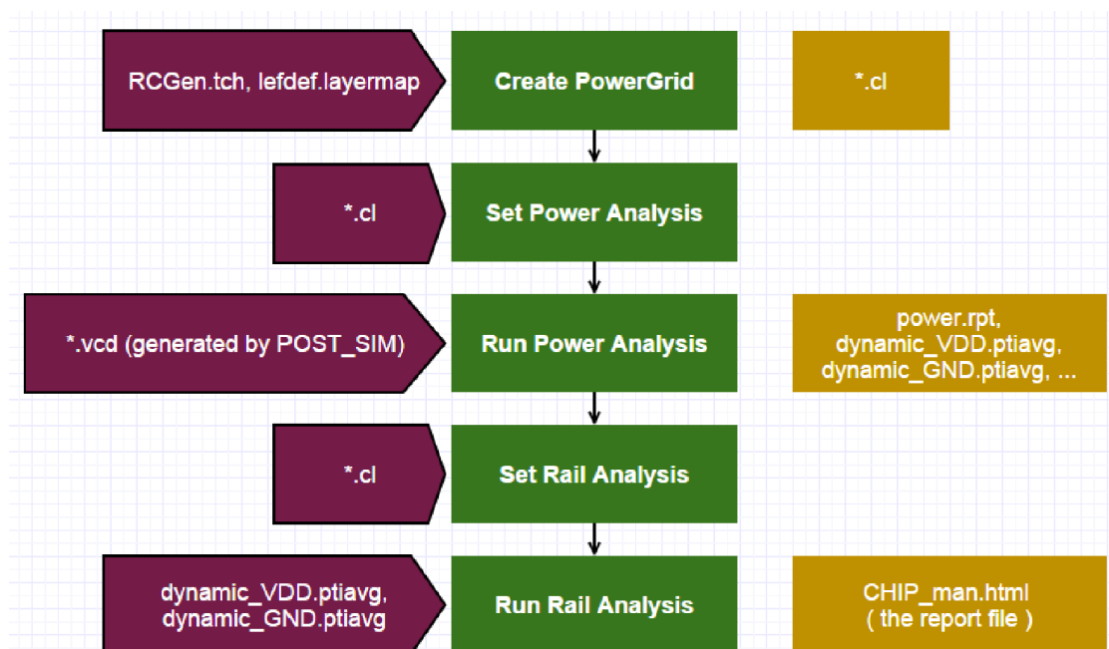# NCTU-EE IC Design LAB - Spring 2018

## Lab12 Power Rail Analysis

*Before starting this lab, you should finish the APR flow in Lab12 and save the final result as iclabXX.inn (or any name you want).*

## 1. Flow overview



## 2. Set environment

**1.** Set up the environment. These commands must be keyed in in exactly the terminal you're going to open innovus later.

- unix% tar –xvf ~iclabta01/Lab12.tar

- Put the following files into 05_APR/

  - CHIP_iclabXX.io

  - CHIP_iclabXX.sdc

  - iclabXX.inn

  - iclabXX.inn.dat.tar

- Go to 05_APR

- unix% ./set.sh (key in your iclab number)

