 1.130 0.760 ;
    END
  END Y
  PIN VPWR
    DIRECTION INOUT ;
    USE POWER ;
    PORT
      LAYER li1 ;
        RECT -0.200 2.580 1.430 2.900 ;
        RECT 0.180 2.330 0.350 2.580 ;
        RECT 0.100 1.970 0.440 2.330 ;
      LAYER mcon ;
:
```

```
  PIN VPWR
    DIRECTION INOUT ;
    USE POWER ;
    PORT
      LAYER li1 ;
        RECT -0.200 2.580 1.430 2.900 ;
        RECT 0.180 2.330 0.350 2.580 ;
        RECT 0.100 1.970 0.440 2.330 ;
      LAYER mcon ;
        RECT 0.230 2.640 0.400 2.810 ;
        RECT 1.000 2.650 1.170 2.820 ;
      LAYER met1 ;
        RECT -0.200 2.480 1.570 2.960 ;
    END
  END VPWR
  PIN VGND
    DIRECTION INOUT ;
    USE GROUND ;
    PORT
      LAYER li1 ;
        RECT 0.100 0.410 0.450 0.760 ;
        RECT 0.150 0.210 0.380 0.410 ;
        RECT 0.000 -0.150 1.460 0.210 ;
      LAYER mcon ;
        RECT 0.210 -0.090 0.380 0.080 ;
        RECT 1.050 -0.090 1.220 0.080 ;
      LAYER met1 ;
        RECT -0.110 -0.240 1.570 0.240 ;
    END
  END VGND
END sky130_inv
.
```

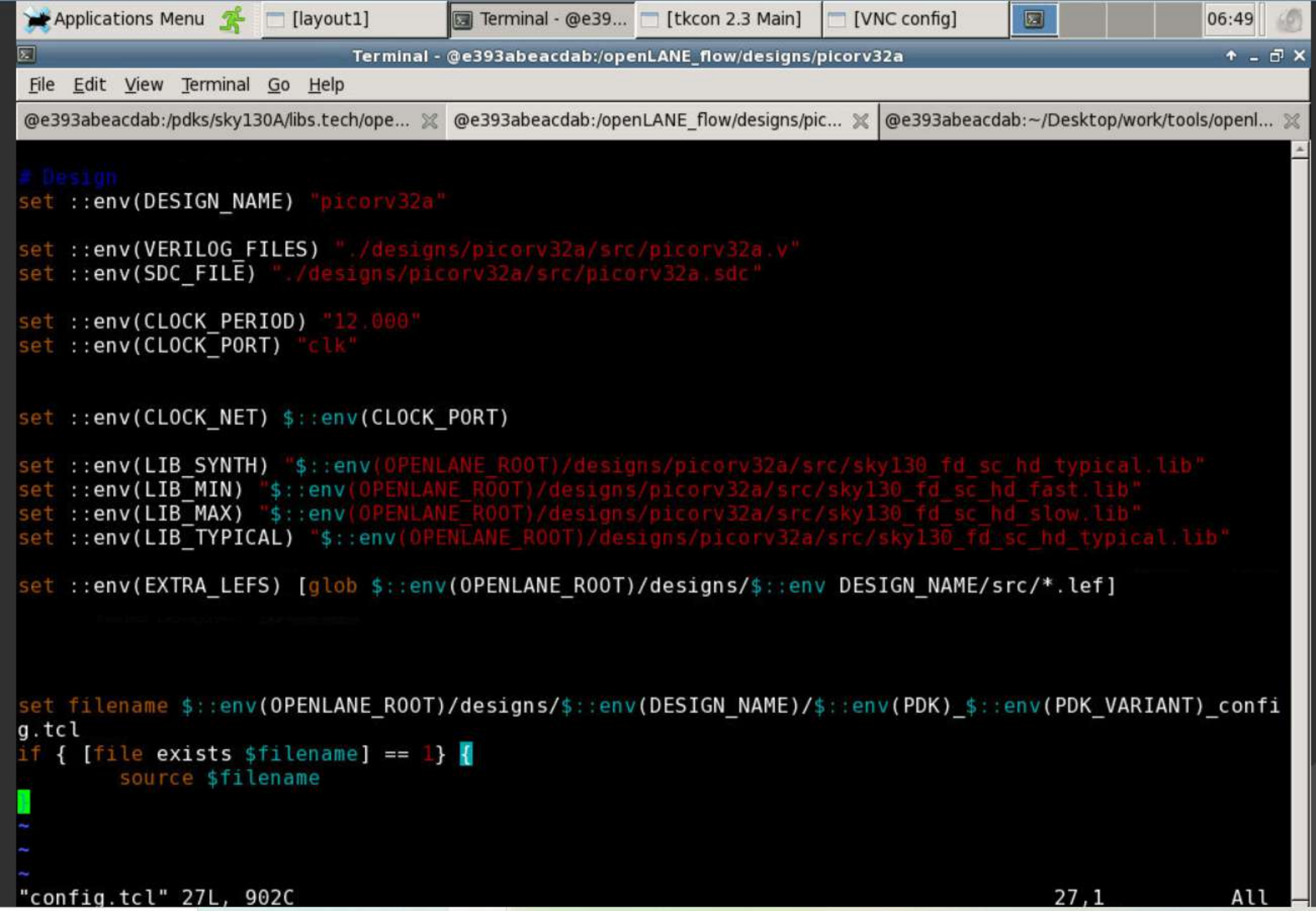
```
[root@e393abeacdab vsdstdcelldesign]# less sky130_inv.lef
[root@e393abeacdab vsdstdcelldesign]# cp sky130_inv.lef /openLANE_flow/designs/picorv32a/src
```

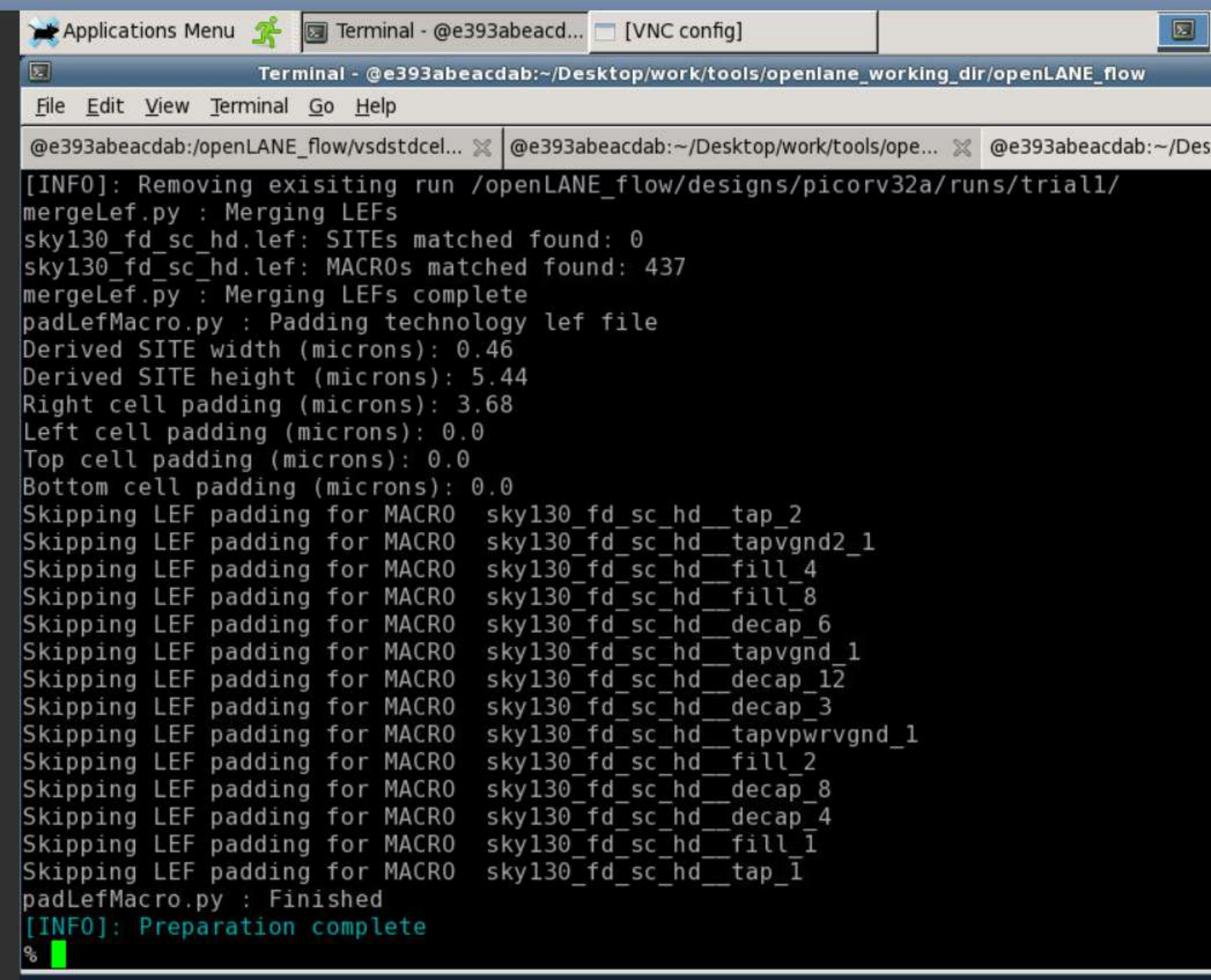
```
[root@e393abeacdab picorv32a]# cd src
[root@e393abeacdab src]# ls -ltr
total 100
-rw-r--r-- 1 root root 92423 Oct  5 11:35 picorv32a.v
-rw-r--r-- 1 root root    77 Oct  5 11:35 picorv32a.sdc
-rw-r--r-- 1 root root  1532 Oct 19 06:04 sky130_inv.lef
[root@e393abeacdab src]#
```

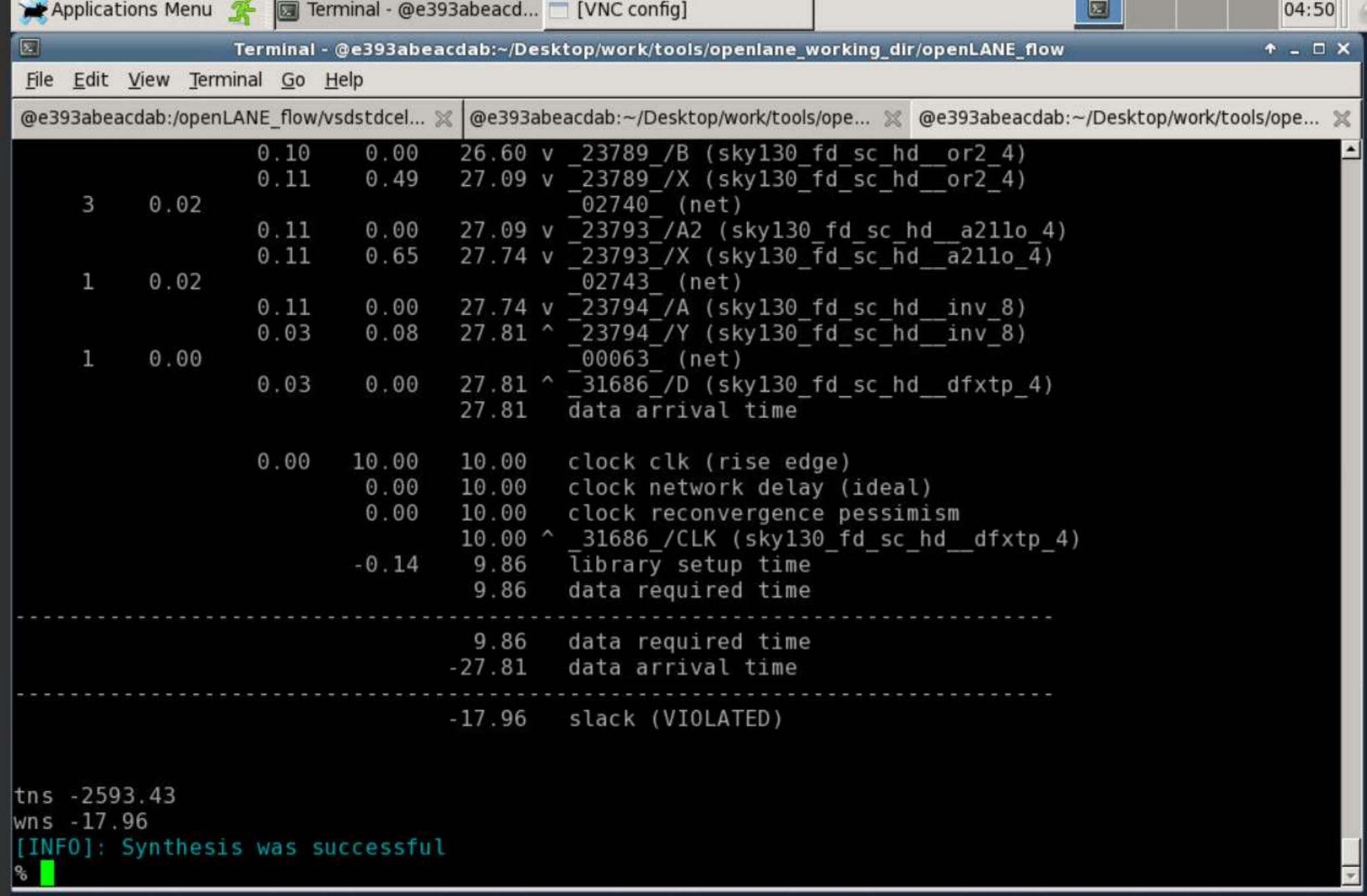
```
[root@e393abeacdab vsdstdcelldesign]# cd libs
[root@e393abeacdab libs]# ls -ltr
total 37916
-rw-rw-r-- 1 nishu nishu 12732345 Oct 18 09:42 sky130_fd_sc_hd__typical.lib
-rw-rw-r-- 1 nishu nishu 12732258 Oct 18 09:42 sky130_fd_sc_hd__slow.lib
-rw-rw-r-- 1 nishu nishu 12753932 Oct 18 09:42 sky130_fd_sc_hd__fast.lib
-rw-rw-r-- 1 nishu nishu    94245 Oct 18 09:42 sky130A.tech
-rw-rw-r-- 1 nishu nishu   170984 Oct 18 09:42 pshort.lib
-rw-rw-r-- 1 nishu nishu   331131 Oct 18 09:42 nshort.lib
[root@e393abeacdab libs]# less sky130_fd_sc_hd__typical.lib
[root@e393abeacdab libs]#
```