- unix% setenv LD_LIBRARY_PATH /home/RAID2/COURSE/iclab/iclabXX/Lab12/EXERCISE/05_APR/lib: $LD_LIBRARY_PATH

```
% setenv LD_LIBRARY_PATH /home/RAID2/COURSE/iclab/iclabXX/Lab12/EXERCISE/05_APR/lib/:$LD_LIBRARY_PATH
```
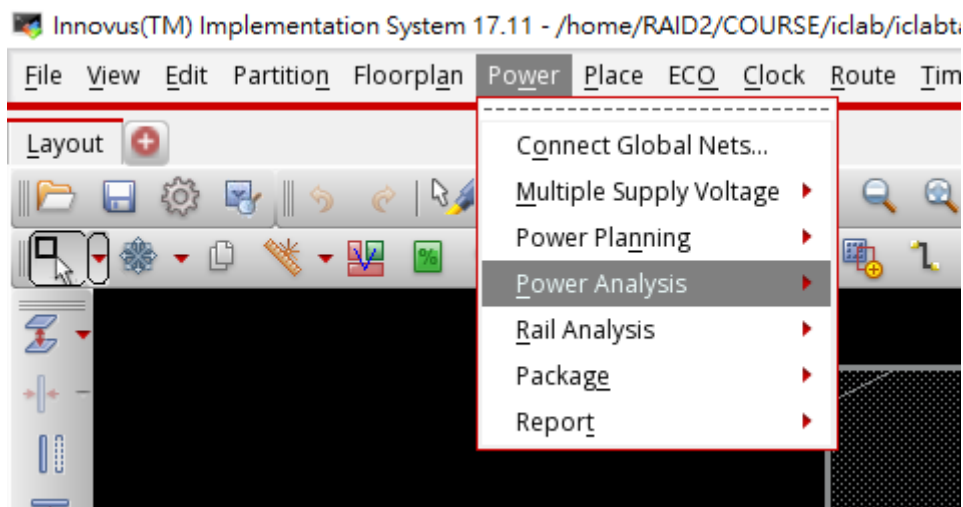
- unix% echo $LD_LIBRARY_PATH

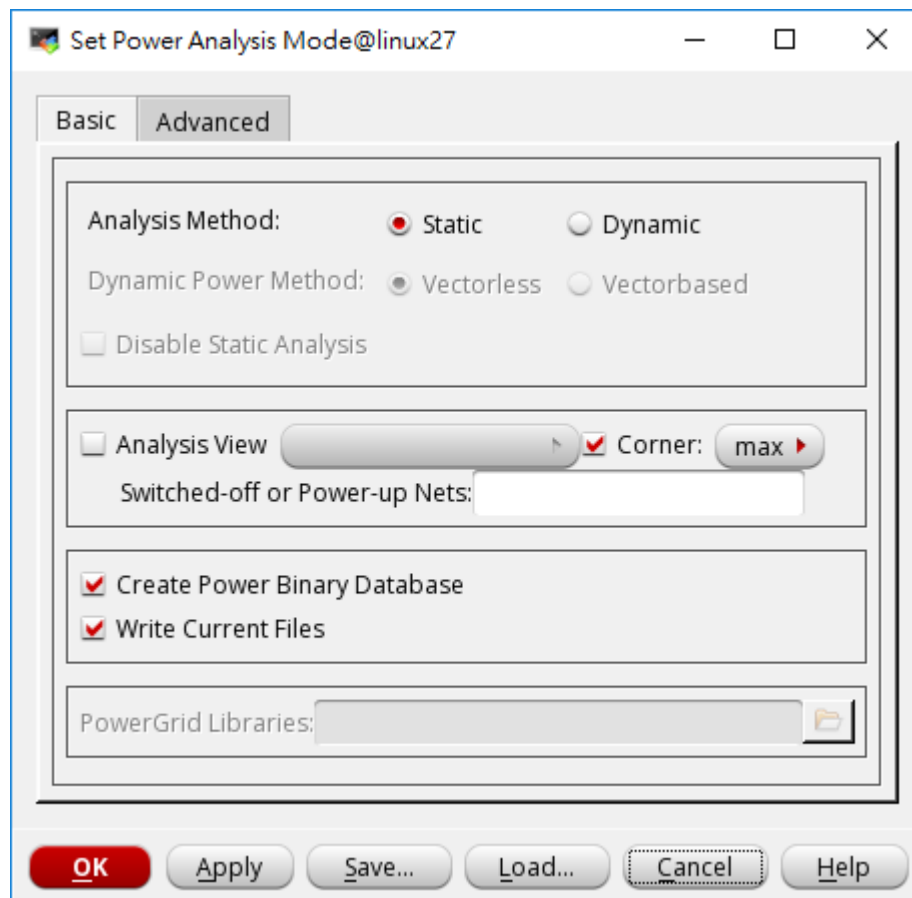  Check the library is linked to the lib directory in 05_APR/

2. mkdir power_log/, you will save all the things here.

3. Start Innovus and restore the design iclabXX.inn.

## 3. Static Power Analysis

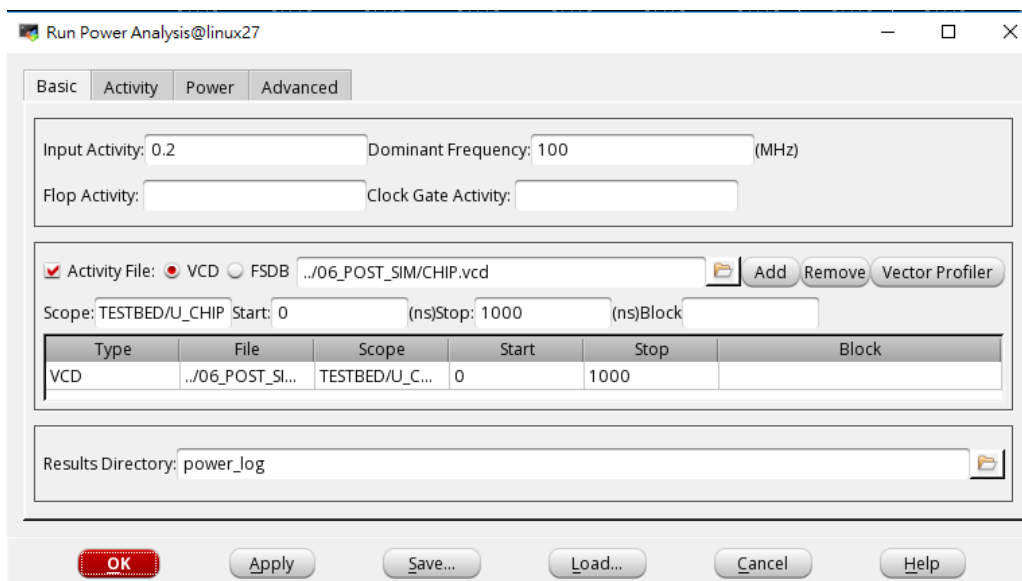1. In the innovus menu, open **Power** -> **Power Analysis** -> **Setup**

i.   Click OK.



2. In the innovus menu, open *Power* -> *Power Analysis* -> *Run*

   i.   ◆Activity FILE  ◆VCD

   ii.  Fill the information:

   - Select CHIP.vcd (linked from 06_POSTSIM)

   - Scope: TESTBED/U_CHIP

   - Start: 0; Stop: 1000

   iii. Results Directory: power_log

iv.    Press Add, and click OK.