```
[root@e393abeacdab libs]# less sky130_fd_sc_hd__slow.lib
[root@e393abeacdab libs]# less sky130_fd_sc_hd__fast.lib
[root@e393abeacdab libs]# less sky130_fd_sc_hd__typical.lib
[root@e393abeacdab libs]#
[root@e393abeacdab libs]# cp sky130_fd_sc_hd_* /openLANE_flow/designs/picorv32a/src
[root@e393abeacdab libs]#
```

```
[root@e393abeacdab src]# ls -ltr
total 37428
-rw-r--r-- 1 root root    92423 Oct  5 11:35 picorv32a.v
-rw-r--r-- 1 root root       77 Oct  5 11:35 picorv32a.sdc
-rw-r--r-- 1 root root     1532 Oct 19 06:04 sky130_inv.lef
-rw-r--r-- 1 root root 12753932 Oct 19 06:22 sky130_fd_sc_hd__fast.lib
-rw-r--r-- 1 root root 12732258 Oct 19 06:22 sky130_fd_sc_hd__slow.lib
-rw-r--r-- 1 root root 12732345 Oct 19 06:22 sky130_fd_sc_hd__typical.lib
[root@e393abeacdab src]#
```


Applications Menu
[layout1]
Terminal - @e39...
[tkcon 2.3 Main]
[VNC config]
06:49
Terminal - @e393abeacdab:/openLANE_flow/designs/picorv32a
File Edit View Terminal Go Help
@e393abeacdab:/pdks/sky130A/libs.tech/ope...
@e393abeacdab:/openLANE_flow/designs/pic...
@e393abeacdab:~/Desktop/work/tools/openl...
Design
set ::env(DESIGN_NAME) "picorv32a"
set ::env(VERILOG_FILES) "./designs/picorv32a/src/picorv32a.v"
set ::env(SDC_FILE) "./designs/picorv32a/src/picorv32a.sdc"
set ::env(CLOCK_PERIOD) "12.000"
set ::env(CLOCK_PORT) "clk"
set ::env(CLOCK_NET) $::env(CLOCK_PORT)
set ::env(LIB_SYNTH) "$::env(OPENLANE_ROOT)/designs/picorv32a/src/sky130_fd_sc_hd_typical.lib"
set ::env(LIB_MIN) "$::env(OPENLANE_ROOT)/designs/picorv32a/src/sky130_fd_sc_hd_fast.lib"
set ::env(LIB_MAX) "$::env(OPENLANE_ROOT)/designs/picorv32a/src/sky130_fd_sc_hd_slow.lib"
set ::env(LIB_TYPICAL) "$::env(OPENLANE_ROOT)/designs/picorv32a/src/sky130_fd_sc_hd_typical.lib"
set ::env(EXTRA_LEFS) [glob $::env(OPENLANE_ROOT)/designs/$::env DESIGN_NAME/src/*.lef]
set filename $::env(OPENLANE_ROOT)/designs/$::env(DESIGN_NAME)/$::env(PDK)_$::env(PDK_VARIANT)_confi
g.tcl
if { [file exists $filename] == 1} {
source $filename
"config.tcl" 27L, 902C
27,1
All


Applications Menu
Terminal - @e393abeacd...
[VNC config]
Terminal - @e393abeacdab:~/Desktop/work/tools/openlane_working_dir/openLANE_flow
File Edit View Terminal Go Help
@e393abeacdab:/openLANE_flow/vsdstdcel...
@e393abeacdab:~/Desktop/work/tools/ope...
@e393abeacdab:~/Des
[INFO]: Removing exisiting run /openLANE_flow/designs/picorv32a/runs/trial1/
mergeLef.py : Merging LEFs
sky130_fd_sc_hd.lef: SITEs matched found: 0
sky130_fd_sc_hd.lef: MACROs matched found: 437
mergeLef.py : Merging LEFs complete
padLefMacro.py : Padding technology lef file
Derived SITE width (microns): 0.46
Derived SITE height (microns): 5.44
Right cell padding (microns): 3.68
Left cell padding (microns): 0.0
Top cell padding (microns): 0.0
Bottom cell padding (microns): 0.0
Skipping LEF padding for MACRO sky130_fd_sc_hd__tap_2
Skipping LEF padding for MACRO sky130_fd_sc_hd__tapvgnd2_1
Skipping LEF padding for MACRO sky130_fd_sc_hd__fill_4
Skipping LEF padding for MACRO sky130_fd_sc_hd__fill_8
Skipping LEF padding for MACRO sky130_fd_sc_hd__decap_6
Skipping LEF padding for MACRO sky130_fd_sc_hd__tapvgnd_1
Skipping LEF padding for MACRO sky130_fd_sc_hd__decap_12
Skipping LEF padding for MACRO sky130_fd_sc_hd__decap_3
Skipping LEF padding for MACRO sky130_fd_sc_hd__tapvpwrvgnd_1