v.     Results appear at terminal



```
Total Power
--------------------------------------------------------------------------------
Total Internal Power:       6.08674367         91.3719%
Total Switching Power:      0.57095948          8.5710%
Total Leakage Power:        0.00379808          0.0570%
Total Power:                6.66150126
--------------------------------------------------------------------------------
```
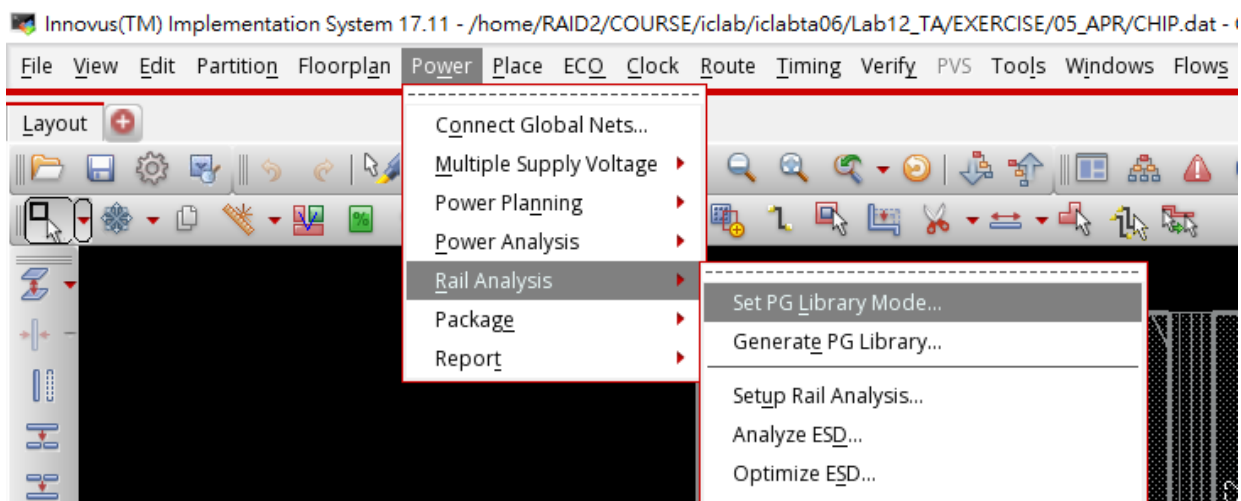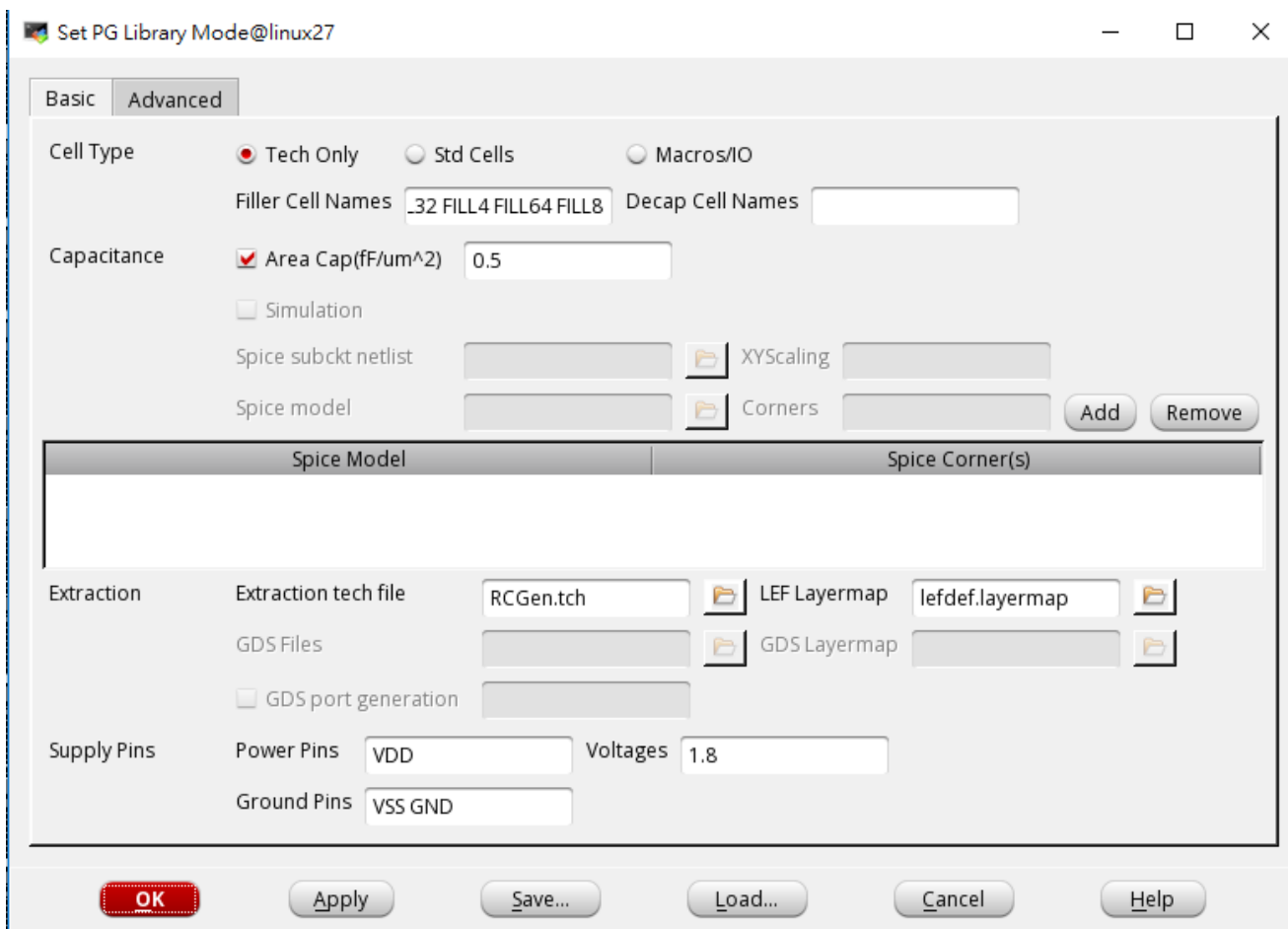
# 4. Create Power Grid Library