Skipping LEF padding for MACRO sky130_fd_sc_hd__fill_2
Skipping LEF padding for MACRO sky130_fd_sc_hd__decap_8
Skipping LEF padding for MACRO sky130_fd_sc_hd__decap_4
Skipping LEF padding for MACRO sky130_fd_sc_hd__fill_1
Skipping LEF padding for MACRO sky130_fd_sc_hd__tap_1
padLefMacro.py : Finished
[INFO]: Preparation complete
%


Applications Menu
Terminal - @e393abeacd...
[VNC config]
04:50
Terminal - @e393abeacdab:~/Desktop/work/tools/openlane_working_dir/openLANE_flow
File Edit View Terminal Go Help
@e393abeacdab:/openLANE_flow/vsdstdcel...
@e393abeacdab:~/Desktop/work/tools/ope...
@e393abeacdab:~/Desktop/work/tools/ope...
0.10 0.00 26.60 v _23789_/B (sky130_fd_sc_hd__or2_4)
0.11 0.49 27.09 v _23789_/X (sky130_fd_sc_hd__or2_4)
3 0.02 _02740_ (net)
0.11 0.00 27.09 v _23793_/A2 (sky130_fd_sc_hd__a211o_4)
0.11 0.65 27.74 v _23793_/X (sky130_fd_sc_hd__a211o_4)
1 0.02 _02743_ (net)
0.11 0.00 27.74 v _23794_/A (sky130_fd_sc_hd__inv_8)
0.03 0.08 27.81 ^ _23794_/Y (sky130_fd_sc_hd__inv_8)
1 0.00 _00063_ (net)
0.03 0.00 27.81 ^ _31686_/D (sky130_fd_sc_hd__dfxtp_4)
27.81 data arrival time
0.00 10.00 10.00 clock clk (rise edge)
0.00 10.00 clock network delay (ideal)
0.00 10.00 clock reconvergence pessimism
10.00 ^ _31686_/CLK (sky130_fd_sc_hd__dfxtp_4)
-0.14 9.86 library setup time
9.86 data required time
9.86 data required time
-27.81 data arrival time
-17.96 slack (VIOLATED)
tns -2593.43
wns -17.96
[INFO]: Synthesis was successful
%

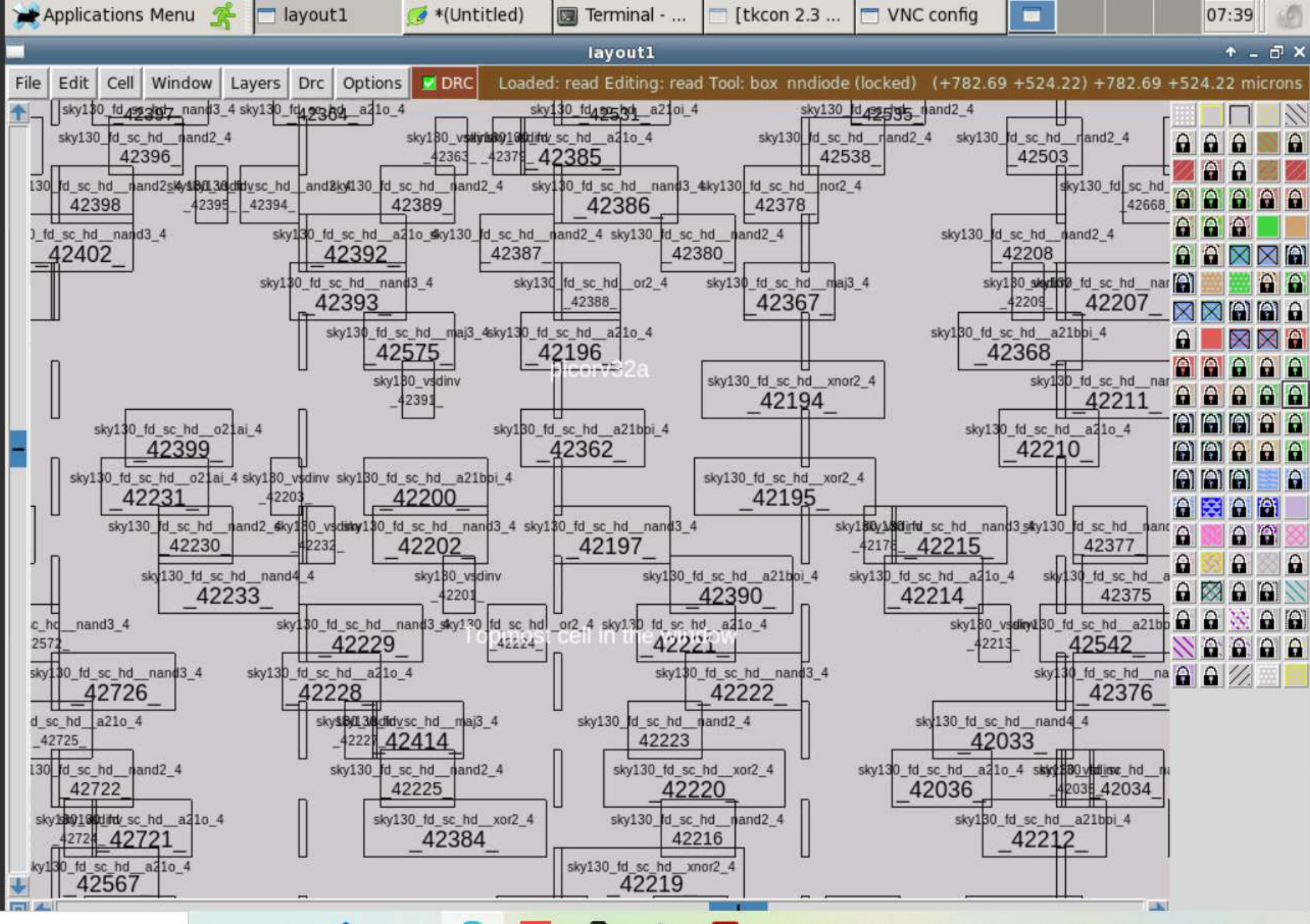
Terminal - @e393abeacdab:~/Desktop/work/tools/openlane_working_dir/openLANE_flow

File Edit View Terminal Go Help

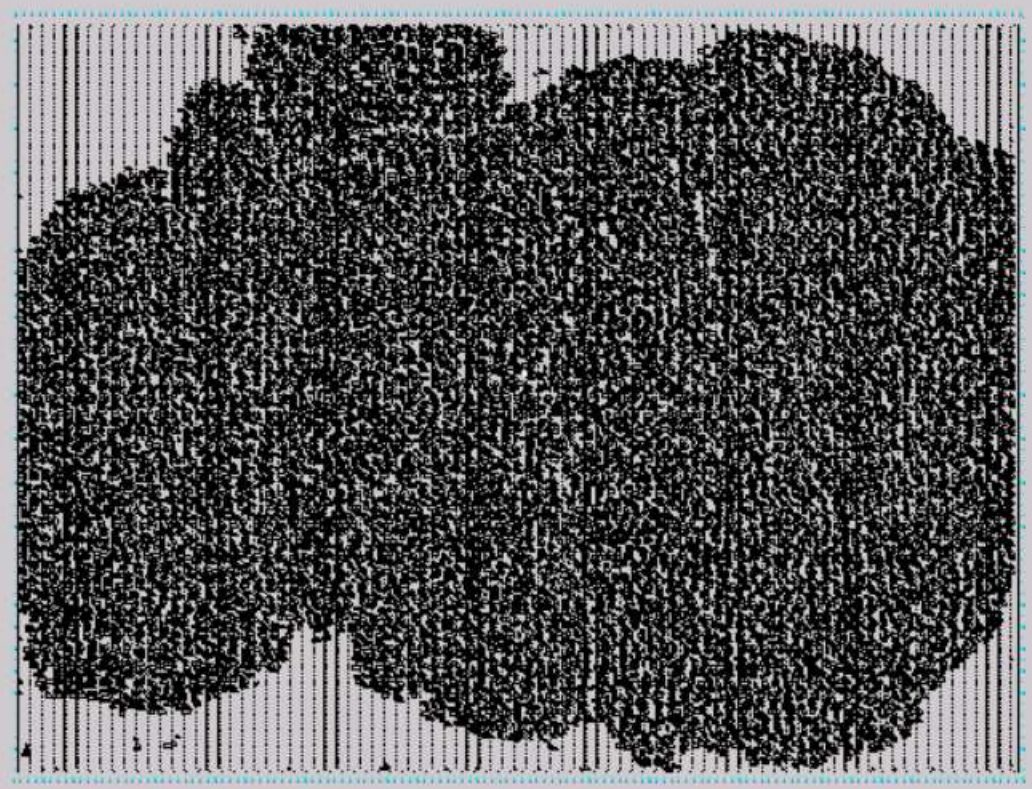
@e393abeacdab:/openLANE_flow/vsdstdcel... | @e393abeacdab:~/Desktop/work/tools/ope... | @e393abeacdab:~/Desktop/work/tools/ope...

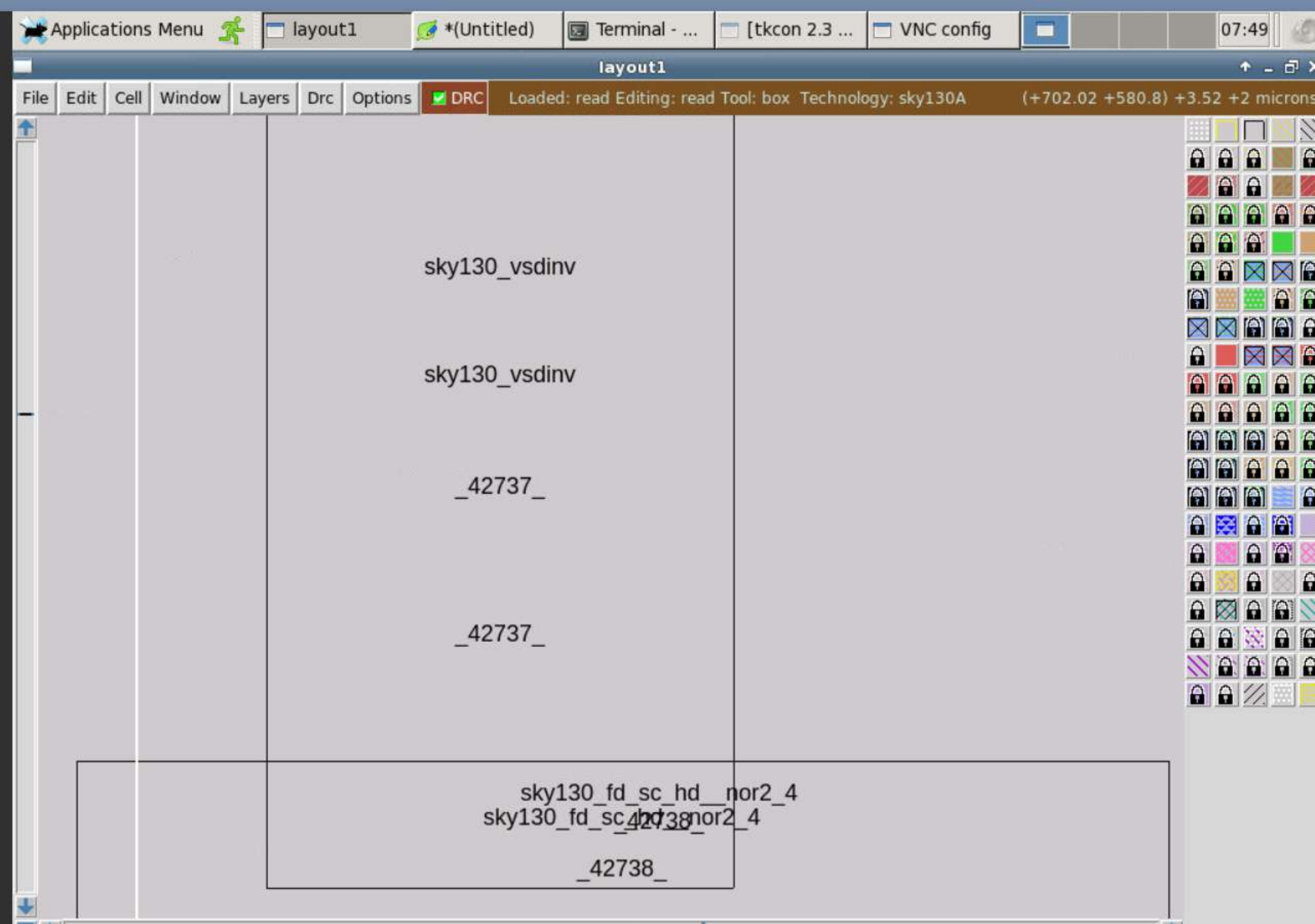
```
 DEF file write success !!
 location : /openLANE_flow/designs/picorv32a/runs/trial1//results/placement/picorv32a.placement.de
f
------------------------------------------------------------------
 tasks                          Wtime      Ctime
 Parser                         1.702      1.270
 resgin assign                  1.714      1.280
 pre-placement                  1.714      1.280
 non Group cell placement       1.817      1.370
 All                            1.830      1.380
 - - - - - EVALUATION - - - - -
 AVG_displacement : 1761.31
 SUM_displacement : 6.77207e+07
 MAX_displacement : 19379
 - - - - - - - - - - - - - - - - -
 GP HPWL          : 1.48172e+06
 HPWL             : 1.52912e+06
 avg_Disp_site    : 3.82894
 avg_Disp_row     : 0.647541
 delta_HPWL       : 3.19908
 ==== CHECK LEGALITY ====
 row_check ==>> PASS
 site_check ==>> PASS
 power_check ==>> PASS
 edge_check ==>> PASS
 placed_check ==>> PASS
 overlap_check ==>> PASS
 - - - - - < Program END > - - - - -
%
```

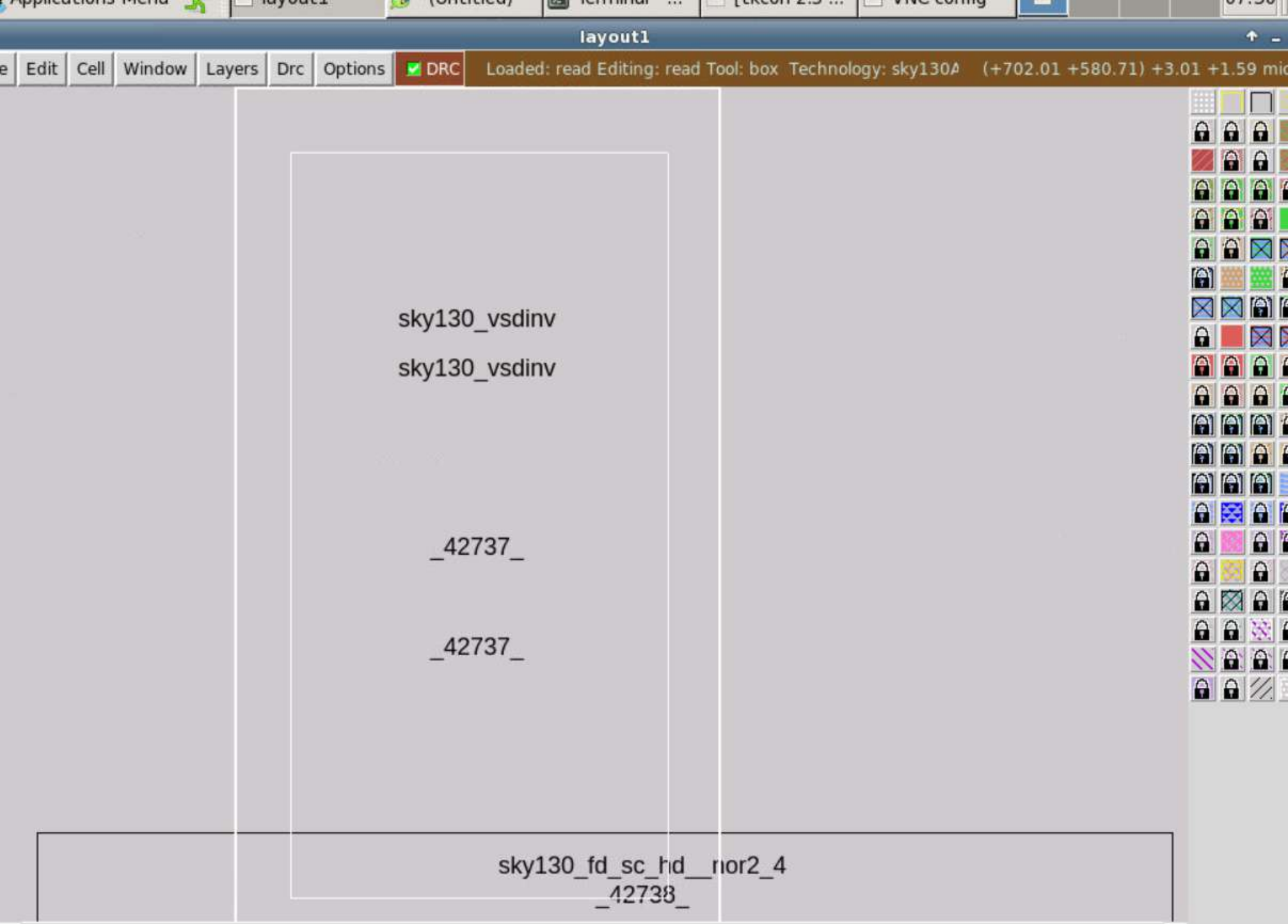
```
[root@e393abeacdab configuration]# less README.md
[root@e393abeacdab configuration]# ls
checkers.tcl  floorplan.tcl  placement.tcl  routing.tcl
cts.tcl       general.tcl    README.md      synthesis.tcl
[root@e393abeacdab configuration]# cd ../
[root@e393abeacdab openLANE_flow]# cd designs/picorv32a/
[root@e393abeacdab picorv32a]# ls
config.tcl  runs  sky130A_sky130_fd_sc_hd_config.tcl  src
[root@e393abeacdab picorv32a]# cd runs
[root@e393abeacdab runs]# ls -ltr
total 8
drwxr-xr-x 6 root root 4096 Oct 19 16:49 19-10_16-47
drwxr-xr-x 6 root root 4096 Oct 20 07:19 trial1
[root@e393abeacdab runs]# cd trial1/tmp/
[root@e393abeacdab tmp]# less merged.lef
[root@e393abeacdab tmp]# cd ../results/placement/
[root@e393abeacdab placement]# ls
picorv32a.placement.def
[root@e393abeacdab placement]# magic -T /root/Desktop/work/tools/openlane_working_dir/pdks/sky130A
/libs.tech/magic/sky130A.tech
[root@e393abeacdab placement]# magic -T /root/Desktop/work/tools/openlane_working_dir/pdks/sky130A
/libs.tech/magic/sky130A.tech lef read ../../tmp/merged.lef def read picorv32a.placement.def
```

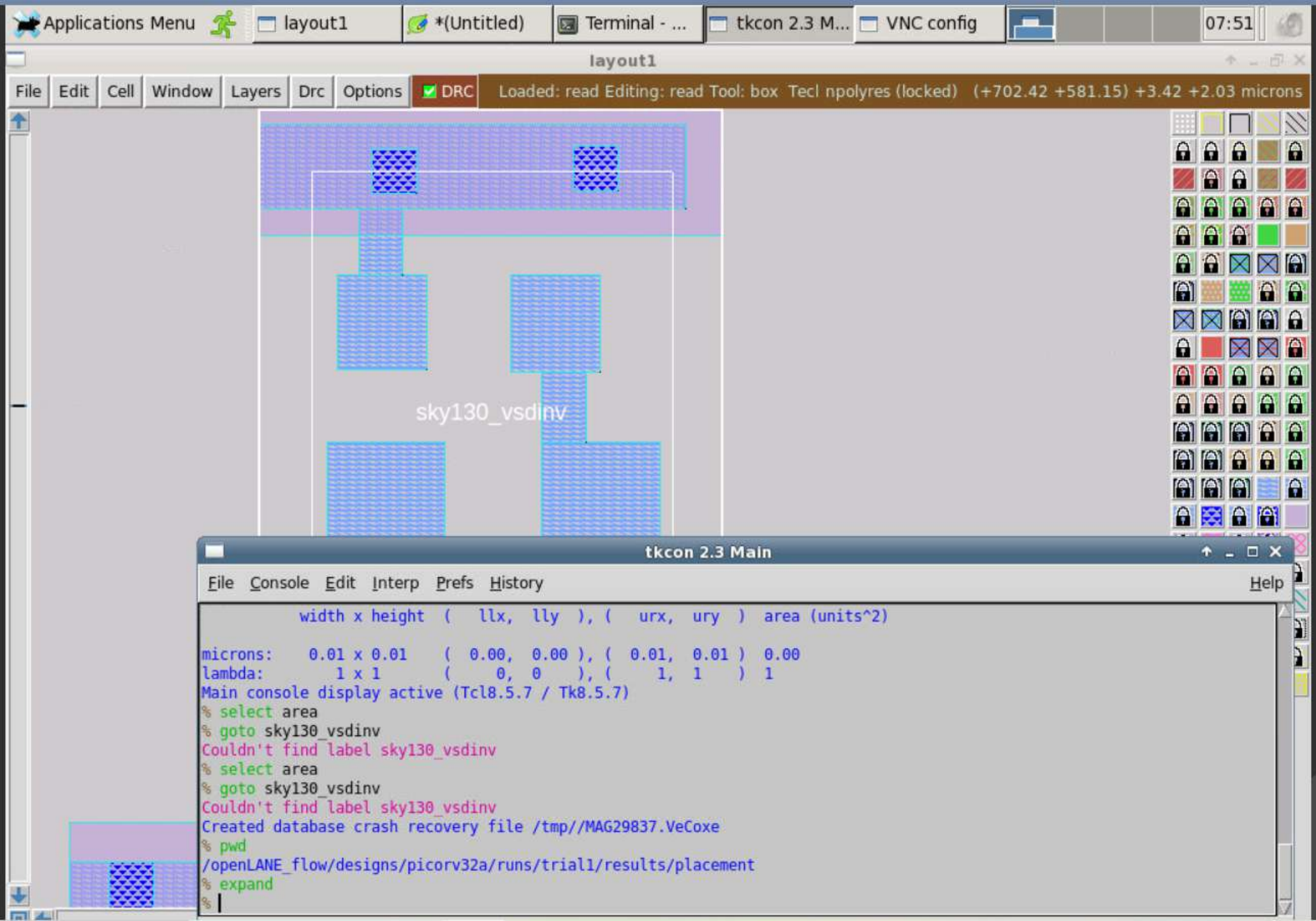

Applications Menu
layout1
*(Untitled)
Terminal - ...
[tkcon 2.3 ...
VNC config
07:39
layout1
File
Edit
Cell
Window
Layers
Drc
Options
DRC
Loaded: read Editing: read Tool: box nndiode (locked) (+782.69 +524.22) +782.69 +524.22 microns
sky130_fd_sc_hd__nand3_4 _42397_
sky130_fd_sc_hd__a21o_4 _42364_
sky130_fd_sc_hd__a21oi_4 _42531_
sky130_fd_sc_hd__nand2_4 _42535_
sky130_fd_sc_hd__nand2_4 _42396_
sky130_fd_sc_hd__a21o_4 _42385_
sky130_fd_sc_hd__nand2_4 _42538_
sky130_fd_sc_hd__nand2_4 _42503_
sky130_fd_sc_hd__nand2_4 _42398_
sky130_fd_sc_hd__nand2_4 _42389_
sky130_fd_sc_hd__nand3_4 _42386_
sky130_fd_sc_hd__nor2_4 _42378_
sky130_fd_sc_hd__nand3_4 _42402_
sky130_fd_sc_hd__a21o_4 _42392_
sky130_fd_sc_hd__nand2_4 _42387_
sky130_fd_sc_hd__nand2_4 _42380_
sky130_fd_sc_hd__nand2_4 _42208_
sky130_fd_sc_hd__nand3_4 _42393_
sky130_fd_sc_hd__or2_4 _42388_
sky130_fd_sc_hd__maj3_4 _42367_
sky130_fd_sc_hd__nand3_4 _42207_
sky130_fd_sc_hd__maj3_4 _42575_
sky130_fd_sc_hd__a21o_4 _42196_
sky130_fd_sc_hd__a21boi_4 _42368_
sky130_vsdinv _42391_
sky130_fd_sc_hd__xnor2_4 _42194_
sky130_fd_sc_hd__nand3_4 _42211_
sky130_fd_sc_hd__o21ai_4 _42399_
sky130_fd_sc_hd__a21boi_4 _42362_
sky130_fd_sc_hd__a21o_4 _42210_
sky130_fd_sc_hd__o21ai_4 _42231_
sky130_vsdinv _42203_
sky130_fd_sc_hd__a21boi_4 _42200_
sky130_fd_sc_hd__xor2_4 _42195_
sky130_fd_sc_hd__nand2_4 _42230_
sky130_vsdinv _42232_
sky130_fd_sc_hd__nand3_4 _42202_
sky130_fd_sc_hd__nand3_4 _42197_
sky130_fd_sc_hd__nand3_4 _42215_
sky130_fd_sc_hd__nand3_4 _42377_
sky130_fd_sc_hd__nand4_4 _42233_
sky130_vsdinv _42201_
sky130_fd_sc_hd__a21boi_4 _42390_
sky130_fd_sc_hd__a21o_4 _42214_
sky130_fd_sc_hd__a21o_4 _42375_
sky130_fd_sc_hd__nand3_4 _42229_
sky130_fd_sc_hd__or2_4 _42224_
sky130_fd_sc_hd__a21o_4 _42221_
sky130_vsdinv _42213_
sky130_fd_sc_hd__a21boi_4 _42542_
sky130_fd_sc_hd__nand3_4 _42726_
sky130_fd_sc_hd__a21o_4 _42228_
sky130_fd_sc_hd__nand3_4 _42222_
sky130_fd_sc_hd__nand3_4 _42376_
sky130_fd_sc_hd__a21o_4 _42725_
sky130_fd_sc_hd__maj3_4 _42227_
sky130_fd_sc_hd__nand2_4 _42414_
sky130_fd_sc_hd__nand2_4 _42223_
sky130_fd_sc_hd__nand4_4 _42033_
sky130_fd_sc_hd__nand2_4 _42722_
sky130_fd_sc_hd__nand2_4 _42225_
sky130_fd_sc_hd__xor2_4 _42220_
sky130_fd_sc_hd__a21o_4 _42036_
sky130_fd_sc_hd__a21o_4 _42034_
sky130_fd_sc_hd__a21o_4 _42721_
sky130_fd_sc_hd__xor2_4 _42384_
sky130_fd_sc_hd__nand2_4 _42216_
sky130_fd_sc_hd__a21boi_4 _42212_
sky130_fd_sc_hd__a21o_4 _42567_
sky130_fd_sc_hd__xnor2_4 _42219_

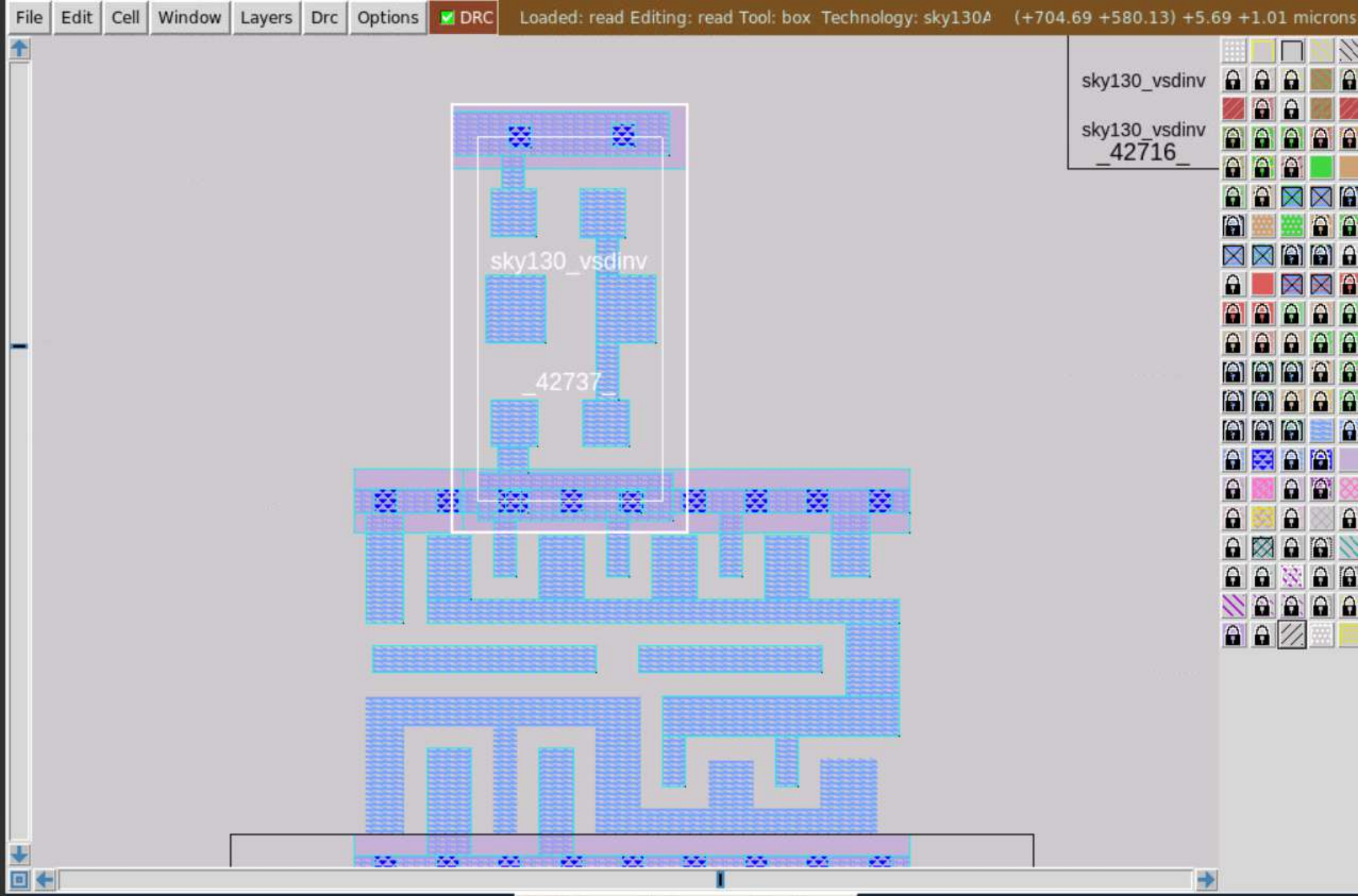