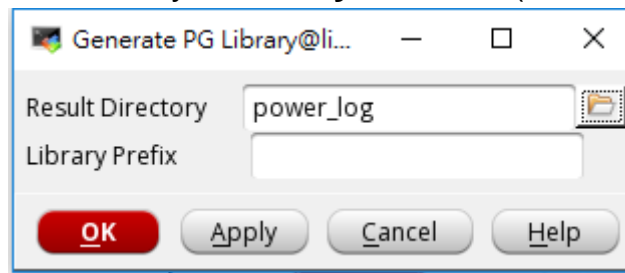1.  In the innovus menu, open **Power** -> **Rail Analysis** -> **Set PG Library Mode**



i.     Cell type:  ◆Tech Only

ii.    Filler Cell Names: **FILL1 FILL16 FILL2 FILL32 FILL4 FILL64 FILL8**

iii. Extraction

- Extraction tech file: **RCGen.tch**

- LEF Layermap: **lefdef.layermap**

iv. Supply Pins

- Voltages: **1.8**

- Power pin: **VDD**

- Ground pin: **VSS GND**

v. Click OK



2. In the innovus menu, open *Power -> Rail Analysis -> Generate PG Library*

i. Choose power_log

ii. Click OK

iii.   Check if the directory **techonly.cl** exists (under power_log/)



3. In the innovus menu, open ***Power -> Rail Analysis -> Set PG Library Mode***

   i.   Cell type: ◆Std Cells

   ii.   Filler Cell Names: **FILL1 FILL16 FILL2 FILL32 FILL4 FILL64 FILL8**

   iii.   Capacitance: ◆Simulation

   - Spice subckt netlist: **umc18_lvs.spi**

   - Spice model: **umc018.l**

   - Corners: L18U18V_SS

   - Click **Add** button

   iv.   Extraction

   - Extraction tech file: **RCGen.tch**

   - LEF Layermap: **lefdef.layermap**

   v.   Supply Pins

   - Voltage: **1.8**

   vi.   Change to the **Advanced** page

   - Cell List File: **cell018.list**

## vii.    Click OK.

**4.** In the innovus menu, open *Power -> Rail Analysis -> Generate PG Library*

    i.     Click OK

    ii.    Check if the directory **stdcells.cl** exists (under power_log/)

    iii.   Results



# 5. Rail Analysis

**1.** In the innovus menu, open *Power -> Rail Analysis -> Setup Rail Analysis*

    i.     Analysis Method: ◆ **Static**

    ii.    PowerGrid Libraries: **technoly.cl** (should be added first) **stdcells.cl**