File Edit Cell Window Layers Drc Options DRC Loaded: read Editing: read Tool: box Technology: sky130A (+831.04 -172.5) +223.2 -655.36 microns

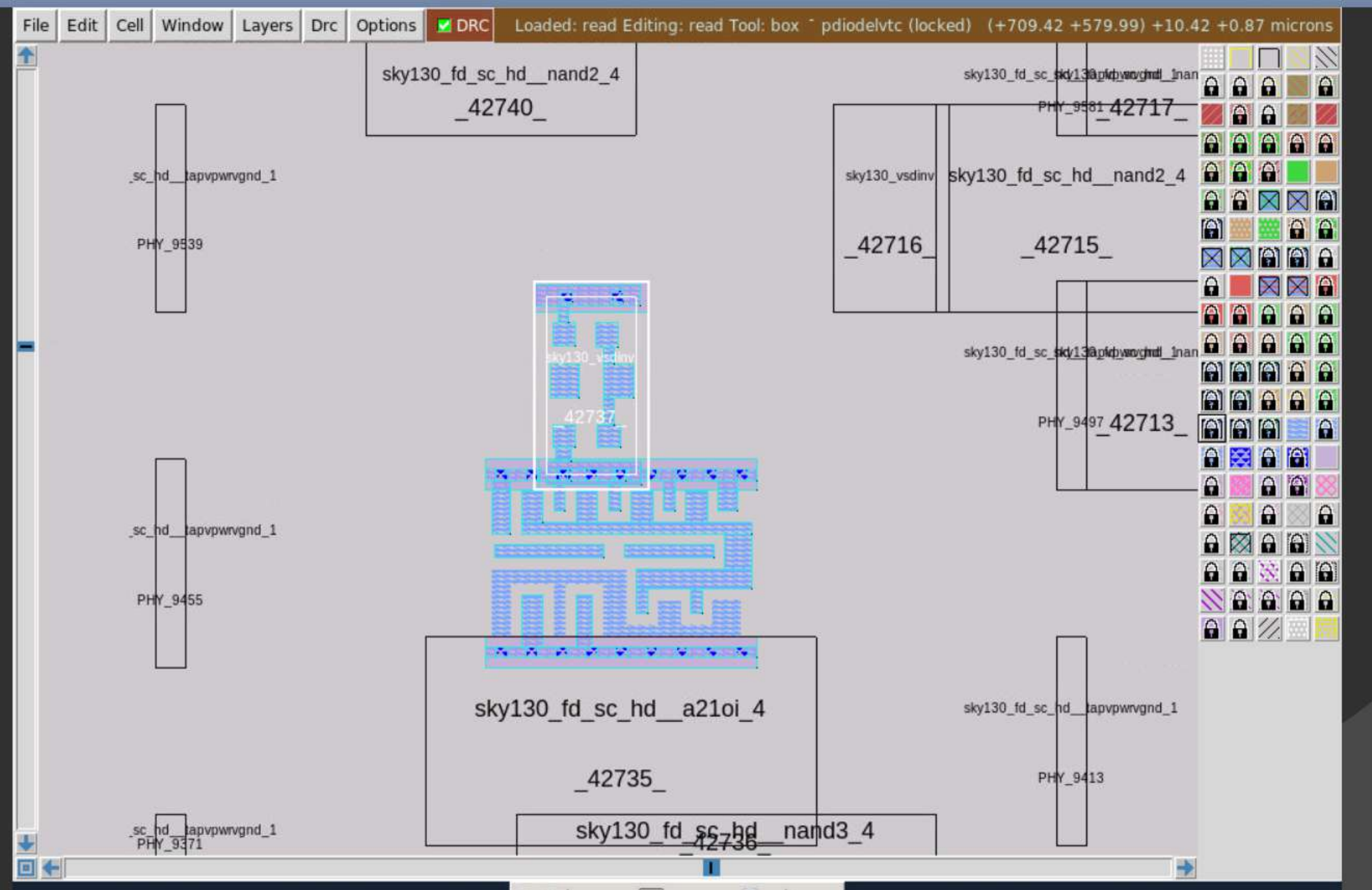


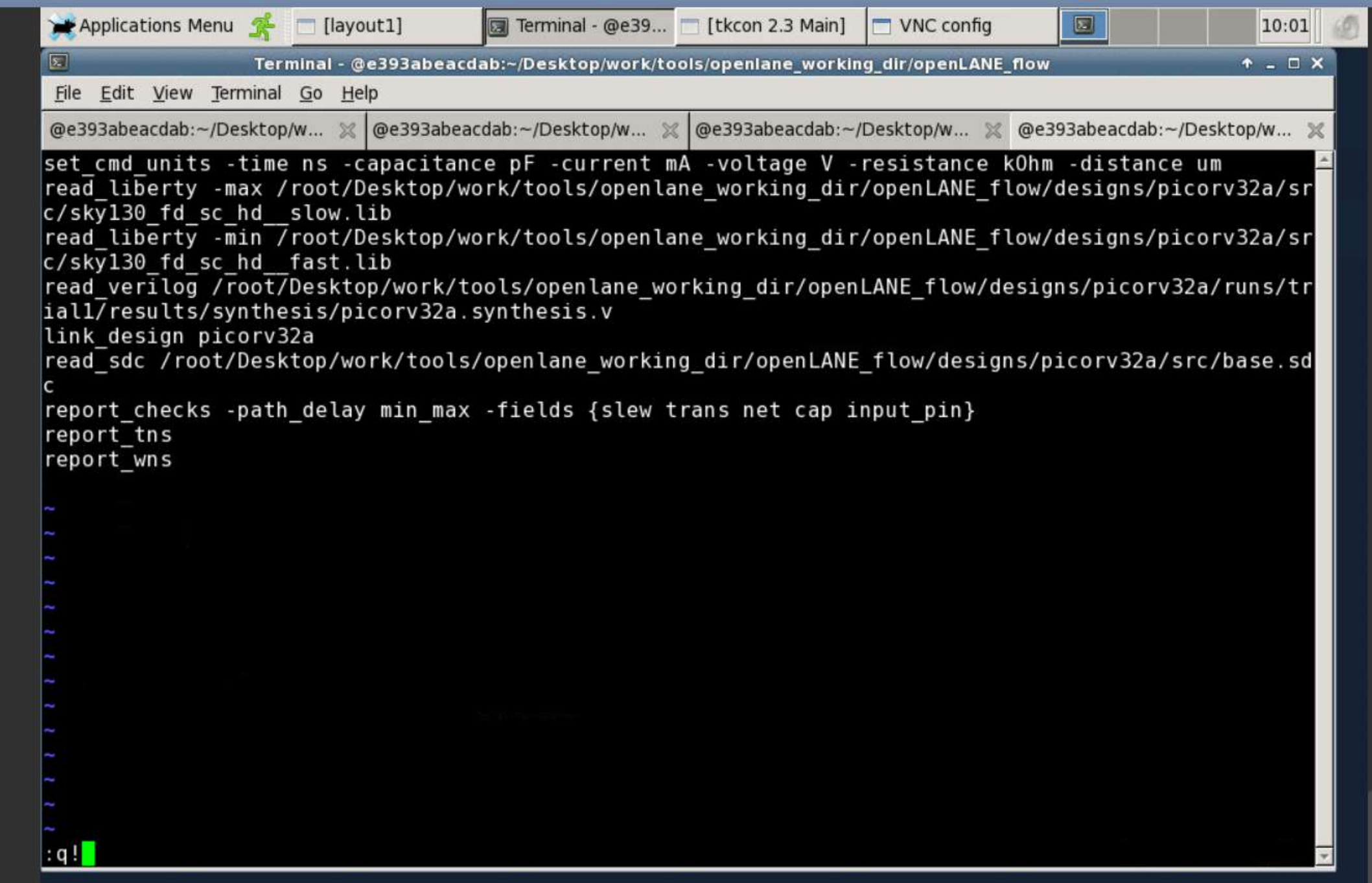

Applications Menu
layout1
*(Untitled)
Terminal - ...
[tkcon 2.3 ...
VNC config
07:49
layout1
File
Edit
Cell
Window
Layers
Drc
Options
DRC
Loaded: read Editing: read Tool: box Technology: sky130A
(+702.02 +580.8) +3.52 +2 microns
sky130_vsdinv
sky130_vsdinv
_42737_
_42737_
sky130_fd_sc_hd__nor2_4
sky130_fd_sc_hd__nor2_4
_42738_
_42738_


layout1
Edit
Cell
Window
Layers
Drc
Options
DRC
Loaded: read Editing: read Tool: box Technology: sky130A (+702.01 +580.71) +3.01 +1.59
sky130_vsdinv
sky130_vsdinv
_42737_
_42737_
sky130_fd_sc_hd__nor2_4
_42738_


Applications Menu
layout1
*(Untitled)
Terminal - ...
tkcon 2.3 M...
VNC config
07:51
layout1
File Edit Cell Window Layers Drc Options DRC
Loaded: read Editing: read Tool: box Tecl npolyres (locked) (+702.42 +581.15) +3.42 +2.03 microns
sky130_vsdinv
tkcon 2.3 Main
File Console Edit Interp Prefs History Help
width x height (llx, lly), (urx, ury) area (units^2)
microns: 0.01 x 0.01 (0.00, 0.00), (0.01, 0.01) 0.00
lambda: 1 x 1 (0, 0), (1, 1) 1
Main console display active (Tcl8.5.7 / Tk8.5.7)
% select area
% goto sky130_vsdinv
Couldn't find label sky130_vsdinv
% select area
% goto sky130_vsdinv
Couldn't find label sky130_vsdinv
Created database crash recovery file /tmp//MAG29837.VeCoxe
% pwd
/openLANE_flow/designs/picorv32a/runs/trial1/results/placement
% expand
%


File
Edit
Cell
Window
Layers
Drc
Options
DRC
Loaded: read Editing: read Tool: box Technology: sky130A
(+704.69 +580.13) +5.69 +1.01 microns
sky130_vsdinv
sky130_vsdinv
_42716_
sky130_vsdinv
_42737_


File
Edit
Cell
Window
Layers
Drc
Options
DRC
Loaded: read Editing: read Tool: box ˜ pdiodelvtc (locked) (+709.42 +579.99) +10.42 +0.87 microns
sky130_fd_sc_hd__nand2_4
_42740_
sky130_fd_sc_hd__nand2_4
_42717_
PHY_9581
_sc_hd__tapvpwrvgnd_1
PHY_9539
sky130_vsdinv
_42716_
sky130_fd_sc_hd__nand2_4
_42715_
sky130_vsdinv
42737
sky130_fd_sc_hd__nand2_4
_42713_
PHY_9497
_sc_hd__tapvpwrvgnd_1
PHY_9455
sky130_fd_sc_hd__a21oi_4
_42735_
sky130_fd_sc_hd__tapvpwrvgnd_1
PHY_9413
sky130_fd_sc_hd__nand3_4
_42736_
_sc_hd__tapvpwrvgnd_1
PHY_9371


Applications Menu
[layout1]
Terminal - @e39...
[tkcon 2.3 Main]
VNC config
10:01
Terminal - @e393abeacdab:~/Desktop/work/tools/openlane_working_dir/openLANE_flow
File Edit View Terminal Go Help
@e393abeacdab:~/Desktop/w...
@e393abeacdab:~/Desktop/w...
@e393abeacdab:~/Desktop/w...
@e393abeacdab:~/Desktop/w...
set_cmd_units -time ns -capacitance pF -current mA -voltage V -resistance kOhm -distance um
read_liberty -max /root/Desktop/work/tools/openlane_working_dir/openLANE_flow/designs/picorv32a/src/sky130_fd_sc_hd__slow.lib
read_liberty -min /root/Desktop/work/tools/openlane_working_dir/openLANE_flow/designs/picorv32a/src/sky130_fd_sc_hd__fast.lib
read_verilog /root/Desktop/work/tools/openlane_working_dir/openLANE_flow/designs/picorv32a/runs/trial1/results/synthesis/picorv32a.synthesis.v
link_design picorv32a
read_sdc /root/Desktop/work/tools/openlane_working_dir/openLANE_flow/designs/picorv32a/src/base.sdc
report_checks -path_delay min_max -fields {slew trans net cap input_pin}
report_tns
report_wns
:q!