    iii.   Click **OK**
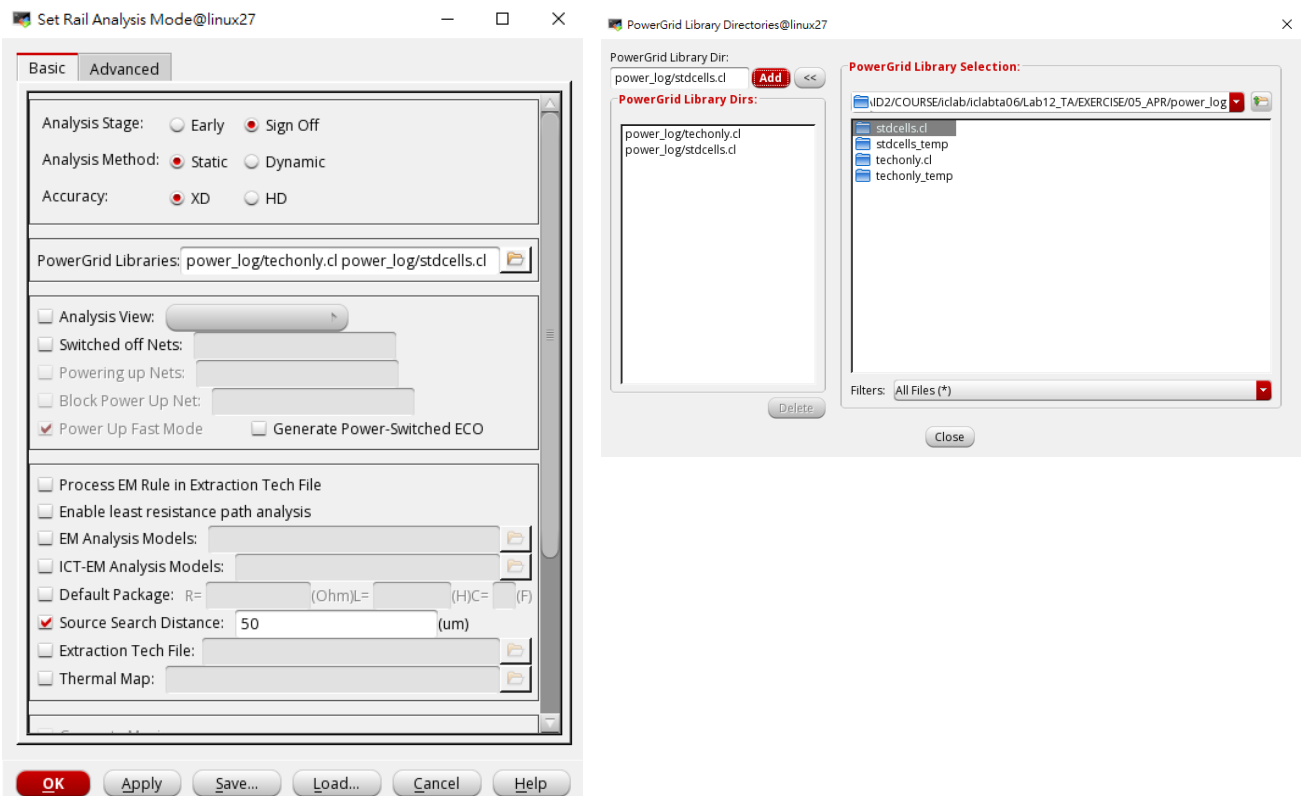
**2.** In the innovus menu, open *Power -> Rail Analysis -> Run Rail Analysis*

    i.    Power/Current Files(s): **static_VDD.ptiavg, static_GND.ptiavg**(under power_log/)