```
f
-----------------------------------------------------------------------
 tasks                          Wtime      Ctime
 Parser                         1.702      1.270
 resgin assign                  1.714      1.280
 pre-placement                  1.714      1.280
 non Group cell placement       1.817      1.370
 All                            1.830      1.380
 - - - - - EVALUATION - - - - -
 AVG_displacement : 1761.31
 SUM_displacement : 6.77207e+07
 MAX_displacement : 19379
 - - - - - - - - - - - - - - - - -
 GP HPWL          : 1.48172e+06
 HPWL             : 1.52912e+06
 avg_Disp_site    : 3.82894
 avg_Disp_row     : 0.647541
 delta_HPWL       : 3.19908
 ==== CHECK LEGALITY ====
 row_check ==>> PASS
 site_check ==>> PASS
 power_check ==>> PASS
 edge_check ==>> PASS
 placed_check ==>> PASS
 overlap_check ==>> PASS
 - - - - - - < Program END > - - - - - -
% set ::env(SYNTH_MAX_FANOUT) 4
4
% 
```

```
% report_net -connections  _11341_
Net _11341_
Driver pins
 _41879_/X output (sky130_fd_sc_hd__buf_1)

Load pins
 _41880_/B1 input (sky130_fd_sc_hd__a21o_4)
 _41881_/A input (sky130_fd_sc_hd__buf_1)
 _42233_/B1 input (sky130_fd_sc_hd__a21o_4)
 _42234_/C input (sky130_fd_sc_hd__nand3_4)
% replace_cell  _41879_ sky130_fd_sc_hd__buf_4
1
% report_net -connections _11340_
Net _11340_
Driver pins
 _41878_/Y output (sky130_vsdinv)

Load pins
 _41879_/A input (sky130_fd_sc_hd__buf_4)
 _42544_/B1 input (sky130_fd_sc_hd__a21o_4)
 _42545_/B input (sky130_fd_sc_hd__nand3_4)
% replace_cell  _41878_ sky130_fd_sc_hd__buf_4
0
% report_net -connections _13779_
Net _13779_
Driver pins
 _44325_/X output (sky130_fd_sc_hd__buf_1)

Load pins
 _44327_/A input (sky130_fd_sc_hd__xor2_4)
 _44591_/A input (sky130_fd_sc_hd__xor2_4)
 _45562_/A input (sky130_fd_sc_hd__xor2_4)
```

File Edit View Terminal Go Help

@e393abeacdab:~/Desktop/wo... | @e393abeacdab:~/Desktop/wo... | @e393abeacdab:~/Desktop/wo... | @e393abeacdab:/openLANE_flow

```
                0.1053    0.6913    0.6913 ^ _50144_/Q (sky130_fd_sc_hd__dfxtp_4)
   4    0.0152                               pcpi_mul.rs1[32] (net)
                0.1053    0.0000    0.6913 ^ _33451_/A (sky130_fd_sc_hd__buf_1)
                0.5445    0.5022    1.1935 ^ _33451_/X (sky130_fd_sc_hd__buf_1)
   4    0.0285                               _03405_ (net)
                0.5445    0.0000    1.1935 ^ _33452_/A (sky130_fd_sc_hd__buf_1)
                0.5479    0.6421    1.8356 ^ _33452_/X (sky130_fd_sc_hd__buf_1)
   4    0.0288                               _03406_ (net)
                0.5479    0.0000    1.8356 ^ _33453_/A (sky130_fd_sc_hd__buf_1)
                0.5406    0.6379    2.4734 ^ _33453_/X (sky130_fd_sc_hd__buf_1)
   4    0.0284                               _03407_ (net)
                0.5406    0.0000    2.4734 ^ _33454_/A (sky130_fd_sc_hd__buf_1)
                0.4680    0.5840    3.0574 ^ _33454_/X (sky130_fd_sc_hd__buf_1)
   4    0.0244                               _03408_ (net)
                0.4680    0.0000    3.0574 ^ _33455_/A (sky130_fd_sc_hd__buf_1)
                0.4233    0.5320    3.5894 ^ _33455_/X (sky130_fd_sc_hd__buf_1)
   4    0.0220                               _03409_ (net)
                0.4233    0.0000    3.5894 ^ _47484_/A (sky130_fd_sc_hd__buf_1)
                0.5123    0.5832    4.1726 ^ _47484_/X (sky130_fd_sc_hd__buf_1)
   4    0.0269                               _16921_ (net)
                0.5123    0.0000    4.1726 ^ _47685_/A (sky130_fd_sc_hd__nand2_4)
                0.1089    0.1729    4.3455 v _47685_/Y (sky130_fd_sc_hd__nand2_4)
   2    0.0042                               _17120_ (net)
                0.1089    0.0000    4.3455 v _47686_/A (sky130_fd_sc_hd__buf_1)
                0.4816    0.5016    4.8471 v _47686_/X (sky130_fd_sc_hd__buf_1)
   4    0.0429                               _17121_ (net)
                0.4816    0.0000    4.8471 v _47876_/A (sky130_fd_sc_hd__xor2_4)
                0.3140    0.5168    5.3639 ^ _47876_/X (sky130_fd_sc_hd__xor2_4)
   2    0.0197                               _17309_ (net)
                0.3140    0.0000    5.3639 ^ _47972_/A (sky130_fd_sc_hd__buf_1)
                0.8078    0.7633    6.1272 ^ _47972_/X (sky130_fd_sc_hd__buf_1)
   4    0.0432                               _17404_ (net)
```

File Edit View Terminal Go Help

@e393abeacdab:~/Desktop/wo... | @e393abeacdab:~/Desktop/wo... | @e393abeacdab:~/Desktop/wo... | @e393abeacdab:/openLANE_flow