    ii.    Power Pads: ◆ XY File

    iii.    Click Create

- Net Name: VDD
- Click **Fetch**
- Save as CHIP_VDD.pp

    iv.    Click Create again

- Net Name: GND
- Click **Fetch**
- Save as CHIP_GND.pp

    v.    Click Cancel and click Cancel again

    vi.    Change to terminal

    vii.    % innovus > source run_rail_analysis_VDD.cmd

    viii.    % innovus > source run_rail_analysis_GND.cmd
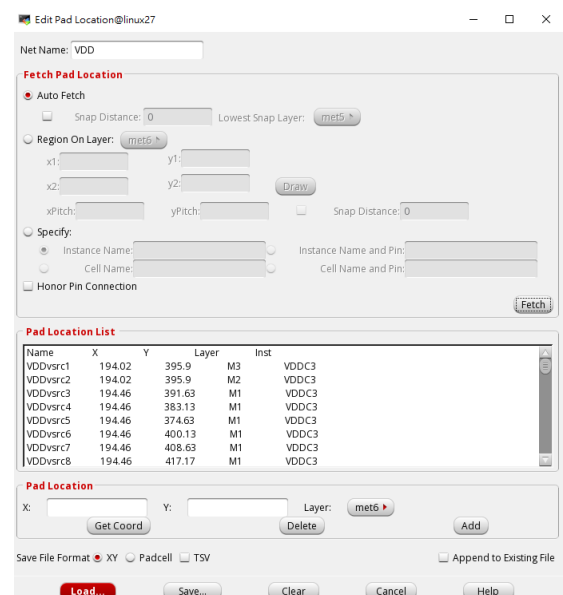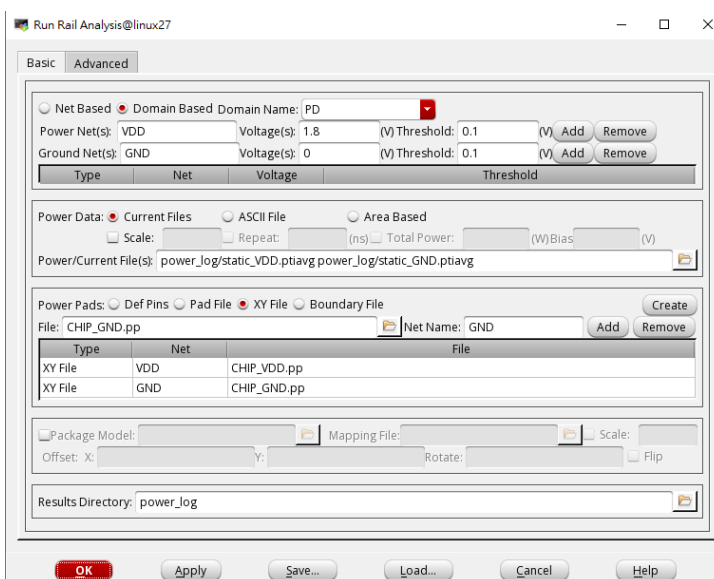
# 6. IR Drop Results