```
                  0.0856    0.0000   10.4077 ^ _46207_/A (sky130_fd_sc_hd__buf_1)
                  0.7957    0.6719   11.0796 ^ _46207_/X (sky130_fd_sc_hd__buf_1)
     4    0.0424                              _15653_ (net)
                  0.7957    0.0000   11.0796 ^ _46892_/A1 (sky130_fd_sc_hd__a21oi_4)
                  0.2433    0.3962   11.4758 v _46892_/Y (sky130_fd_sc_hd__a21oi_4)
     3    0.0270                              _16334_ (net)
                  0.2433    0.0000   11.4758 v _47183_/A2 (sky130_fd_sc_hd__o21ai_4)
                  0.3575    0.4104   11.8862 ^ _47183_/Y (sky130_fd_sc_hd__o21ai_4)
     2    0.0248                              _16623_ (net)
                  0.3575    0.0000   11.8862 ^ _47312_/A1 (sky130_fd_sc_hd__a21oi_4)
                  0.1362    0.2306   12.1167 v _47312_/Y (sky130_fd_sc_hd__a21oi_4)
     1    0.0159                              _16751_ (net)
                  0.1362    0.0000   12.1167 v _47313_/B (sky130_fd_sc_hd__xnor2_4)
                  0.0756    0.2349   12.3516 v _47313_/Y (sky130_fd_sc_hd__xnor2_4)
     1    0.0014                              _01460_ (net)
                  0.0756    0.0000   12.3516 v _50067_/D (sky130_fd_sc_hd__dfxtp_4)
                                     12.3516   data arrival time

                  0.0000   12.0000   12.0000   clock clk (rise edge)
                            0.0000   12.0000   clock network delay (ideal)
                            0.0000   12.0000   clock reconvergence pessimism
                                     12.0000 ^ _50067_/CLK (sky130_fd_sc_hd__dfxtp_4)
                           -0.2934   11.7066   library setup time
                                     11.7066   data required time
-----------------------------------------------------------------------------
                                     11.7066   data required time
                                    -12.3516   data arrival time
-----------------------------------------------------------------------------
                                     -0.6450   slack (VIOLATED)


%
```

```
% write_verilog /root/Desktop/work/tools/openlane_working_dir/openLANE_flow/designs/picorv32a/runs/t
rial1/results/synthesis/picorv32a.synthesis.v
%
```

```
[root@e393abeacdab results]# ls -ltr
total 28
drwxr-xr-x 2 root root 4096 Oct 20 14:42 cts
drwxr-xr-x 2 root root 4096 Oct 20 14:42 routing
drwxr-xr-x 2 root root 4096 Oct 20 14:42 magic
drwxr-xr-x 2 root root 4096 Oct 20 14:42 lvs
drwxr-xr-x 2 root root 4096 Oct 20 14:44 synthesis
drwxr-xr-x 2 root root 4096 Oct 20 14:45 floorplan
drwxr-xr-x 2 root root 4096 Oct 20 14:46 placement
[root@e393abeacdab results]# cd synthesis
[root@e393abeacdab synthesis]# ls -ltr
total 2236
-rw-r--r-- 1 root root 2288624 Oct 20 16:18 picorv32a.synthesis.v
[root@e393abeacdab synthesis]#
```

```
 * Post CTS opt *
 ****************
 Avg. source sink dist: 47107.4 dbu.
 Num outlier sinks: 7
 ********************
 * Write data to DB *
 ********************
 Writing clock net "clk" to DB
    Created 278 clock buffers.
 Minimum number of buffers in the clock path: 12.
 Maximum number of buffers in the clock path: 13.
    Created 278 clock nets.
    Fanout distribution for the current clock = 1:23, 2:127, 3:1, 5:2, 6:9, 7:8, 8:6, 9:7, 10:13, 11
:8, 12:17, 13:6, 14:8, 15:4, 16:9, 17:7, 18:8, 19:3, 20:3, 21:3, 22:2, 23:1, 24:1, 25:2.
    Max level of the clock tree: 7.
 ... End of TritonCTS execution.
%
%
% echo $::env(LIB_SYNTH_COMPLETE)
/openLANE_flow/designs/picorv32a/src/sky130_fd_sc_hd__typical.lib
%
% echo $::env(LIB_TYPICAL)
/openLANE_flow/designs/picorv32a/src/sky130_fd_sc_hd__typical.lib
% echo $::env(CURRENT_DEF)
/openLANE_flow/designs/picorv32a/runs/trial1//results/cts/picorv32a.cts.def
% echo $::env(SYNTH_MAX_TRAIN)
can't read "::env(SYNTH_MAX_TRAIN)": no such variable
% echo $::env(SYNTH_MAX_TRAN)
1.0
% echo $::env(CTS_MAX_CAP)
1.53169
%
```

File Edit View Terminal Go Help

@e393abeacdab:~/Desktop/wo... | @e393abeacdab:~/Desktop/wo... | @e393abeacdab:~/Desktop/wo... | @e393abeacdab:/openLANE_flo...

```
   0.2306    14.3925 v _47312_/Y (sky130_fd_sc_hd__a21oi_4)
   0.2349    14.6274 v _47313_/Y (sky130_fd_sc_hd__xnor2_4)
   0.0000    14.6274 v _50067_/D (sky130_fd_sc_hd__dfxtp_4)
             14.6274   data arrival time

  12.0000    12.0000   clock clk (rise edge)
   0.0000    12.0000   clock source latency
   0.0074    12.0074 ^ clk (in)
   0.0693    12.0767 ^ clkbuf_0_clk/X (sky130_fd_sc_hd__clkbuf_16)
   0.0463    12.1229 ^ clkbuf_1_1_0_clk/X (sky130_fd_sc_hd__clkbuf_1)
   0.0480    12.1709 ^ clkbuf_1_1_1_clk/X (sky130_fd_sc_hd__clkbuf_1)
   0.0614    12.2323 ^ clkbuf_1_1_2_clk/X (sky130_fd_sc_hd__clkbuf_1)
   0.0518    12.2841 ^ clkbuf_2_3_0_clk/X (sky130_fd_sc_hd__clkbuf_1)
   0.0615    12.3456 ^ clkbuf_2_3_1_clk/X (sky130_fd_sc_hd__clkbuf_1)
   0.0518    12.3974 ^ clkbuf_3_7_0_clk/X (sky130_fd_sc_hd__clkbuf_1)
   0.0615    12.4589 ^ clkbuf_3_7_1_clk/X (sky130_fd_sc_hd__clkbuf_1)
   0.0652    12.5241 ^ clkbuf_4_15_0_clk/X (sky130_fd_sc_hd__clkbuf_1)
   0.0652    12.5893 ^ clkbuf_5_31_0_clk/X (sky130_fd_sc_hd__clkbuf_1)
   0.0652    12.6545 ^ clkbuf_6_63_0_clk/X (sky130_fd_sc_hd__clkbuf_1)
   0.1998    12.8543 ^ clkbuf_7_126_0_clk/X (sky130_fd_sc_hd__clkbuf_1)
   0.0000    12.8543 ^ _50067_/CLK (sky130_fd_sc_hd__dfxtp_4)
   0.3999    13.2542   clock reconvergence pessimism
  -0.2292    13.0251   library setup time
             13.0251   data required time
-------------------------------------------------------------
             13.0251   data required time
            -14.6274   data arrival time
-------------------------------------------------------------
             -1.6023   slack (VIOLATED)


% exit
```

File Edit View Terminal Go Help

@e393abeacdab:~/Desktop/wo... | @e393abeacdab:~/Desktop/wo... | @e393abeacdab:~/Desktop/wo... | @e393abeacdab:/openLANE_flo...

```
    4    0.0088                                          _01565_ (net)
                0.1147    0.0000    4.1828 ^ _31099_/A (sky130_fd_sc_hd__buf_1)
                0.1258    0.1560    4.3388 ^ _31099_/X (sky130_fd_sc_hd__buf_1)
    4    0.0098                                          _01566_ (net)
                0.1258    0.0000    4.3388 ^ _31100_/A (sky130_fd_sc_hd__buf_1)
                0.2362    0.2349    4.5737 ^ _31100_/X (sky130_fd_sc_hd__buf_1)
    4    0.0194                                          _01567_ (net)
                0.2362    0.0000    4.5737 ^ _31101_/B (sky130_fd_sc_hd__or2_4)
                0.0467    0.1725    4.7462 ^ _31101_/X (sky130_fd_sc_hd__or2_4)
    1    0.0090                                          _01568_ (net)
                0.0467    0.0000    4.7462 ^ _31102_/B1 (sky130_fd_sc_hd__o21ai_4)
                0.0698    0.0524    4.7986 v _31102_/Y (sky130_fd_sc_hd__o21ai_4)
    1    0.0082                                          _01569_ (net)
                0.0698    0.0000    4.7986 v _31109_/A1 (sky130_fd_sc_hd__a21oi_4)
                0.1929    0.1955    4.9941 ^ _31109_/Y (sky130_fd_sc_hd__a21oi_4)
    2    0.0202                                          mem_la_addr[2] (net)
                0.1929    0.0000    4.9941 ^ mem_la_addr[2] (out)
                                    4.9941   data arrival time

                         12.0000   12.0000   clock clk (rise edge)
                          0.0000   12.0000   clock network delay (propagated)
                          0.0000   12.0000   clock reconvergence pessimism
                         -2.4000    9.6000   output external delay
                                    9.6000   data required time
-----------------------------------------------------------------------------
                                    9.6000   data required time
                                   -4.9941   data arrival time
-----------------------------------------------------------------------------
                                    4.6059   slack (MET)


%
```

```
                                   9.6000   data required time
                                  -4.9941   data arrival time
-----------------------------------------------------------------------------
                                   4.6059   slack (MET)


% report_clock_skew -hold
Clock clk
Latency      CRPR       Skew
_49097_/CLK ^
   1.31
_49803_/CLK ^
   1.13      0.00       0.18

% report_clock_skew -setup
Clock clk
Latency      CRPR       Skew
_49097_/CLK ^
   1.31
_49803_/CLK ^
   1.13      0.00       0.18

%
```