1. **Go back to innovus window**

2. **In the innovus menu, open *Power -> Report -> Power & Rail Result***

   i. ◆Auto Apply for Color Scale

   ii. Click DB Setup

   - Rail Database: power_log/VDD_25C_av g_1

   - Click OK

   iii. Type: ◆Rail

   iv. Choose ir – IR Drop
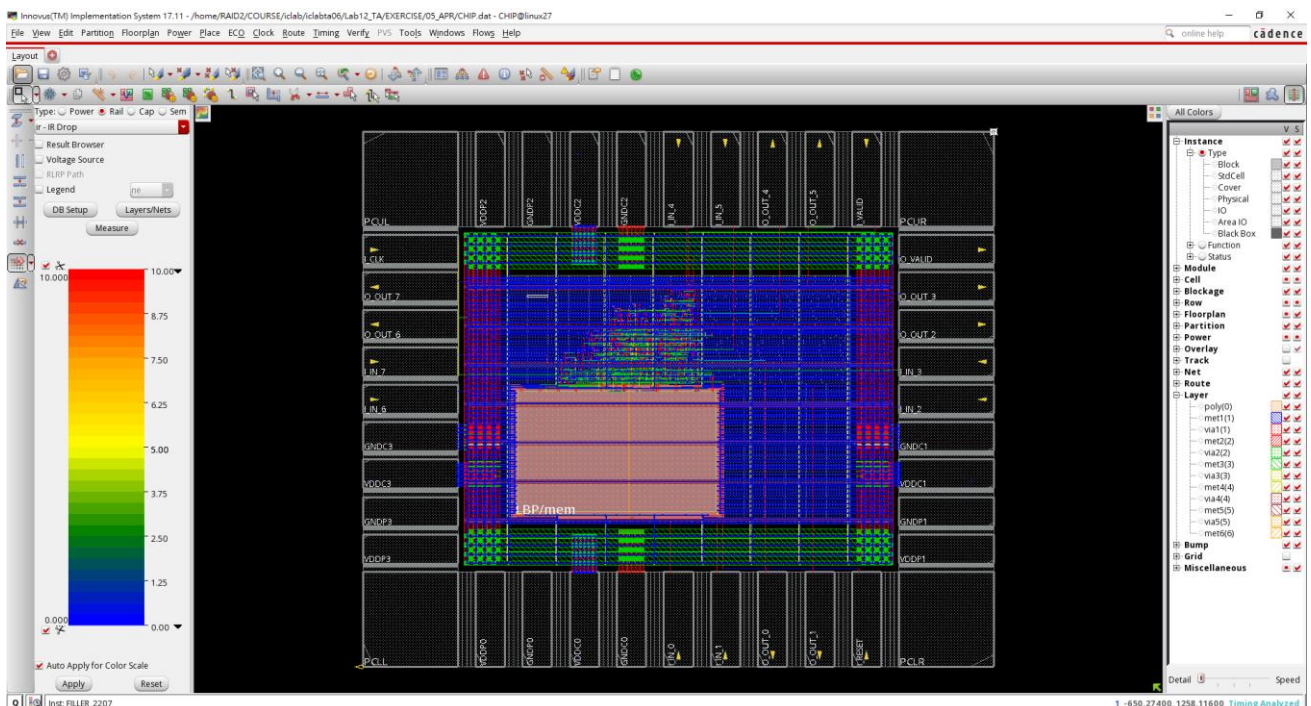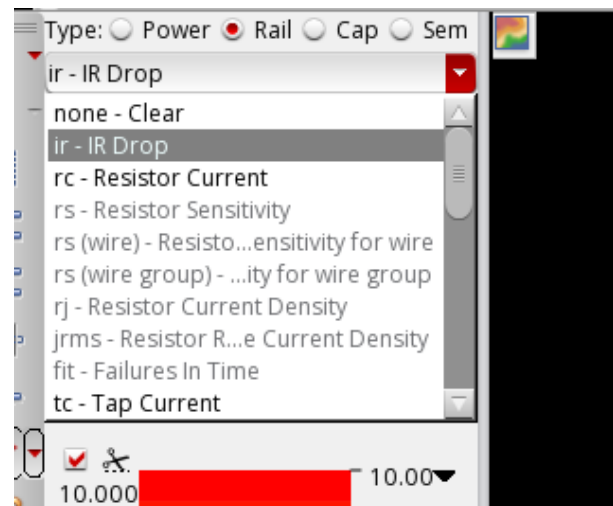
# 7. Files you have to hand in

1. **From Lab11**

     i.    CHIP_iclabXX.io

     ii.   CHIP_iclabXX.sdc

     iii.  iclabXX.inn

     iv.   iclabXX.inn.dat.tar

2. **In this lab**

     i.    iclabXX.cmd

     ii.   Note: There may be innovus.cmd1, innovus.cmd2…, and the bigger number corresponds to the latter process. Therefore, be careful to choose the newest cmd file and rename it to iclabXX.cmd.)